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EFFECTIVENESS OF THE INDIANA 4-H TRACTOR PROGRAM: ALUMNI PERCEPTIONS

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Abstract

The purpose of this study was to evaluate the effectiveness of the Indiana 4-H Tractor Program by assessing the impact the program has had on alumni of the program. Past contestants of the state 4-H tractor-driving contest from the years 1982-1997 (N=233) were surveyed using a 30-item mailed questionnaire. A response rate of 72.4% was obtained for this census study. Respondents reported that the program was effective at teaching them to be safe tractor operators. They also believed that the program benefited them in other aspects of their life including general safety awareness. Respondents reported that they were involved in farming on a full or part-time basis (74%) or employed full-time in a mechanical or technology-related career (21%). The respondents self-reported involvement in a number of risky tractor operating behaviors including not wearing seat belts with ROPS-equipped tractors and allowing extra riders. Recommendations for improving the program include: (1) strengthening approaches for reducing risky behaviors, (2) developing up-to-date teaching materials, (3) conduct a future, more comprehensive study of past participants of the program, and (4) conduct a thorough evaluation of all of the program's components.

Introduction

Research has shown that the most common agent of injury on farms is the tractor (Lehtola & Marley, 1992; Murphy, 1992; National Coalition for Agricultural Safety and Health, 1989; Purschwitz, 1990; U.S. D.O.T., 1971). A study conducted on childhood agricultural fatalities in Indiana and Wisconsin found that tractors were involved in 50% of all fatal injuries to children ages 1 through 17 (Sheldon, 1992). On most farms it is a common practice for young children to operate tractors. A childhood farm safety survey conducted in Indiana, found that the age when tractor operation was first allowed ranged from 4 to 16 years, with an average of 11 years (Freeman, Whitman, & Tormoehlen, 1998).

Education and operator training have been widely used for reducing tractor-related injuries. One educational program that has addressed this problem is the 4-H Tractor Program that is designed to train youth in the safe maintenance and operation of tractors and machinery. Participants attend informal instructional meetings, complete student manuals, and demonstrate their knowledge on a written test and their skills through optional operating contests. Nationally, the 4-H Tractor Program has been one of the smallest 4-H education programs with 16,598 boys and 4,799 girls enrolled in 1997 (A. T. Smith, National 4-H Program Leader, Cooperative State Research, Education and Extension Service, personal correspondence, 1997). Enrollment figures from 1997 show that Indiana's 4-H Tractor Program had 1,657 participants enrolled in the program (R. Tormoehlen, 4-H Youth Specialist, Purdue Cooperative Extension Service, personal correspondence, 1997). Participants, however, have traditionally represented a larger number of farm children or potential tractor operators than many other 4-H projects. A review of the literature did not uncover any research that has specifically evaluated the effectiveness of the 4-H Tractor Program, as a safety intervention, at either a state or national level.

Under the Fair Labor Standards Act, youths that are 14 and 15 years of age may legally operate tractors over 20 PTO horsepower for hire if they have completed a

tractor and machinery certification training course offered by either 4-H Extension or an agricultural education program. Research on youth tractor and machinery certification programs in Wisconsin noted that these programs are conducted at the county or public school level and have very little centrality at state or national levels (Schuler, Skjolaas, Purschwitz, & Wilkinson, 1994). Schuler et al. further stated that the evaluation and monitoring of these programs for effectiveness has been nearly nonexistent. An earlier assessment of the Wisconsin youth tractor and machinery certification programs found that little has been done in Wisconsin and across the nation to monitor and evaluate the effectiveness of these training programs (Wilkinson, Schuler, & Skjolaas, 1993). The researchers concluded that these programs should continue to be evaluated in Wisconsin and nationwide to determine their effectiveness in reducing injuries, illnesses, and making changes in unsafe behavior.

Research on tractor and machinery certification courses has also been conducted in New York (Abend & Longhouse, 1994; Pollock, 1997), Ohio (Emory & Ferguson, 1980; Yarosh, Bean & Gliem, 1993), and earlier by the U.S. Department of Transportation (1971). None of these efforts, however, were designed to demonstrate the effectiveness of certification courses or compare their educational outcomes with those resulting from no formal training.

Purpose and Objectives

The purpose of this study was to evaluate the effectiveness of the Indiana 4-H Tractor Program by assessing the impact the program has had on alumni of the program. The objectives of the study were as follows:

1. Describe safety demographics of alumni of the 4-H Tractor Program including type of employment, injury experience, and involvement in tractor operation activities.
2. Describe perceptions of alumni of the 4-H Tractor Program concerning the effectiveness of the program.
3. Identify suggestions for improvement of the program by alumni of the 4-H Tractor Program.

Methodology

A census survey was mailed to 233 past participants of the Indiana State 4-H Tractor Driving Contest from the years 1982-1997. The 30-item survey collected information on attitudes towards tractor safety, tractor exposure time, and tractor-related injury experience. This survey was administered using methods described by Dillman (1978, 1991) and Best (1970).

Part I of the survey contained 16 questions that collected general information on age, gender, occupational status, total number of years of participation, any parental involvement in the program, completion of farm tractor and machinery certification, tractor exposure time both as an operator and as an extra rider, the use of seat belts and ROPS (roll over protective structure), and involvement as a tractor club leader. Questions in Part I was adapted from surveys used in the evaluation of Wisconsin Tractor and Machinery Certification Programs (Schuler et al., 1994; Wilkinson et al., 1993). Part II contained three questions on the tractor-related injury experience of the respondents. Question 17 asked for the number of significant tractor-related injuries experienced and for a brief description of the nature of injuries received. Question 18 asked the respondent if any member of their immediate family had ever experienced a tractor-related injury requiring emergency medical treatment. Question 19 asked the respondents, "While operating a tractor, have you ever had a close call where you narrowly escaped serious injury?" Questions in Part II were adapted from the farm injury-coding sheet developed by Purschwitz (1989). Part III contained eight questions on the respondent's opinions regarding the Indiana 4-H Tractor Program. These were five-point Likert-type questions. Each item was a statement concerning the Indiana 4-H Tractor Program. The possible responses to the statements were strongly agree, agree, undecided, disagree, and strongly disagree. The question about how the 4-H Tractor Program benefited them in other aspects of their life also had a space for the respondent to describe what benefits they received. Part IV contained three open-ended questions. The first asked for suggestions on how to improve the Indiana

4-H Tractor Program. The second asked for comments regarding the respondent's experience with the Indiana 4-H Tractor Program. The final question asked the respondent if they would be willing to participate in making the 4-H Tractor Program more effective.

Pilot testing of the *Indiana 4-H Tractor Program Alumni Survey* was conducted in August 1998. The pilot survey was mailed to the 47 members of the Indiana 4-H Petroleum Power Council who served as an expert review panel for the survey. The Petroleum Power Council is comprised of 4-H volunteer leaders who oversee the Indiana 4-H Tractor Program. Most of these volunteer leaders were also former participants in the program. Thirty-one of the pilot surveys were returned for a response rate of 65.9%. From the pilot test, changes were made to several of the items in the survey to improve clarity.

The *Indiana 4-H Tractor Program Alumni Survey* was mailed in late September 1998 to the past participants of the Indiana 4-H Tractor Program State Tractor Operating Contests for the years 1982 to 1997. Former state contest participants were selected for this survey as they were the only 4-H Tractor Program participants whose names and addresses are kept on file by the Indiana State 4-H Office (R. Tormoehlen, 4-H Youth Specialist, Purdue Cooperative Extension Service, personal correspondence, 1997). The specific population was selected due to concerns of cost and accuracy of participant addresses. These records provided a database of 233 possible respondents. Forty-one surveys were returned with undeliverable addresses; these were deleted from the database resulting in an accessible population of 192. After two follow-ups, there were 126 useable surveys.

When response rates are less than 90% even after a follow-up, the researcher should perform non-respondent bias checks (Smith & Glass, 1987). Mail survey response rates in the range of 60% to 70% are considered acceptable, but at this level the researcher should be concerned with the non-responder bias that may be present (Mangione, 1998). To check for non-responder bias, a telephone survey of the non-responding alumni was conducted. Thirteen of the non-responders (21% of total non-responders) were contacted and agreed to be surveyed over the telephone. All of the items in the mail survey were asked in the telephone survey. The data collected in the telephone survey were entered in the main database with an additional variable for which survey (mail or telephone) the data were collected from added to that database. The appropriate comparison was made for each item on the two groups. There were no statistically significant differences between the responses of the respondents to the mail survey and the telephone survey. Thus, the 13 respondents from the telephone survey were added to the 126 respondents from the mail survey resulting in a response rate of 72.4%.

Findings

The mean age of the respondents was 24.6 years. Most of the respondents were males (98%). The majority (74%) worked on farms either on a full or part-time basis (Table 1). Of the 36 respondents who reported full-time employment in an off-farm job, 29 reported working in a mechanical or technology-related career. The mean number of years involved in the 4-H tractor program was 7.5 years. Forty-five percent of the respondents reported having a parent who had been a member of the 4-H Tractor Program. There were 18% of the respondents who reported being a tractor club leader at some time.

Table 1
Work Status of Respondents (N=139)

Current type of Employment	Percent	Frequency
Full-time farm operator	32%	45
Part-time farm operator (principal source of income from farm)	7%	10

Table Continues

Table 1 (Continued)

Current type of Employment	Percent	Frequency
Part-time farm operator (principal source of income from off-farm employment)	23%	32
Hired labor on a farm	12%	16
Employed full-time in off farm job	26%	36

Eleven (5.7%) of the respondents reported a personal tractor-related injury that required them to receive emergency medical treatment (Table 2). Twenty-six respondents (21%) reported that a family member had experienced a tractor-related injury requiring emergency medical treatment. There were 37 (27%) of the respondents who reported experiencing a tractor-related close call incident where the respondent narrowly escaped serious injury (Table 3). The most common type of close call incident was tractor rollovers (11) and roadway collisions (6). Of the 37 respondents who reported experiencing a tractor-related close call, thirty of them listed the type of incident. Since hourly exposure data were not collected and comparative, non-fatal injury data for Indiana tractor operators in general were not available, injury rates could not be calculated or compared.

Table 2
Types of Tractor-Related Incidents Causing Injury (N=139)

Type of Incident	Number of Incidents
Fell off tractor	3
Tractor runover	2
Tractor rollover	1
PTO Entanglement	1
Pinned against object	1
Other	3

Table 3
Types of Tractor-Related Close Call Incidents (N=139)

Type of Incident	Number of Incidents
Tractor rollover	11
Roadway collision	6
PTO Entanglement	2
Tractor incident, unspecified	2
Tractor runover	1
Other	8

Likert-type questions were used to determine the respondent's involvement in tractor operation activities (Table 4). Responses were coded as Daily=1, Weekly=2, Monthly=3, Rarely=4, Never=5, and Does not apply=6. Respondents indicated that they operate tractors on a daily to weekly basis (mean = 1.6). Riding

as an extra rider was not a common activity for the respondents (mean = 3.4). Most of the respondents have access to tractors with ROPS (Figure 1) and the majority of respondents used tractors with ROPS (Table 4). Eighteen respondents (13%) reported that none of their tractors were equipped with ROPS. Very few of the respondents wear a seat belt when operating a tractor with ROPS (81.6% rarely or never). The activity of operating a tractor with an extra rider was not a common activity for the respondents (mean = 3.5).

Table 4
Respondents' Involvement in Tractor Operation Activities (N=139)

Type of Activity	Daily		Weekly		Monthly		Rarely		Never		N/A	
	n	%	n	%	n	%	n	%	n	%	n	%
Operate a tractor	80	57.5	34	24.5	18	13.0	5	3.6	0	0.0	2	1.4
Ride as extra rider	6	4.3	31	22.3	13	9.4	73	52.5	14	10.1	2	1.4
Operate tractor equipped with ROPS	30	21.6	50	36.0	18	13.0	25	17.9	11	7.9	5	3.6
Wear seat belt with ROPS tractor	10	7.4	0	0.0	3	2.2	31	22.8	80	58.8	12	8.8
Operate with an extra rider	4	2.8	19	13.7	27	19.4	71	51.1	15	10.8	3	2.2

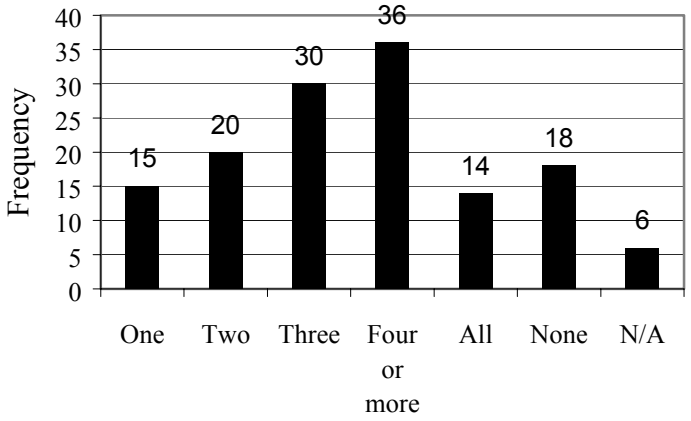

Figure 1. Number of Tractors with ROPS

There were seven statements designed to determine the respondents' perceptions of the 4-H Tractor Program (Table 5). Most of the respondents agreed or strongly agreed (86.3%) that they were safer tractor operators because of the 4-H Tractor Program. A majority agreed or strongly agreed (97.1%) that the 4-H Tractor Program was effective at educating youth to be safe tractor and machinery operators and that it was cost effective (97.8%). The respondents also agreed or strongly agreed (97.6%) that the 4-H Tractor Program should be continued and expanded. Seventy percent of the respondents felt that the program could be more effective at training youth to be safer tractor and machinery operators. The majority strongly agreed

(59.4%) that they would like their children to be involved in the 4-H Tractor Program. A majority (89.9%) agreed or strongly agreed that the program benefited them in other aspects of their life.

The respondents were also asked to briefly describe what benefits they received from the program. There were 94 respondents that chose to list the benefits they received. A few of the respondents listed more than one benefit. The types of the benefits reported by the respondents are displayed in Figure 2.

Table 5
Respondents' Perception Regarding The Benefits of the 4-H Tractor Program (N=139) [a]

Response	n	Mean	5	4	3	2	1
The 4-H Tractor Program should be continued and expanded	139	4.7	91	45	3	0	0
I would like my children to be involved in the 4-H Tractor Program	138	4.6	82	47	9	0	0
The 4-H Tractor Program is effective	139	4.5	66	69	2	2	0
The 4-H Tractor Program is cost effective	139	4.4	59	77	2	0	1
4-H Tractor Program benefited me in other aspects of my life	139	4.3	47	78	13	1	0
I am a safe tractor and machinery operator because of the 4-H Tractor Program	139	4.2	42	78	18	1	0
The 4-H Tractor Program could be more effective	137	3.8	25	71	33	7	1

[a] 5 =Strongly Agree, 4 =Agree, 3 =Undecided, 2 =Disagree, 1 =Strongly Disagree

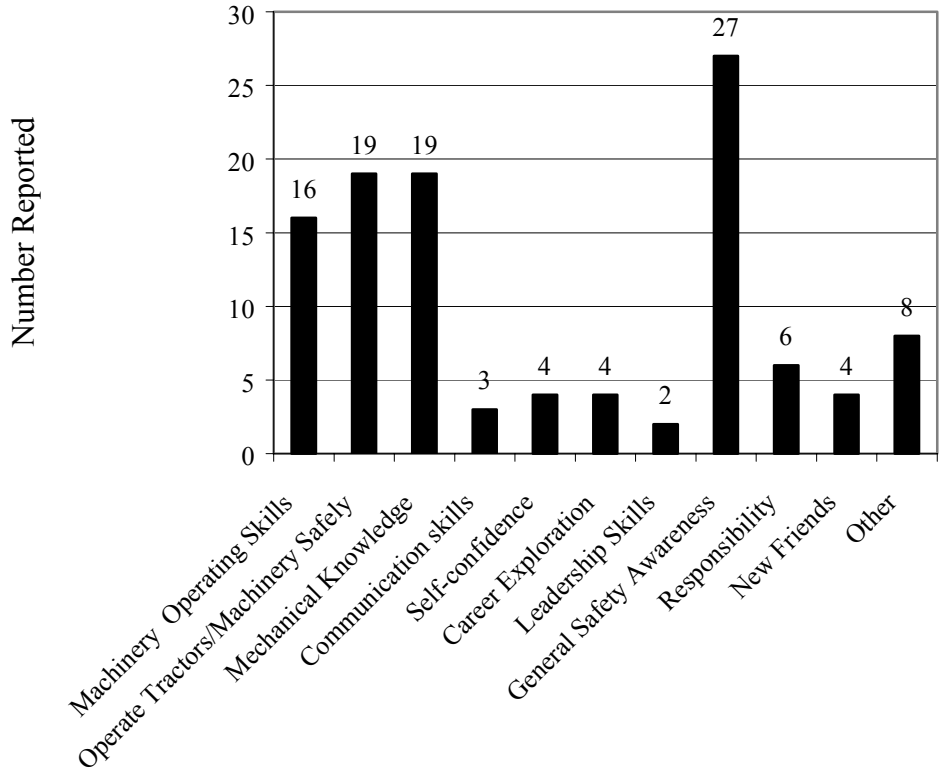

Figure 2. Reported Benefits of the Indiana 4-H Tractor Program

The final section of the survey solicited suggestions and comments concerning the program. One hundred and two people (73.4%) provided one or more suggestions. The most common suggestion was to update the student workbooks. Other common suggestions were to improve the subject matter content of the program by keeping it current, improve the quality of the tractor club meetings, and improve the operating courses and contests (Table 6).

Table 6
Suggestions to Improve the Indiana 4-H Tractor Program (N=139)

General Suggestion Categories	# of Suggestions	% of Responses
Updated Manuals	19	17.1
Improve Subject Matter Content/Meetings	17	15.3
Improve Operating Courses & Contests	14	12.6
More Emphasis on Safety	12	10.8
Increased Promotion/Membership	12	10.8
More Hands on Activities	10	9.0
More Support for Leaders	8	7.2
De-emphasize Speed at Contests	7	6.3
More Support from Dealers & Manufacturers	5	4.5
Better Teaching Materials/Videos	3	2.7
Parent Involvement	2	1.8
Other	2	1.8

Seventy-seven respondents (55.4%) gave qualitative comments on their experience in the Indiana 4-H Tractor Program. A majority of the comments reflected positively on the program. Adjectives used by the respondents to describe the program included "good," "best," "interesting," "very good," "great," "fun," and "educational." A typical comment was "I feel that it is a great program. I have learned a lot about safety and learning the right way to do things."

Conclusions and Implications

The response from the *Indiana 4-H Tractor Program Alumni Survey* indicates that the program has had a mostly positive impact on the 139 individuals that chose to respond. The alumni believed that the program was effective at teaching them to be safe tractor operators as well as benefiting them in other aspects of their life. Most of the alumni strongly agreed that they would like their children to be involved in the program. This indicates their belief in the value of the program. A majority of respondents felt that the program was cost effective and that it should be continued and expanded. These responses indicate that the participants have favorable impressions about the program and the effect that it had on them.

A measure of impact that the program has may be related to career selection. The Indiana 4-H Tractor Program may provide participants with an opportunity for career exploration. For example, 21% of the respondents not involved in agricultural production were working in positions relating to mechanical sciences. Also, almost three-fourths of the respondents were involved in farming on a full or part-time basis. Since such a large percentage of the participants are involved in farming, it should be noted that the safety training provided by the program actually reaches people who need it the most.

Even though the feedback of the respondents in regard to the Indiana 4-H Tractor Program was generally positive, some felt that there was room for improvement. Sixty-nine percent of the respondents to the alumni survey felt that the program could be more effective at instilling safe tractor operating behaviors in youth. The most common suggestion from the alumni was to update the student workbooks and related material. Other common suggestions were to improve the subject matter content of the program by keeping it current, improving the quality of the tractor club meetings, and improving the operating courses and contests.

In spite of the training they received, some of the respondents reported being involved in risky behaviors. Approximately 13% of the respondents indicated that all of their tractors were not equipped with ROPS and more than three-fourths of respondents reported rarely or never wearing a seat belt on a ROPS equipped tractor. Ninety percent of respondents reported riding on a tractor as an extra rider and 90% allow an extra rider on a tractor that they are operating. Involvement in these risky behaviors indicates that the program could be more effective at instilling safe tractor operating behaviors in its participants. It was of concern to note that when the respondents' injury experience data were combined with reported injuries of other family members, more than 26% of all family units represented in the study had experienced a tractor-related injury requiring medical treatment. Even though those cases occurred over an undefined time period, the rate of recalled incidents was higher than originally anticipated by the researchers.

Recommendations

Based on the findings and conclusions of this study, the following recommendations for improving the Indiana 4-H Tractor Program were developed. The reader is reminded that this was a census study on perceptions and self-reported behaviors of alumni from the Indiana 4-H Tractor Program and generalizations to programs in other states are not implied.

1. The respondents understood that a major purpose of the 4-H Tractor Program was to instill safe tractor operation habits in its participants and wanted their own children to be involved in the program. However, the respondents self-identified numerous risky behaviors they did on a regular basis. These included not wearing a seat belt with a ROPS-

equipped tractor, operating at an unsafe speed, and allowing extra riders. Therefore, the Indiana 4-H Tractor Program should strengthen its approaches for reducing risky behaviors and should especially target for enrollment those youth who operate or plan to operate tractors and machinery.

2. New teaching materials need to be developed for the program. Up-to-date tractor curriculum manuals that reflect the latest technology need to be developed. The new manuals would be another vehicle for disseminating tractor safety information. Other types of instructional media such as videos and computer-based programs should be developed and made available to leaders and members. Updating course materials in content, methods of delivery, and design of tractor operating courses could help the club leaders to reduce the frequency and severity of tractor and machinery-related injuries in their communities.
3. A more comprehensive survey of past participants of the Indiana 4-H Tractor Program should be undertaken. This research should survey a more representative body of all 4-H Tractor Program alumni. The injury history of these individuals should be compared to the general farm population in Indiana to determine if differences exist and thus, what impact the program has had on preventing tractor and machinery-related injuries.
4. The respondents reported overall positive experiences with the Indiana 4-H Tractor Program and believed that the program should be continued and even expanded. Therefore, it is recommended that a thorough evaluation of the program's components be conducted so that good aspects of the program can be replicated in other states and other agricultural safety education programs.

References

Abend, E. L., & Longhouse, H. (1994). Comparing youth tractor certification programs in New York and Ohio. [Oral presentation] *Agricultural Safety and Health: A National Conference on Detection, Prevention, and Interaction.* NIOSH, Columbus, OH.

Best, J. W. (1970). *Research in education.* Englewood Cliffs, NJ: Prentice Hall.

Dillman, D.A. (1991). The design and administration of mail surveys. *Annual Review of Sociology, 17,* 225-249.

Dillman, D.A. (1978). *Mail and telephone surveys: The total design method.* New York: John Wiley & Sons.

Emory, J. E., & Ferguson, J. J. (1980). *An evaluation of the tractor/machinery certification programs based upon review of the farm youth accident statistics in Ohio*. Unpublished master's thesis, University of Cincinnati, Cincinnati, OH.

Freeman, S. A., Whitman, S.D., & Tormoehlen, R. L. (1998). Baseline childhood farm safety data for Indiana. *Journal of Agricultural Safety and Health, 4* (2), 119-130.

Lehtola, C. J., & Marley, S. J. (1992). Tractor risk abatement and control. *ASAE Paper No. 92-5507.* St. Joseph, MI.

Mangione, T. W. (1998). *Handbook of applied social research methods.* Thousand Oaks, CA: Sage Publications.

Murphy, D. J. (1992). *Safety and health for production agriculture.* St. Joseph, MI: ASAE.

National Coalition for Agricultural Safety and Health (NCASH). (1989). *Agriculture at risk: A report to the nation*. Des Moines, IA: Pioneer International Hi-Bred, Inc.

National Committee for Childhood Agricultural Injury Prevention. (1996).

Children and agriculture: Opportunities for safety and health. Marshfield, WI: Marshfield Clinic.

Pollock, J. (1997, February). Tractor safety education. *Cornell Cooperative Extension Program Catalyst.* Ithaca, NY: Cornell University.

Purschwitz, M. A. (1989). *Development of a data collection system for farm-related accidents resulting in injury.* Unpublished doctoral dissertation, Purdue University, West Lafayette, IN.

Purschwitz, M. A. (1990). Fatal farm injuries to children. *Wisconsin Rural Health Research Center.* NAL Call No.: SB565.P87.

Rivara, F. P. (1997). Fatal and nonfatal farm injuries to children and adolescents in the United States, 1990-3. *Injury Prevention, 3,* 190-194.

Schuler, R. T., Skjolaas, C. A., Purschwitz, M. A., & Wilkinson, T. L. (1994). Wisconsin youth tractor and machinery certification programs evaluation. *ASAE Paper No. 94-5503.* St. Joseph, MI.

Sheldon, E. J. (1992). *Review and analysis of fatal and nonfatal farm work-related injuries involving children and adolescents through age 17.* Unpublished master's thesis, Purdue University, West Lafayette, IN.

Smith, M. L., & Glass, G. V. (1987). *Research and evaluation in education and the social sciences.* Boston: Allyn and Bacon.

U.S. Department of Transportation. (1971). *Agricultural tractor safety on public roads and farms. A report to the Congress from the Secretary of Transportation.* Washington, DC: U.S. Government Printing Office.

Wilkinson, T. L., Schuler, R. T., & Skjolaas, C. A. (1993). The effect of safety training and experience of youth tractor operators. *NIFS Paper No. 93-6.* Columbia, MO.

Yarosh, A. J., Bean, T. L., & Gliem, J. A. (1993). Farm injury intervention: Ohio's tractor certification program. *ASAE Paper No. 93-1589.* St. Joseph, MI.