Observation Study of Students Who Completed a High School Agricultural Safety Education Program

D. B. Reed, S. C. Westneat, P. Kidd

ABSTRACT. *The Agricultural Disability Awareness and Risk Education Project (AgDARE) is a research–based curriculum of agricultural safety instruction based on Prochaska and DiClemente's Transtheroetical Model of Change. The program uses eight reality–based psychomotor and narrative modules to teach safe farm work behaviors. In addition to in–class pencil and paper assessments on safety attitudes and behavior intention, farm visits were made to assess the longer term influence of AgDARE. Visits were made between 11 and 20 months (mean = 14.24 months) after completion of the classroom instruction to 29 students who worked on farms and completed at least one–half of the AgDARE instruction. All but one of the visited students exhibited safe work behaviors addressed by the AgDARE instruction. In addition, 76% of the visited students had moade positive changes in their farm work behavior since participating in AgDARE. Changes extended beyond the instruction that students received in class to include other aspects of farm work and other family members. The use of farm visits to evaluate students' safety behaviors was tempered by the challenge of contacting students and obstacles associated with observing work in an environment where little is routine or regular.*

Keywords. *Adolescent, Behavior, Evaluation, Injury prevention, Instruction.*

Background

The purpose of this study was to assess targeted work behaviors of students who participated in a new safety education program in their high school agriculture class. Even though the childhood fatality rate in agriculture has decreased, it has been accompanied by a rise in morbidity (Rivara, 1997). Adolescents experience the highest number of non–fatal injuries of all children that work on farms (Myers and Hendricks, 2001). When adjusted for actual work exposure time, adolescent injury rates on agricultural establishments surpass those of adults (Castillo et al., 1994). An examination of national occupational fatality databases revealed that young agricultural production workers are three times more likely to die on the job than their non–agriculture

Article was submitted for review in December 2002; approved for publication by the Journal of Agricultural Safety and Health of ASAE in May 2003.

The views expressed in this document are those of the authors and not necessarily those of the University of Kentucky, Arizona State University, the National Institute for Occupational Health, or the U.S. Government.

The authors are **Deborah B. Reed,** RNC, MSPH, PhD, and **Susan C. Westneat,** MA, College of Nursing, University of Kentucky, Lexington, Kentucky; and **Pamela Kidd** (deceased), PhD, FNP–C, FAAN, Associate Dean for Graduate Programs and Research, College of Nursing, Arizona State University, Tempe, Arizona. **Corresponding author:** Deborah B. Reed, College of Nursing, University of Kentucky, Rose St., HSLC 553, Lexington, KY 40536–0232; phone: 859–257–9636; fax: 859–323–1057; e–mail: dbreed01@pop.uky.edu.

  ISSN 1074-7583

counterparts (Hard et al., 1999). The effect of educational safety programs on farm work behaviors of children remains undocumented.

As children age, they begin to perform farm work that involves greater risks. By the time children reach middle school age and adolescence, they begin to work unsupervised, often with heavy machinery, in close quarters with large animals, and in circumstances where they have received little training (Lee and Marlenga, 1999; Marlenga et al., 2002; Runyon and Zakoes, 2000). The Agricultural Disability Awareness and Risk Education Project (AgDARE) was developed to provide safety training designed to decrease farm–related injuries to teens.

Risk Taking and Learning Styles

There is abundant evidence that teenagers engage in risky behaviors (CDC, 2001). Children appraise risk in different ways as their cognitive skills develop. Kidd et al. (1997) discovered that negative experiences had greater influence on the child's safety behavior than the imposition of safety rules. A similar study conducted in Colorado with 36 FFA members found that adolescents recognized the importance of safety rules but made conscious choices to bend or break rules based on their perceived risk of injury (Darraugh et al., 1998). In a study of youth 14 to 18 years old, the best predictor of any injury was having a friend injured in a similar manner, attesting to the influence of social culture and peer pressure in risk–taking behavior (Jelalian et al., 1997). Children learn their farm work by modeling their parents and other authority figures (Darraugh et. al., 1998; Kidd et al., 1997; Lee and Marlenga, 1999). This practice of imitation can lead to farm adolescents adopting unsafe work behaviors. A review of the literature revealed no articles on the use of protective behaviors by children.

Educational Efforts

Although agricultural safety educational programs have been presented for many years, reports of their effectiveness have been equivocal. In an observational study of 212 farm tractor operators age 14 to 19, safer tractor operation was noted by the group who had participated in a structured 4–H tractor safety program, yet these children reported that they rarely or never wore seat belts while tractor driving in their usual settings (Carrabba et al., 2000). It is unknown whether safety programs move participants to safer behaviors or lead them to unrealistic confidence in their ability to avoid injury because of their training. Shutske (1994) suggested that safety programs need to be evaluated in a systematic way that includes objective measurement of behavior change. A recent review of the literature revealed that the use of farm visits in safety education focused on visits as part of adult intervention programs, not as an outcome measurement (DeRoo and Rautianen, 2000). Observation of actual farm work performed by students who participated in safety education programs has not been reported.

Agricultural Disability Awareness and Risk Education (AgDARE)

AgDARE, funded as part of the Child Agricultural Injury Prevention Initiative (Castillo et al., 1998), is an experiential learning curriculum for high school agriculture classes based primarily on Prochaska's Transtheroretical Model of Change (Prochaska et al., 1992). This model incorporates five stages that track a person's progress from not realizing an action is needed (precontemplation) through contemplation, action, adoption, and maintenance of an adopted behavior. The Model defines adoption of a

behavior as behavior that is performed several months after being first initiated. AgDARE intended to move the students from precontemplation to action on focused safety behaviors. Farm visits were included several months after the completion of AgDARE to assess students' adoption of safety behaviors presented by the program.

In AgDARE, eight psychomotor and narrative simulation exercise units, based on real stories told by farmers with disabilities, allow students to vicariously experience the consequences of injuries and illnesses that occur as a result of poor work decisions. Simulations focus on spinal cord injury related to tractor safety, amputation due to machinery entanglement, noise–induced hearing loss, and hypersensitivity pneumonitis (farmer's lung) due to exposure to organic particles. Paired instructional modules, in which one narrative and one psychomotor simulation address the same topic, reinforce the safety instruction. In this supervised and safe setting, the student physically and mentally experiences the challenges and frustrations a person with a disability encounters in completing routine farm work.

Method

Approval was gained from the University of Kentucky Institutional Medical Review Board prior to data collection. A quasi–experimental crossover design was used in the larger study (Cook and Campbell, 1979). The design contained two treatment groups that received the same interventions in reverse order, and a control group. The research team delivered all of the interventions. Fourteen schools across Kentucky, Iowa, and Mississippi received the interventions, and seven schools in the three states served as controls. A total of 373 students completed at least half of the AgDARE instruction and all surveys; 473 students comprised the control group. Students in all groups completed demographic surveys and the Stages of Change (SOC) pretest prior to further participation in the project. The SOC measured the contemplation and action stages of movement regarding selected farm safety behaviors addressed by AgDARE. Cronbach's alpha was 0.87 for the contemplation subscale and 0.81 for the action subscale. The post–test SOC was administered immediately after the second intervention and in the same time frame for the control schools. Intervention students scored significantly better than control students on the SOC ($p < 0.0001$; SE = 21.4, F statistic 134.5, df 2;604), when adjusted for baseline measures (Reed et al., 2001).

Farm visits were made to a subset of the intervention students at least 11 months after the completion of AgDARE to assess the actual work behavior of the students. This article focuses on the farm visit component of the study. Results from the larger samples have been reported elsewhere (Reed et al., 2001).

A two–part pencil and paper survey designed by the investigators was completed by the research team during the farm visit. In the first section, the student's work safety performance was observed. During the second part of the visit, verbal data were collected on the student's perception of work hazards, ability to change the work environment, and changes made since AgDARE (stated as "What have you done to make your farm work safer since you participated in AgDARE?"). After the student visit was completed, data were confirmed by the agriculture teacher who accompanied the researcher and by parents if present. Data were collected in pencil and paper format during the farm visits and later entered into an SAS file for data management and analysis (SAS, 1990).

Sample

The AgDARE project focused on high school agriculture students, particularly ninth and tenth graders. Kentucky, Iowa, and Mississippi were selected because of previous cooperative working relationships, cultural diversity, and differences in agricultural production and commodities. The complete selection process is described elsewhere (Reed et al., 2001).

Students who completed at least half of the AgDARE curriculum and who reported currently working on a farm were eligible for farm visits (N = 187). Because of time constraints, expense, and small numbers, students in Mississippi were excluded. Five schools were purposively selected for farm visits. These schools, two in Iowa and three in Kentucky, were chosen because of the high percentage of students who initially reported working on farms and the geographic diversity that would capture the most variation in farm work. Ninety–two students in the five schools met the eligibility criteria for inclusion. The students' agriculture teachers were contacted by the research team and asked to schedule the farm visits. Teachers reported difficulty in contacting many of the students, citing graduation, summer vacation schedules, dropouts, and time constraints as reasons. Some contacted students reported that they no longer did farm work. From the contacted students that performed farm work, 31 visits were scheduled, and 29 visits were completed. One visit was cancelled due to a family vacation and the other because of a dental emergency. No students refused to be visited. Twenty–four (87.8%) of the visited students had completed all 8 units of AgDARE. The remaining five students had completed at least 6 of the 8 units.

Results

Students who received farm visits (N = 29) and the non–visited eligible group (N = 63) were compared for differences in demographic characteristics and farm work as reported on their demographic surveys. As noted in table 1, the groups were very similar in age and years lived on and worked on farms. There was no difference in gender mix of the groups. Table 2 illustrates that students' work environments and pre–intervention use of protective safety measures were very similar, with only one exception. The visited group was more likely to use respirators. Although not statistically significant, more of the visited students tended to work in noisy environments. This effect may have been related to the large number of students visited in Iowa, where confined feeding operations and swine confinement are more common than in Kentucky.

Work of the Visited Students

The students resided mostly on corn, grain, and beef cattle farms; however, tobacco, horse, swine, and other operations were also reported. Work exposure varied by type

Table 1. Sample description (N = 92).[a]

	No–Visit Sample (%; N = 63)	Visit Sample (%; N = 29)	Pr > | t |
Age in years	15.0	14.8	0.249
Years lived on a farm	12.1	13.0	0.319
Years worked on a farm	7.4	8.5	0.193

[a] Kentucky and Iowa treatment students who completed at least half of AgDARE and currently work on farm.

Table 2. Sample comparison to no–visit group (N = 92) at baseline.

	No–Visit Sample (%; N = 63)	Visit Sample[a] (%; N = 29)	p
Drive tractor with ROPS	53 (86.9)	27 (96.4)	0.227
Work in a dusty environment	51 (82.3)	27 (93.1)	0.213
Use respirators	10 (16.1)	11 (37.9)	0.032[b]
Use PTO equipment	49 (81.7)	25 (89.3)	0.534
Step over PTO	23 (39.7)	12 (42.9)	0.818
Work in a noisy environment	49 (83.1)	27 (96.4)	0.096
Use hearing protection	14 (23.7)	6 (21.4)	1.0

[a] Kentucky and Iowa treatment students who completed at least half of AgDARE and currently work on farms.
[b] Statistically significant ($p \leq 0.05$); based on Fisher's exact test, 1 df.

of work, extent of time engaged in work, and by gender. Males used more powered equipment (tractors, PTO–powered equipment, and augers) than females. The overall estimates of hours worked per week ranged from 2 to 40 hours (mean = 13.9 hours; standard deviation (SD) = 10.6). Males worked significantly more hours per week (mean = 18.1 hours; SD = 11.2) than females (mean = 8.5 hours per week; SD = 7.1). Five male students worked an average of 25 hours a week or more. None of the females worked more than 25 hours per week, and five of the 11 females worked only 1 to 4 hours per week. Females who reported working very limited hours were also less likely to use PTO–powered equipment or augers. It was very difficult for the students to estimate their hours of work because work varied so much by season and crop. Agriculture teachers and parents (if present after the visit) assisted the students with time estimates.

Observed Behaviors

Observed work focused on safety behaviors included in the AgDARE instruction. Students were asked to perform farm tasks in the way they usually did the task. They were instructed not to attempt the task if it was not part of their usual farm activities or if they did not feel comfortable doing it. Teachers and researchers did not coach the student in any way or interfere with any task. Students were asked to mount, start, and dismount from the tractor they generally used in the manner they would use if they were working on the farm and needed to check something on the ground. They were asked to couple a PTO–powered piece of equipment to the tractor and walk to the other side of the equipment. After these demonstrations, the visit team accompanied the students to areas that they identified as noisy or that posed respiratory risks, and the students demonstrated how they worked in these environments. Twenty–two (76%) of the visited students had made changes in their farm work safety behaviors since AgDARE. Table 3 illustrates observed work behaviors compared to behaviors reported by the visited students in the baseline demographic survey they completed at the beginning of AgDARE. Not all students performed all tasks, so the N in each cell differs. While the data are not directly comparable because of differences in collection methods (survey versus observation), differences in work exposure and safety behavior are noted. No inferences about the causal role of the instruction on work exposure or behavior can be drawn; rather, the results are presented to emphasize the changing exposure and subsequent behaviors.

One additional student had begun driving a tractor since the initial AgDARE survey, and four additional students drove tractors equipped with ROPS and seatbelts. These

Table 3. Baseline self–report and post–intervention observed work and safety behaviors.

	Baseline			Visit		
	N[a]	Yes	%	N	Yes	%
Drive tractor	28	27	96.4	28	28	100.0
Tractor ROPS/belt	27	13	48.1	27	17	63.0
Use PTO equipment	27	23	85.2	23	18	78.3
No step over PTO	23	11	47.8	16	12	75.0
Work in dust	28	27	96.4	27	27	100.0
Use respirator	27	11	37.9	26	16	61.5
Noisy environment	27	26	96.3	26	25	96.2
Use hearing protection	27	5	18.5	25	9	36.0

[a] N = data points (answered survey question or confirmed/observed behavior)

data were verified by parents after completion of the observation portion of the visit. All students used the correct path to mount and dismount from the tractor they usually used. Of the 11 tractors observed with seat belts, only 3 students (27.3%) fastened their belts. Hazard identification of the PTO–powered device (generally rotary mowing machines) illustrated that students were able to identify safety hazards associated with the equipment, and the majority of the students did not cross the PTO shaft during the observation. Personal attire was appropriate to prevent entanglement in equipment (tight–fitting clothing, no strings or dangling fabric), and nearly all of the students worked without any jewelry.

To evaluate work behavior that could lead to hearing loss and respiratory disease, students identified noisy and dusty areas where they worked. While not all of the actual work was observed because of seasonality, students showed the team the work areas and demonstrated the methods they used to decrease their exposure to noise and dust. Most students identified more than one area. The most frequently noted noise sources were tractors, grain bins, other powered equipment, and livestock feeding areas. Slightly more than one third of the students practiced hearing conservation, and all of these except one used earplugs or earmuffs. That student decreased the amount of time exposed to loud noises. Grain, hay, animal dust, tobacco stripping rooms, and chemical exposure were listed most frequently as areas of respiratory risk. Over half the students used respiratory protection. All but three of these were appropriate measures, but the use of protection was inconsistent. Students noted that their use of respiratory protection depended primarily on the type purchased by their parents and the comfort of the device. Certain work, such as spray painting or work done in swine confinement buildings, was associated with more consistent use of respiratory protection.

Reported Behaviors

Students were asked to identify any other changes they had made in their farm work behavior since they participated in AgDARE. Students were able to identify additional changes because their work environments surrounded them during the farm visit. Students demonstrated these changes and seemed pleased to show the visit team how they were able to influence the farm operation. Ten students reported making cognitive changes in their work behavior. They reported thinking more about safety, being more careful and observant, and making different tractor driving decisions. Ten students reported using personal protective equipment they had not used before AgDARE, including hearing protection, respirators, seat belts, and safety glasses. Three students had made substantial changes in the physical work environment by adding turf tires, a communication system, and cages around grain bins. Three students had their tractors

retrofitted with ROPS, and another student had his tractor scheduled for a retrofit the week following the visit. Reported behaviors and modifications were confirmed by the students' parents or teacher during the visit. None of the students reported using fewer safety measures because they felt more confident in their ability to perform work.

Discussion

The instructional styles of AgDARE are congruent with general agriculture education styles. The program uses both problem solving and hands–on activities, methods reported in the literature as effective instructional methods for agriculture students (Rollins et al., 1992; Johnson et al., 1997). Traditional evaluation methods for assessing the immediate influence of the program quantitatively supported that AgDARE was effective in moving students from the precontemplation to the action stage of behavior change. Farm visits were used to provide data about the adoption of behaviors that might have been missed through usual methods of self–report. The walk–abouts on their farms cued students to report and demonstrate work they might not have thought of if they were in another environment. Students were able to show the research team actual equipment they used and point out hazards along with their protective actions and equipment.

Although not randomly selected, the group of visited students was very similar to the non–visited group. In order to minimize response bias, neither the teacher nor the visit team reminded students about the AgDARE content. Students proved to be quite frank in their discussion of their safety behaviors, and teachers were reliable in predicting how the students would respond to our requests prior to our visits.

Work practices and exposures varied most by gender, a result expected by the team and supported in the literature (Myers and Hendricks, 2001). Visited females were less likely to be exposed to high–risk work, and females worked fewer hours than their male counterparts. The findings of the visited students may underrepresent true exposure and behaviors. It was very difficult to obtain reliable exposure estimates, especially on the less frequent work exposures like noise or dust. Identification of areas where exposure occurred was very good; estimates of actual exposure times were much less precise. Estimating exposure continues to be problematic in the agricultural work context (Reed and Claunch, 2000; Russer, 1998).

The ability of students to make changes in their own work behavior and influence the overall safety of the farm operation was evident. Four students had persuaded their parents to retrofit at least one tractor with ROPS. A retrofit can cost in excess of $1,000, clearly a major expenditure on a family farm. Unfortunately, the students did not extend this protection to more active protective strategies, such as wearing seat belts. The lack of seat belt use continues to be problematic in educational programs about farm tractor use (Carrabba et al., 2000).

Students took steps to protect themselves from respiratory damage and hearing loss; however, these behaviors tended to include only the use of personal protective equipment. The use of earplugs and respirators, both relatively inexpensive, were the most frequently noted changes in safety behavior. The AgDARE curriculum also emphasized other methods to decrease risk, such as distancing oneself from the noise source and decreasing time of exposure to noise and dust. Only one student cited decreasing time as a method of personal protection. Perhaps students find it easier to use mechanical methods of protection, or perhaps they did not feel they could influence the exposure in terms of time or distance.

It was encouraging to identify new positive safety behaviors, but the behaviors were not necessarily part of the students' routine work. Students who used personal protective equipment did not use it consistently except in certain situations. Reasons cited for non–use included forgetting to use it, inconvenience, and short–term exposure to the hazard. This type of behavior is an example of movement from contemplation to action but not yet maintenance of the behavior and indicates the need for continued reinforcement (Prochaska et al., 1998).

Limitations

In addition to the usual limitations of self–reported data, teachers might have made a more concentrated effort to select students they thought would perform well. Students might have altered their behavior during the visit to impress the visitors; however, self–reported behavior and observed behavior were strikingly similar. Although behavior could have been modified for the observation, on several visits the students' fathers joined us after the work observation was completed and validated the student's behavior. These types of data could not have been gathered via a written survey but were easily obtained during the farm visit. It is not known whether students in treatment schools or control schools not selected for visits would have differed in their safety behavior. Students were not visited prior to their AgDARE instruction, which would have been ideal. Lack of a control group limits findings to descriptive statistics. The inclusion of more students and a comparison group from the control schools would strengthen the study.

Conclusions

Farm visits have not been used as a validation tool for teen farm work safety behavior and have had limited use as an evaluation of the effectiveness of farm safety instruction among adults. Farm visits are expensive, and the possibility of selection and response bias is certainly very real; however, using the actual farm work environment provides cues that may assist in recall of work behavior. In this study, teens demonstrated safety behaviors that were congruent with self–reported data. Students were straightforward about their behaviors and reasons they did or did not engage in certain behaviors. Parents and teachers validated the students' responses immediately after completion of the observation visit. Even though a limited number of visits were made, the quality of the observations added valuable data for evaluation of the possible long–term influences of the safety curriculum presented through AgDARE. In addition to self–reports, farm visits should be considered as validation tools for farm safety education.

Acknowledgements

This work was conducted under CDC/NIOSH grant number 1R01CCR414307. At the time of the research, Dr. Kidd was director of the University of Kentucky Injury Prevention Center. Dr. Reed and Ms. Westneat also hold appointments in the Department of Preventive Medicine and Environmental Health, Southeast Center for Agricultural Health and Injury Prevention.

References

Carrabba, J. J., W. E. Field, R. L. Tormoehlen, and B. A. Talbert. 2000. Effectiveness of the Indiana 4–H tractor program at instilling safe tractor operating behaviors and attitudes in youth. *J. Agric. Safety and Health* 6(3): 179–189.

Castillo, D. N., D. D. Landen, and L. A. Layne. 1994. Occupational death of 16–17 year olds in the United States. *American J. Public Health* 84(4): 646–649.

Castillo, D., D. Hard, J. Myers, T. Pizzatella, and N. Stout. 1998. A national childhood agricultural injury prevention initiative. *J. Agric. Safety and Health* 4(special issue 1): 183–191.

CDC. 2001. Youth risk behavior survey. Centers for Disease Control and Prevention. Available at: www.cdc.gov/needphp/dash/yrbs/2001survey.htm. Accessed on 27 October 2002.

Cook, T. D., and D. T. Campbell. 1979. *Quasi–Experimentation: Design and Analysis Issues for Field Settings.* Chicago, Ill.: Rand McNally.

Darraugh, A. R., L. Stallones, P. L. Sample, and K. Sweitzer. 1998. Perceptions of farm hazards and personal safety behavior among adolescent farmers. *J. Agric. Safety and Health* 4(special issue 1): 159–169.

DeRoo, L. A., and R. H. Rautiainen. 2000. A systematic review of farm safety interventions. *American J. Preventive Medicine* 18(4S): 51–62.

Hard, D., J. Myers, K. Snyder, V. Casini, L. Morton, R. Cianfrocco, and J. Fields. 1999. Young workers at risk when working in agricultural production. *American J. Industrial Medicine* 36(suppl. 1): 31–33.

Jelalian, E., A. Spirito, and D. Rasile. 1997. Risk taking, reported injury, and perception of future injury among adolescents. *J. Pediatric Psychology* 22(4): 513–531.

Johnson, D. M., G. W. Wardlow, and T. D. Franklin. 1997. Hands–on activities versus worksheets in reinforcing physical science principles: Effects on student achievement and attitude. *J. Agric. Education* 38(3): 9–17.

Kidd, P., K. Townly, H. Cole, R. McKnight, and L. Piercy. 1997. The process of chore teaching: Implications for farm youth injury. *Farm and Community Health* 19(4): 78–79.

Lee, B., and B. Marlenga. 1999. *Professional Resource Manual: North American Guidelines for Children's Agricultural Tasks.* Marshfield, Wisc.: Marshfield Clinic.

Marlenga, B., W. Pickett, and R. L. Berg. 2002. Agricultural work activities reported for children and youth on 498 North American farms. *J. Agric. Safety and Health* 7(4): 241–252.

Myers, J. R., and K. J. Hendricks. 2001. Injuries among youth on farms in the United States, 1998. DHHS Publication No. 2001–154. Cincinnati, Ohio: NIOSH.

Prochaska, J., C. DiClemente, and J. Norcross. 1992. In search of how people change: Applications to addictive behaviors. *American Psychologist* 47(9): 1102–1114.

Prochaska, J. L., S. Johnson, and P. Lee. 1998. The transtheoretical model of behavior change. In *The Handbook of Health Behavior Change*, 59–84. 2nd ed. S. S. Shumaker and E. B. Schron, eds. New York, N.Y.: Springer.

Reed, D. B., and D. T. Claunch. 2000. Incidents and disability from farm injuries to children: A systematic review. *American J. Preventive Medicine* 18(4S): 70–79.

Reed, D. B., P. S. Kidd, S. C. Westneat, and M. K. Rayens. 2001. Agricultural disability awareness and risk education project (AgDARE) for high school students. *Injury Prevention* 7(suppl. I): i59–i63.

Rivara, F. P. 1997. Fatal and non–fatal farm injuries to children and adolescents in the United States, 1990–1993. *Injury Prevention* 3: 190–194.

Rollins, T. J., J. Scholl, and D. C. Scanlon. 1992. The learning styles of youth in non–formal agricultural education programs. *J. Agric. Education* 33(1): 53–60.

Runyan, C. W., and R. Zakoes. 2000. Epidemiology and prevention of injuries among adolescent workers in the United States. *Annual Review of Public Health* 85(1): 89–91.

Russer, J. W. 1998. Denominator choice in the calculation of workplace fatality rates. *American J. Industrial Medicine* 33(2): 151–156.

SAS. 1990. *SAS/STAT User's Guide.* Cary, N.C.: SAS Institute, Inc.

Shutske, J. M. 1994. An educator's perspective on childhood agricultural injury. *J. Agromedicine* 1(4): 31–46.