Job Hazards for Musculoskeletal Disorders for Youth Working on Farms

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Abstract

A series of eight focus groups were convened to: (1) identify tasks and activities performed by youth on farms with the potential for causing non-traumatic work-related Musculoskeletal Disorders (MSDs); (2) determine the participants perceptions about risks of MSDs for youths performing those tasks; and (3) determine other factors that might relate to MSDs for youth working on farms, such as possible interventions for prevention. Seventy-two farm family members, 40 adults and 32 farm youth aged 8-18, participated in focus groups. Ten questions were posed to each of the eight groups about what tasks youth perform on the farm, how the work is assigned, and what risk factors are associated with the work.

There was general agreement among the adults that maturity rather than age is the dominant factor for determining what tasks are performed by youth workers on the farm. Youth, on the other hand, believed that task urgency dictated what jobs were assigned to youth workers. Most adults indicated that lifting objects, forking, or shoveling was responsible for most of the serious non-traumatic injuries. Bending over while working, sitting in an awkward position looking back at equipment from a tractor, sitting in a cramped position, looking down at a combine header, and long hours of work were also identified as potential problems. Youth described muscle aches and strains of the legs, arms, shoulder, back or neck as everyday occurrences. According to the youth, "If it's not broken, you're fine". Only basic training is provided and most respondents believed that youth learned best through observation. There was general agreement that physician recommended guidelines for assigning youth to tasks would be ignored unless they carried the force of the law.

Keywords. Ergonomics, Child labor, Focus groups, Farm tasks.

Many people perceive rural living and farm life to be a healthy, safe, easygoing environment for raising children. They envision children running carefree through fields, fishing in farm ponds, and swimming in the favorite local water hole. While these are some of the benefits of living on a farm, life for farm children is far from carefree. Farmwork is serious business, and children of farm households are expected to contribute to the farm operation from a very young age. They learn responsibility, work ethics, and dedication to livestock, crops and family, but they also face a serious risk of injury from one of the most

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hazardous occupations in the U.S. In 1991, there were 923,000 children under 15 years of age and 346,000 children 15 to 19 years of age residing on United States farms and ranches (Dacquel and Dahmann, 1993). Another 800,000 children lived in households of hired farmworkers and may work on farms with their parents (Olivera and Cox, 1989). Farming has been shown to be hazardous for adults, resulting in an average of 8 injuries per 100 workers in 1998 (OSHA, 1998). In addition, it has been estimated that as many as 100,000 children suffer a preventable injury associated with production agriculture annually (Miller, 1995). While there have been a number of studies of adult farmworkers, little has been published on the risk of injury for youth workers on the farm.

A report from the National Committee for Childhood Agricultural Injury Prevention (NCCAIP) on research needs for children working in agriculture indicated that studies are needed to determine the impact of noise, vibration, cumulative trauma, and other work-induced health hazards on children and adolescents (NCCAIP, 1996). Also, the National Children's Center in Marshfield, Wisconsin, has recently published the North American Guidelines for Children Working in Agriculture (NAGCAT). These comprehensive guidelines were developed by agriculture safety and health experts to provide information about the risks to children associated with farmwork and to recommend ways of reducing those risks. Many of the recommendations contained in the guidelines pertain to jobs with significant risk of injury to the musculoskeletal system of children and youths, such as lifting, bending, carrying, etc. Only a relatively few of these guidelines, however, are based on empirical studies examining the relationship between the demands of the work and the capacity of youth to perform that work.

Musculoskeletal disorders are common in male and female agricultural workers. A study in the milking industry found that women who milk cows ran a higher risk of developing symptoms in the wrist and hands than comparable women who did not milk cows (Stal et al., 1996). In a Swedish study, 82% of men and 86% of women reported some kind of symptom from the musculoskeletal system during the previous 12 months when working on a dairy farm (Gustafsson, 1994). In another Swedish study, farmers who farmed more than 10 years were found to have significantly more hip joint arthrosis (Thelin, 1990). Dairy farmers in Wisconsin were found to have a higher prevalence of degenerative knee disease than other blue collar or white collar workers (Anderson, 1984). In an evaluation of the results from a national survey on low back pain, it was reported that, of 502 major occupations, farmers represented the fifth highest risk occupation for low back pain for males (Guo et al., 1995). However, we were unable to find any studies that presented data indicating the perceived prevalence of work-related musculoskeletal disorders for children working in agriculture or any studies examining the long-term consequences of youth working in agriculture. Kidd and Draime (1998) conducted a comprehensive literature review and found no studies focusing on risk of work-related musculoskeletal disorders for youth.

This article reports on the findings from a series of focus groups that were convened with farmers and children to: (1) identify potentially hazardous tasks and activities performed by youth farmworkers; (2) determine the participants perceptions about risks of Non-Traumatic Work-Related Musculoskeletal Disorders for youth working on farms; and (3) determine other factors that might relate to musculoskeletal disorders for youth farmworkers. Focus groups were used to collect information in this study because they provide an economical method for identifying specific issues and problems, while at the same time gaining insight into participant perceptions. Focus groups also provide an important opportunity for observers to

gain an understanding of the environment as seen by the target group rather than using predetermined frameworks developed by the researcher. Focus groups also allow the researcher to interact with the participants and explore issues of interest in greater detail than with a self-administered survey (Goldenhar et al., 1999).

For this study, the term Non-Traumatic Work-Related Musculoskeletal Disorders (henceforth referred to as MSDs) is defined as disorders of the nerves, tendons, muscles or supporting structures of the body attributed to overexertion or repeated exertion at work, but not associated with a potentially traumatic event, such as a slip, trip or fall. These disorders may include, but are not limited to, pain in the lower back, shoulder, neck, arms, wrists, hands, legs or feet.

Methods

In order to identify jobs performed by youth working in agriculture that might increase their risk of developing a MSD, we convened eight focus groups in four locations in Butler County, Ohio. The primary purpose of a focus group study is to determine the broad range of responses to a set of critical questions related to an environment of interest. This qualitative method discerns trends in the groups' responses to questions about that environment. Focus groups also provide an excellent tool to gain broad insight into complex situations. To make the information as meaningful as possible, however, the focus groups must be representative of the population exposed to the environment. In order to insure broad representation in our focus groups, we included farm parents and adults who employed youth on the farm, youth who live and work on a farm, and youth hired to work on a farm.

Four of the eight groups were made up of adults whose children worked on a farm and/or who hired youth as seasonal workers. The 40 adults represented 33 farm families who have 67 children, 18 years old and younger. In the adult groups, 22 participants were male and 18 were female. The four youth focus groups consisted of 10 female and 22 males, ranging between eight and eighteen years of age. The youth represented 26 different farm families.

All of the focus group participants were randomly selected from the mailing list of the *Butler County Farmers Newsletter* of the Ohio State University Extension Butler County, Ohio. The participants were selected by contacting every tenth family from the 975 names on the list. Each family was contacted via the telephone. They were screened by asking them "did you live on a farm?" If they lived on a farm, they were asked "Did you have children who routinely worked on the farm?" They were also asked "Have you hired youth to work on the farm other than your own family?" If they did not live on a farm, they were asked "Did any of your children work for another farmer for hire?" If they answered affirmatively to any of the questions, the adults and the youth were asked to participate in the focus group. A follow up reminder letter was sent to each person. The participation rate amongst those contacted was 30.4%. Many of those contacted were small farms who did not have children under the age of 18 and did not hire outside labor. Of those who qualified to participate via the screening questions, 73.4% participated. In the adult groups 75% had family who were below the age of 18 who worked on the farm and 25% had no family working on the farm that were youth, but did hire youth to work on their farm. The majority of youth who participated (94%) lived and worked on farms. Farm family youth are often hired by other families. Nearly half (43%) of the youth who lived on a farm indicated they occasionally worked for hire for another farm. According to the 1997 Census of agriculture, 51% of the farm operators in Butler County were between the ages of 25 and 54. The locations of the focus

groups were selected for their convenience to the participants. They were easy to find, held in known buildings in the community, and near the participants homes.

Each focus group was led by a moderator who asked the same 10 questions. The discussion was recorded on audio tape and notes were taken by an observer. One observer attended all of the youth groups and another observer attended all of the adult groups. At the completion of each focus group session, the observer debriefed the group moderator and made notes. A transcript was made for each focus group from the audio tape and the observer's notes. The transcripts were then studied to discover similar related or identical words to answer the specific questions. A summary of like statements was generated from the raw data. The broad range of responses makes it difficult to quantify the proportion of individuals who responded a particular way to specific questions, but rather indicates patterns or trends in the responses that are similar. The questions included the following:

1. How do farmers determine what farmwork tasks a youth is asked to do?
2. What are the different expectations between a child of a farmer and a hired employee of the same age?
3. Describe how youth are involved in the work routine of the farm? Include information on hours worked each day and seasonal differences.
4. How do other youth activities affect the amount of hours worked on the farm?
5. What are different tasks youth perform according to their age?
6. Think back through all the farmwork tasks that you have seen youth do. Describe an injury that happened to a youth age six to eighteen that was not the result of a traumatic event (e.g., an injury due to overexertion or repeated activity).
7. What are the most common non-traumatic strains or sprains that happen to youth performing farmwork tasks? What tasks caused these strains or sprains and how often do they occur?
8. What kind of training is provided to youth workers to perform tasks in a way to reduce strains and sprains?
9. How do you assess or treat sprains or strains at home?
10. How would you follow physician recommended guidelines for age appropriate tasks on the farm?

Results

A summary of the responses to the 10 questions asked in the focus groups is listed in table 1. The tasks associated with the most serious injuries were lifting objects, forking, and shoveling. When lifting was implicated in the injury, the lifting was typically performed in an awkward position or with a twisting motion. The most serious back injuries reported were associated with lifting objects over a fence in a twisting motion, such as emptying a bag of swine feed into a feeder. Injuries associated with shoveling or forking were thought to be caused by heavy pushing forces created when the material would not move and when forking or shoveling heavy loads in twisted and strained postures. This usually occurred when cleaning a barn, spreading straw or shoveling silage into a feed bunk. Less severe musculoskeletal complaints were reported to be caused by bending over while working, sitting in an awkward position looking back at equipment from a tractor, sitting in a cramped position looking down at a combine header, and long hours of work. Although these moderately severe disorders occurred frequently, they rarely stopped the worker from performing their tasks. The least serious but most common

Table 1. Answers to focus group questions

Question 1. How do farmers determine what farmwork tasks a youth is asked to perform?
Answer Adults indicated that tasks are assigned according to the maturity of the youths. Maturity included physical and mental capabilities, and demonstrated trustworthiness, responsibility, and farmwork experience. Youths identified family farm business needs, such as urgency of need for task to be completed and delegation of less desirable tasks.
Question 2 What are the different expectations between a child of a farmer and a hired employee of the same age?
Answer Adults indicated that they had greater expectations for farm children and that farm children had greater responsibility. Adults believed that farm children recognized and solved problems better, worked more efficiently, and had greater initiative than hired employees of the same age. Youth believed that less was expected of hired workers because they had less farm experience, but that hired workers were given more difficult physical labor.
Question 3 Describe how youth are involved in the work routine of the farm.
Answer Working with animals Feed and water livestock daily. Milk cows. Spread straw in animal pens. Bottle or bucket feed milk to calves or lambs. Move sows and pigs from pen to pen. Sort animals. Operating Equipment Drive tractor with no specific implement attached. Operate a lawn mower. Drive tractor to plant or drill crops Drive a tractor raking hay. Drive tractor to till the soil. Operate combine to harvest corn, soybeans, or wheat. Operate a skid loader to clean pens. Drive tractor and grain wagon to barn and unload grain into bin. Drive tractor to pull wagons of hay to barn. Drive tractor to hay baler. Drive truck around the farm. Moving materials (Manual Material Handling) Sacking bales of hay or straw on wagon, placing bales on an elevator off of the wagon, stacking bales in the barn. Shovel, fork, or scrape manure to clean barn. Pick up rocks. Shovel grain or silage. Performing tasks requiring awkward postures Pull and sort sweet corn. Weed vegetables with hand hoe.
Question 3a How the work routine on the farm changes with the seasons.
Answer During the winter months, the number of hours worked by youth is reduced. More physical labor, lifting, and bending are associated with planting, weeding or harvesting crops in spring, summer and fall. Youth perceive they work fewer hours per day in the summer than the adults believe they do. Winter months' activities are centered around the care and feeding of livestock.

(cont.)

Table 1 (cont). Answers to focus group questions

Question 4.
How do youth activities affect the amount of hours worked on the farm.
Answer
Some felt no effect.
Others felt there was competition for youths' hours.
Another point of view was that activities, such as 4-H and FFA, actually caused the youth to work harder and longer.
One line of thought was that the work might get done faster so the youth could participate in outside activities.
The youths felt that outside activities (e.g., sports, 4-H, FFA, Band) took priority over work for most employers, but that there is a conflict for time, and work is sometimes done in haste.
Question 5.
Different tasks youth performed according to their ages.
Answer
Younger workers are given tasks that demand less physical strength, less manual dexterity, and less mental maturity.
At the youngest ages, six or seven, work is more following older youth or adults around and "working" as they wish.
At eight or nine years of age, responsibility increases. Workers start to carry up to 30 pounds; they also start to help with livestock care. A few might start to operate tractors.
At age 10 to 12 they start to help with hay harvest, operate tractors, and carry heavier weights. Most boys would be expected to handle up to 50 pounds.
Much more is expected of a 12-year-old than a 10-year-old. At 12, they drive tractors for tasks that are more complicated. Some mature 12-year-olds would operate a combine with adult supervision in the cab.
Youths 13 to 15 years old are expected to do pretty much what an adult can do.
As youth get older, the responsibility increases with experience and maturity, not necessarily age.
Question 6
What types of injuries happened to youth workers 6 to 18 years of age that were not the result of a traumatic event?
Answer
Both adult and youth strata had a difficult time remembering MSDs of a severe nature that were not the result of a traumatic event.
Symptomatic pain to back, shoulders, neck and legs was noted.
There was one back injury from lifting and twisting with hog feed and one from forking manure.
Participants were more concerned about exposure to dust and molds, bee stings, poison ivy, poor ventilation of work areas and air contamination, hearing loss, heat exhaustion, and hand protection.

(cont.)

musculoskeletal problems were associated with bending over while pulling weeds, picking vegetables, exhibiting livestock, trimming animals' feet, shoveling grain, stacking firewood, and other miscellaneous farm chores. Another job mentioned as a potential risk for the musculoskeletal disorders of the arms and hands of youths was operating a weed eater that involved a high level of vibration. Although most youth workers did not report operating this type of equipment frequently, several reported that the vibration caused the hands to become numb and they were concerned that the vibration may affect the ligaments and tendons in the hands and wrists.

According to the perception of the adults and youth, age is not the dominant factor in determining the tasks performed by youth workers. Most youth agreed that jobs were assigned to youth based on task urgency or needs on the farm. If help was needed baling hay, for example, then youth would be asked to help out, regardless of their age. If they can lift the bale, then they would be expected to help. Both adults and youth agreed that younger workers were given tasks that demanded less physical strength, less manual dexterity, and less mental maturity. A six or seven-year-old may

Table 1 (cont). Answers to focus group questions

Question 7
What were the most common non-traumatic strains and sprains?
Answer
Youth described muscle aches and strains of the legs, arms, shoulder, back or neck as everyday occurrences.
Symptomatic pain was described as frequent and caused by tasks that require the worker to bend over for extended periods, sitting in a cramped or awkward positions or repetitive lifting.
Shoveling grain or silage, handling hay bales, harvesting vegetables, weeding, exhibiting livestock and forking or scraping manure or straw were mentioned as common causes of muscle strain.
Numbness to hands due to vibration was described with use of certain kinds of equipment such as a weed eater, but these reports were not typically attributed to carpal tunnel disorders.
More serious muscle or tendon pulls or tears were reported as rare.
Adults indicated that youth workers rarely complain of injury. If minor injuries occur, they usually are not aware that an injury has occurred. Muscle aches are everyday occurrences that youth work through.
Concern was expressed as to long-term effect of labor on youth even though minor injuries were not reported.
There have been isolated cases where youth workers were injured to the point of missing work and/or requiring medical attention for back injuries. Those expressed were the result of lifting, twisting type movement.
Much more concern was expressed about frequency and severity of MSDs caused by sports activities.
Question 8
What types of training is provided to youth workers to reduce strains and sprains?
Answer
Little, if any, formal training provided for less complicated tasks.
Hired laborers are given basic training in proper lifting technique.
Farm youth learn through observation.
Safety is taught to all workers in regards to tractor, heavy equipment and power-take-off-driven equipment.
Question 9
How are sprains and strains assessed and treated on the farm?
Answer
Adults indicated that they watch for swelling, listen for complaint of pain, and observe evidence of immobility. For treatment, they apply ice, heat or over the counter medication if required. They seek medical attention only for the more serious injuries.
Youths stated that, "If it's not broken, you're fine". Most injuries are worked through.
Question 10
Responses regarding physician recommended guidelines for age appropriate tasks on the farm for youth workers.
Answer
Be difficult to prepare as age-appropriate.
Be too restrictive and protective.
Be inappropriate because of a physicians lack of understanding of agriculture.
Be unnecessary because parents would neither ask their children to do something harmful nor ask hired youth to do something they would not ask their own children to do.
Have great legal ramifications for hired workers.
Be ignored unless they carried the force of the law.

help pick up rocks, spread straw from bales in the barn for bedding for livestock, scrape hog floors with a small shovel, bottle feed calves, mow grass in lawn, or weed and hoe vegetables. At this age it is more "following older youth and adults around" and "working" as they wish.

At eight to nine, responsibility may be increased. Youth start carrying buckets of feed and water, smaller 2 1/2 to 3 gallon buckets that weigh 25 to 30 pounds. Children catch and hold tiny pigs while adults clip teeth or give treatments. At age

nine the youth worker might start to operate small tractors to pick up bales or rake hay. A few might drive tractors to operate the hay baler or to work ground with a disc, or some might operate a bobcat-type skid loader to clean barns.

When the youth is 10 to 12 years of age, (s)he starts to operate tractors, carry heavier weights, and bale hay and straw. At age 12 most boys are expected to be able to handle 50-pound buckets of water, bales of hay, and bags of feed. There are major differences between what is expected at 10 and what is expected at 12 years of age. The younger workers are treated more like kids and a 12-year-old more like an adult. At age 12, the youth worker will be expected to be able to do all the daily livestock chores.

At 12 years of age, a youth will probably drive the tractor for tasks that are more complicated, like cultivating corn or mowing hay. Farmers' children may also drive a combine with adult supervision in the cab. Workers probably will drive a pickup truck around the farm. A few youth might operate a feed grinder/mixer, haul grain and unload gravity bed wagons, or pull loads of hay from the field.

Youths 13 to 15 years old are expected to "do pretty much what adults can do". They drive tractors on the road, unload grain at local elevators, plant crops, apply fertilizers, and complete primary and secondary tillage.

Both youth and adult groups agreed there was little, if any, formal training of youth workers. For farm youth it is a matter of watching others and learning from that observation. If an adult sees a youth worker not using proper technique, the adult will show them how to perform the task, but farm kids are "expected to know how". Most focus group participants reported that more training was provided for hired labor, especially regarding proper lifting techniques. In general, more formal training is provided when it comes to operating complicated equipment such as tractors or combines. The greatest concern for adults was the operation of power take-off-driven equipment, tractors and heavy equipment where the most safety training is provided.

When minor injuries do occur, youth workers usually do nothing to treat the injuries. They just "work it out", or in minor cases, ignore the pain. For injuries that cause swelling, the family applies ice and heat, and may take over-the-counter medication.

The general consensus among the youth seemed to be "if it's not broken, you're fine". This could be why the adults tend to feel the frequency of the injury was less than was indicated by the youth. If the youth worker does not complain, or there is no evidence of immobility or swelling, the adults may not even know about the injury.

The last area addressed was if a set of physician-recommended guidelines for age appropriate tasks for youth farmworkers would be followed. We believed that the group would be more likely to indicate support of the guidelines if they were developed by physicians. The greatest concern for all was with the difficulty in preparing age-appropriate guidelines. All participants felt doctors would not have appropriate experience or knowledge to write the guidelines. They all felt the guidelines would probably be too restrictive and protective. Most adults believed there would be considerable legal ramifications involved in following guidelines for hired workers. The reaction to this question was the most negative in the study. There was a consensus among the adults that physician-recommended guidelines would be ignored by workers and employers alike, unless forced by law. It would be interesting to determine how guidelines developed by groups other than physicians or those developed by peers, such as the NAGCAT guidelines, would be perceived by the participants.

The groups felt many more injuries occurred among youth from playing sports or riding recreational motor bikes than from farming. Sports injuries from football, wrestling, soccer or basketball were considered much more frequent than injuries from working on the farm. It was noted that these injuries have not been prevented by warnings or guidelines.

There was a general acknowledgment among the groups that there may be some long-term effects on youth that should be considered, even though the common minor disorders do not require medical attention or cause the youth to miss work. They did recognize that the effects might well be cumulative to the youth workers and that these effects may carry into middle age and beyond.

Discussion/Conclusions

As mentioned previously, studies have shown that agricultural workers have higher rates of musculoskeletal disorders than non-agricultural workers (Stal, 1996; Gustafsson, 1994; Thelin, 1990; Anderson, 1984). This may be due to the high physical demands associated with current jobs performed by agricultural workers, or it may be due to the long-term effects of excessive physical loading associated with agricultural work as youths, or both. Review of the findings from our focus group study of youth workers suggests that because severe cases of MSDs for youth are rare, farmers may not perceive the long-term risks for youth workers and that these risks may lead to chronic disorders later in life. In theory, youth exposed to excessive repetitive physical loading during periods of rapid bone growth during childhood may be at increased risk of developing chronic musculoskeletal disorders later in life due to irreparable damage to bone growth plates. In a 25-year prospective cohort study of Danish school children it was reported that there was an 88% probability that an adult would have low back pain if they had a familial occurrence of low back diseases and low back pain (LBP) during the growth period as a youth (Harreby et al., 1995).

Also, it is not known why youth workers perceive a greater risk of MSDs (i.e., greater frequency and severity) from farmwork than do adults. Although adults know that the job is physically demanding, they may underestimate the risk of the job because they have been performing these jobs since they were children. It is also possible that adults don't take into consideration the possible interactions of work organization or psychosocial factors, such as lack of assistance in performing the job, peer pressure, lack of control over the job, and the physical demands of the jobs that might increase the overall demands on the youth workers. Lastly, it is possible that parents of farm children overestimate the physical capacity of their children because they (1) perceive them to be more capable than average children, (2) believe that the knowledge and experience of their child can replace any reduced physical capacities, or (3) have greater expectations for their children because they were responsible for their training.

Although nearly all of the participants felt that musculoskeletal pain is an everyday occurrence for children working on the farm, there was a perception that severe MSD cases are rare. The findings from the focus groups suggest that this perception may explain why there was little incentive to change jobs or to limit exposure. The focus group findings also should be useful in reducing musculoskeletal disorders by identifying the most effective interventions.

Both farm family youth and youth workers hired to work on farms perceive that MSDs are more frequent for youth working on farms than adults recognize. Adult farmers report that they place heavier demands on their own children and give them

more responsibility than hired youth workers of the same age because they believe that their children are more experienced and more capable. One of the greatest concerns for adults seemed to be sports injuries rather than MSDs due to farmwork.

Most participants felt that physician-based guidelines for determining age-appropriate tasks would be of little value unless they carried the weight of the law. This perception is likely due to a feeling that those who wrote the guidelines would not have appropriate experience or knowledge to write them.

Suggestions for Further Study

Field studies are needed to determine the magnitude of the biomechanical and physiological demands of the identified tasks. These studies should be conducted in field environments with actual youth workers performing the jobs. The results of these studies could then be compared to estimates of the physical capacity of the youth to determine whether the physical demands of the jobs exceed the capacity of the workers. The current focus group findings should be useful in targeting specific jobs for study.

Because "pain symptoms" were reported more frequently than "injuries" in the focus groups, studies are needed to determine if symptom surveys may be more effective than injury reports in identifying problem jobs. Also, the responses of the individuals about training suggests that participants did not consider training to be an important element in prevention of MSDs. Therefore, studies are needed to develop and evaluate new and alternative training approaches that would overcome the perceptions identified in this study.

Studies to determine the health effects of long hours of work and fatigue associated with combined school and farm work demands are also needed. Long hours of work may be a particular problem in summer, but time pressures may be important during the school year. A study employing time logs kept by workers in the field would be of value and this could be supplemented by a field trial of youth workers keeping an accurate record of injuries that caused symptomatic pain but did not stop them from working, especially if tied into a study of the number of hours worked and tasks performed by age group.

Finally, studies are needed to determine whether individuals exposed to excessive physical demands as youth working in agriculture have increased risk of MSDs during adulthood. A possible study design could include a retrospective study of multiple cohorts with varying degrees of exposure during childhood and adulthood and with similar socioeconomic exposures.

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