

Adolescent Work Patterns and Work-Related Injury Incidence in Rural Minnesota

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Background Although there have been many studies on working youth in the United States, we have noted none which have provided a broad picture of adolescent work practices in a rural community.

Methods Six high schools in rural Minnesota were evaluated for adolescent work practices. Schools ranged in size from 173 to 525 students in grades 9 through 12. A 20 page self-administered survey examining work practices was administered to students.

Results A total of 2,250 students completed the survey, representing 92% of the student body. Twenty-eight percent of students lived on a farm. Approximately 45% of the male students and slightly more than 21% of the females were involved in farm work. Only 2.6% of students were injured during this 8-month time period in farm-related activities, and 5.1% were injured doing non-farm work. Many students reported working long hours.

Conclusions Work represents a serious problem for rural youth. These data are significant in the context of national policy discussion concerning the failure of the Fair Labor Standards Act to regulate the agricultural environment. *Am. J. Ind. Med.* 42:134–141, 2002. © 2002 Wiley-Liss, Inc.

KEY WORDS: child labor; farm youth; work hours; injury; epidemiology; policy

INTRODUCTION

The last several decades have seen a shift in the amount of work that is done by adolescents in the United States [Kablaoui and Pautler, 1991; Steel, 1991; National Research Council, 1998]. As noted by Steel [1991], work has become a “non-trivial” activity for youth. Data on the risks and benefits of work are mixed, however, most data indicate that long work hours (generally defined as 20 or more hours per

week) are detrimental to youth [Kablaoui and Pautler, 1991; Steel, 1991].

In 1996, there were just over two million farms in the United States. An estimated 923,000 children less than 15-years old and 345,000 children aged 15–19 lived on these farms [National Research Council, 1998]. There are no data on the proportion of children and adolescents who reside on farms who are directly involved with agriculture as paid or unpaid workers [National Research Council, 1998]. The National Agricultural Workers Survey indicates that 7% of hired farm workers are between 14- and 17-years old. In 1996, an estimated 300,000 15–17-year-olds worked on farms [National Research Council, 1998; United States General Accounting Office, 1998]. We know of no data that indicate the number of adolescent agricultural workers who work on farms but are non-farm residents.

Injury and fatality rates for youth exposed to the agricultural environment vary by study, geographic area, and type(s) of agricultural hazard exposure. For all children less than 19 years of age, there are approximately 1,700 non-fatal farm injuries per 100,000 farm residents each year. However, the

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rate of injury increases to 2,135 and 2,279 for those 10–14 and 15–19 years of age, respectively [Rivara, 1997]. Each year approximately 100 children under the age of 20 years die of agricultural injuries sustained on farms [Rivara, 1997]. Results from a study of farm injuries in children in central Wisconsin, an agricultural area similar to central Minnesota, [Stueland et al., 1996], indicated that injury rates were highest among males aged 14–17 years at 27.2/year/1,000 children.

Belville et al. [1993] evaluated 9,656 adolescent work injuries reported to the New York Department of Labor. Agriculture, in which only 3% of working adolescents were employed, was the second most hazardous industry overall and accounted for the highest injury rates among 16- and 17-year-old workers (67.2/10,000 and 72.3/10,000, respectively). The majority of injuries occurred on dairy farms (39%) and crop producing farms (37%). Both of these industries are extremely common in the Minnesota Department of Health (MDH) study areas. Minnesota data also indicates that dairy farming significantly increases the risk of farm-related injury [Boyle et al., 1997].

The National Institute of Occupational Safety and Health (NIOSH) sponsored Community Partners for Healthy Farming was an experimental surveillance program designed to evaluate data compilation on agriculture-related injury and illness. As part of this program, the Minnesota Department of Health conducted a cross-sectional survey of adolescent work practices, work-related injury, and injury outcomes among students in six high schools in three rural counties in central Minnesota. A companion paper [Munshi et al., 2002] describes the work habits including type of employment and hours of work, and the incidence of work-related adolescent injury in three rural counties in central Minnesota.

METHODS

The Minnesota Community Partners for Healthy Farming (MN CPHF) project, funded by the NIOSH, was a joint effort between the Minnesota Department of Health and the Community Health Board for three central Minnesota farming counties. The overall goals of MN CPHF were to assess work- and agriculture-related injuries to the children and adolescents in these communities, to determine how these injuries were occurring, and to reduce their incidence. As part of this effort, 2,250 adolescents from six central Minnesota rural high schools were surveyed between the end of February and the end of March 1998.

Sample Selection

The sampling method for choosing these schools was based on convenience, size of the school, and the urban/rural quality of the community as determined by its population. A total of 2,250 students represented 92% of the student body

from the six high schools. The high schools ranged in size from 173 students to 525 students between grades 9 and 12, and this population was 95% Caucasian and 52% female. Five of the six schools included students in grades 9 through 12; one school district housed grades 7 through 9 in a separate middle school but had faculty that taught at both the schools. Grades 7 and 8 were not included in the survey.

Contact with the participant schools was made initially through a member of the administrative staff, a faculty member in the agricultural and industrial sciences, or both. Schools received a small stipend to compensate for the time that their staff spent on project-related activities, which included identifying classes and focus groups for survey development, participating in work groups, and organizing survey implementation. Project staff trained the coordinators on survey implementation, and they in turn trained others within their school district to administer the survey.

Survey Implementation

These liaisons selected the most effective technique for survey administration based on the operations of their school district. The procedure differed slightly at each school, but in general two processes were used to administer the survey. Either a school-wide assembly was convened during which the entire student body took the survey at one time or the survey was administered at some time during a week-long period within a required class (i.e., English or Social Science) in which every student was enrolled. In some schools, the liaison followed up on missing students to guarantee that absenteeism was not due to a work-related injury. Student participation rate varied between schools from 79 to 100%.

Survey Design

A 20 page self-administered survey was developed in part from instruments used in previous adolescent work and injury surveys. The survey was divided into three sections: general demographic information and knowledge of occupational health; farm work and farm-related injury; and non-farm work and non-farm injury. The survey included questions on injury risk factors such as work hours, equipment and chemical exposures, reasons for working (e.g., personal gain vs. economic need), and injury experience for both farm work and non-farm employment that occurred in the preceding 8 months.

Several definitions were supplied to the students as they took the survey to clarify terminology and maintain consistency. An injury was defined as any work-related health problem that caused an individual to seek medical attention from a health care facility or miss four or more hours of school or work. A farm was defined as any place that would produce or sell \$1000.00 or more of agricultural products each year, and farm work was defined as any farm activities

done on a regular basis. Payment did not have to be received for a farm activity to qualify it as work, however, the definition for non-farm work required that payment be received. Occasional paid activities such as yard work or babysitting were included as non-farm work to complement the type of expected chores done by adolescents living on a farm.

Data Analysis

Completed surveys were checked and then scanned into a computerized database, and quality assurance tests were completed on a sample of the data. Data were analyzed using Visual FoxPro and SPSS [SPSS, 1990] software programs. Narrative information and Standard Industrial Classification coding were compiled and entered by individuals trained in coding and injury epidemiology.

RESULTS

A total of 2,250 students participated in and completed this self-reported survey, representing 92% of the student body from the six enrolled high schools. All tables refer to data collected for the time period specified as the end of the school year (approximately June, 1997) to the date of survey administration in February/March 1998.

Twenty-eight percent of these students reported that they lived on a farm. The predominant types of farming activities included (the student could select more than one category): row crops (61%), beef cattle (32%), dairy (24%), hogs (21%), small grains (20%), and poultry (12%). As shown in Table I, nearly three-quarters of the students residing on a farm also worked on a farm. Nearly 17% (271 out of 1621) of adolescents who did not live on a farm also were involved in farm work, either as a sole occupation or in combination with non-farm employment.

While approximately 45% of the male students were involved in farm work, only slightly more than 21% of the females were. However, 87% of the female students were active in non-farm work. Fewer adolescents living on farms reported participating in no type of work activity than adolescents who did not live on farms (3.2% vs. 11.5%). As a whole, nearly 90% of these students reported that they participated in some type of work.

Almost 95% of students were involved in some type of work activity by the time they reached eleventh grade. A large increase occurred between the percent of students participating in non-farm work in tenth grade (75.4%) and in eleventh grade (85.4%). This change takes place in spite of the fact that students continue to do farm-related work.

Table II describes the type of work done by Standardized Industrial Classification (SIC) code among the 2,044 working students, either in conjunction with a farm-related job or

as a single occupational role. This table is based on the most recent employment for each student, and hence each student could only mention one non-farm job in addition to farm-related work. The most common type of work done by students was personal services, which includes babysitting and home care. Restaurant work, both fast food and other restaurants employed 22% of the students. The other major employer by SIC code was retail and wholesale trade, in which 19% of the students participated.

Students who did farm work in addition to non-farm work were more likely to be involved in construction as their non-farm employment than students who did not participate in farm-related work. Students who only engaged in non-farm employment were involved in retail and wholesale trades at a higher proportion than adolescents with both farm and non-farm employment.

Tables III and IV describe the number of hours of work reported among the 466 students who reported having both farm and non-farm employment. Table V describes work hours for those who did either farm or non-farm work.

As shown in Table VI, 2.6% of the working student body in these six schools was injured during this 8-month time period doing farm-related activities and 5.1% was injured during this time period doing only farm work. Although the percent of females injured in non-farm work is similar to males, the percent of males injured overall is much higher. Injury rates do not appear to vary by grade level.

DISCUSSION

The data are not without limitations. First, the survey covered a period from the end of school in June until the survey was completed early the next year. Although teens were asked about work during the summer and during the school year, it was not possible to adequately assess all jobs that were held during the study time frame. Second, during data analysis it became apparent that many teens had difficulty describing the hours of work they spend doing specific activities (e.g., driving tractor, operating other machinery). Although information was obtained for both agriculture-related and non-agricultural injury, only the most recent injury in either category was evaluated in detail. Students were asked about the total number of injuries they experienced during the referent time period; however, these data were not used to estimate the injury risk presented above. While this study did not validate the severity of self-reported injuries, previous work by Parker et al. [1994] has demonstrated that adolescents accurately report work-related injuries.

There have been numerous studies on the scope and pattern of work done by teens in the United States [National Research Council, 1998]. However, we know of no studies that have simultaneously examined both agricultural and

TABLE I. Self-Reported Work Habits Among 2,250 Adolescents in Rural Minnesota, 1997–1998*

	Farm work number (%)	Both farm and non-farm work number (%)	Non-farm work number (%)	No work number (%)	Total in row number (%)
Live on farm?					
No	84 (5.2)	187 (11.5)	1,164 (71.8)	186 (11.5)	1,621 (100)
Yes	189 (30.9)	279 (44.4)	140 (22.3)	20 (3.2)	628 (100)
Unknown			1		1
Gender					
Male	221 (20.4)	269 (24.7)	481 (44.5)	111 (10.3)	1,082 (100)
Female	52 (4.5)	197 (16.9)	823 (70.5)	95 (8.1)	1,167 (100)
Unknown			1		1
Grade Level					
9	108 (17.2)	117 (18.6)	323 (51.4)	80 (12.7)	628 (100)
10	76 (13.2)	113 (19.7)	320 (55.7)	65 (11.3)	574 (100)
11	54 (9.5)	122 (21.6)	361 (63.8)	29 (5.1)	566 (100)
12	35 (7.3)	114 (23.7)	300 (62.4)	32 (6.7)	481 (100)
Unknown			1		1

*The numbers in parentheses represent percentages of row totals, with the actual number of adolescents in parentheses.

non-agricultural work in the same communities. It is apparent from the data presented that rural Minnesota teens are working in a wide range of jobs both on and off the farm.

Farming has been consistently identified as Minnesota's most hazardous occupation. The Minnesota Fatality Assessment and Control Evaluation (MN FACE) program has

documented serious ongoing injury hazards associated with tractor use [Brown et al., 1997], augers [Boyle et al., 1995], grain bins [Wahl, 1996], and manure pits [Madery and Parker, 1993] in Minnesota. Farm work has also been consistently related to child injury-related deaths [Parker and Wahl, 1999]. In addition, construction consistently ranks as

TABLE II. Job Activity by Standard Industrial Classification (SIC) Category Among 1,771 Adolescents Employed in Non-Agricultural Jobs in Rural Minnesota, 1997–1998*

Industry	Total number (%)	Farm and non-farm number (%)	Non-farm only number (%)
Total	1,771 (100)	466 (100)	1,305 (100)
Services	745 (42.1)	194 (41.6)	551 (42.2)
Business and repair	41 (2.3)	15 (3.2)	26 (2.0)
Entertainment and recreation	107 (6.0)	21 (4.5)	86 (6.6)
Personal services	480 (27.2)	133 (28.5)	347 (26.6)
Professional or medical	117 (6.6)	25 (5.4)	92 (7.0)
Retail and wholesale trades	715 (40.4)	156 (33.5)	559 (42.8)
Restaurant-fast food	150 (8.5)	31 (6.7)	119 (9.1)
Restaurant-other	236 (13.3)	60 (12.9)	176 (13.5)
Other	329 (18.6)	65 (13.9)	264 (20.2)
Construction	132 (7.5)	60 (12.9)	72 (5.5)
Manufacturing	78 (4.4)	26 (5.6)	52 (4.0)
Transportation and communications	42 (2.4)	13 (2.8)	29 (2.2)
Other	45 (2.5)	13 (2.8)	32 (2.5)
Unknown	7 (<1.0)	4 (<1)	3 (<1)

*The numbers in parentheses represent percentage of column totals.

TABLE III. Self-Reported Hours Worked Among 466 Rural Minnesota Adolescents Employed in Both Farm and Non-Farm Jobs, Non-Harvest, 1997–1998*

		Non-farmwork					
		None	< 4	5–8	9–19	20+	Unknown
Farm work	Hours per week	None	< 4	5–8	9–19	20+	Unknown
	None	10 ^a	13	9	14	7	1
	< 4	20	24	27	38	27	8
	5–8	7	28	20	18	16	8
	9–19	5	11	14	31	20	4
	20+	8	11	9	22	25	6
	Unknown	0	1	0	1	2	1

*Non-harvest refers to farm-work other than during the harvest season. Students were not specifically asked about farm work during the school year.

^aCell numbers refer to the number of students reporting specified hours of work each week.

one of the occupations with the highest rate of both fatal and non-fatal injuries.

The current study of rural youth shows a very similar pattern of employment in rural Minnesota to an earlier study of 3,051 10–12th graders in urban and rural Minnesota [Parker et al., 1994]. Given the laws that regulate the employment of youth, it is not surprising that once they leave the farm environment, youth are working in jobs that are similar to those of the urban environment. However, it appears that many youth assume jobs off the farm while continuing to perform farm-related work. The changes in employment practices may be due to the number of students reaching a legal age to work and obtaining driving permits to allow them the freedom to maintain diverse schedules. However, many older students continued to have two jobs.

The most striking finding of the current study was the number of hours teens reported working. Approximately 5% of teens reported working 40 or more hours per week during the summer and just over 1% reported working 40 or more

hours per week during the school year. Any student listing 40 or more work hours per week was classified into a single category of 40 or greater, thus, it is possible that we have underestimated total work time for those who report working 40 or more hours per week. This was done because several teens reported working 60 or more hours per week. Our inability to verify work hours indicates a need to more closely examine the work hours of rural youth. Regardless, at this time it appears that some rural youth continue to perform farm-related work activities even as they assume jobs off the farm. It is these two-income youth who work the longest hours.

Data of this study are consistent with those of Bachman and Schulenberg [1993] who noted that approximately 36 and 27%, respectively, of male and female high school seniors worked 21 or more hours per week. Similarly, Steinberg and Dornbusch [1991] found that approximately 30 and 56% of 11 and 12th graders, respectively, worked 20 or more hours per week. However, we have not found

TABLE IV. Self-Reported Hours Worked Among 466 Rural Minnesota Adolescents, Employed in Both Farm and Non-farm Jobs, Summer 1997

		Non-farmwork					
		None	< 4	5–8	9–19	20+	Unknown
Farm work	Hours per week	None	< 4	5–8	9–19	20+	Unknown
	None	0 ^a	1	2	2	11	1
	< 4	3	15	10	7	46	3
	5–8	0	14	15	14	35	8
	9–19	5	4	11	25	51	3
	20+	8	12	15	37	94	8
	Unknown	0	0	0	2	3	1

^aCell numbers refer to the number of students reporting specified hours of work each week.

TABLE V. Hours of Farm and Non-Farm Work by Grade for Students Working Either on the Farm or Off, But Not Both

Grade and hours	Hours of non-farm work, number (%)				Hours of farm work, number (%)			
	Summer		School		Summer		Non-harvest	
	Males	Females	Males	Females	Males	Females	Males	Females
Grade 9								
0–4 ^a	46 (9.6)	59 (7.2)	84 (17.5)	138 (16.8)	15 (6.8)	13 (25.0)	27 (12.2)	18 (34.6)
5–8	21 (4.4)	43 (5.2)	18 (3.7)	41 (5.0)	10 (4.5)	6 (11.5)	14 (6.3)	5 (9.6)
9–19	17 (3.5)	42 (5.1)	14 (2.9)	19 (2.3)	16 (7.2)	3 (5.8)	19 (8.6)	2 (3.8)
20+	35 (7.3)	60 (7.3)	3 (0.6)	6 (0.7)	39 (17.6)	6 (11.5)	20 (9.0)	3 (5.8)
Grade 10								
0–4	22 (4.6)	48 (5.8)	59 (12.3)	86 (10.4)	6 (2.7)	2 (3.8)	16 (7.2)	7 (13.5)
5–8	7 (1.5)	23 (2.8)	10 (2.1)	32 (3.9)	5 (2.3)	3 (5.8)	7 (3.2)	1 (1.9)
9–19	30 (6.2)	64 (7.8)	22 (4.6)	70 (8.5)	11 (5.0)	4 (7.7)	15 (6.8)	3 (5.8)
20+	48 (10.0)	78 (9.5)	16 (3.3)	25 (3.0)	41 (18.6)	4 (7.7)	25 (11.3)	2 (3.8)
Grade 11								
0–4	17 (3.5)	26 (3.2)	40 (8.3)	48 (5.8)	6 (2.7)	0 (0.0)	11 (5.0)	1 (1.9)
5–8	10 (2.1)	15 (1.8)	17 (3.5)	28 (3.4)	0 (0.0)	2 (3.8)	8 (3.6)	2 (3.8)
9–19	18 (3.7)	57 (6.9)	47 (9.8)	109 (13.2)	14 (6.3)	1 (1.9)	12 (5.4)	2 (3.8)
20+	91 (18.9)	127 (15.4)	32 (6.7)	40 (4.9)	29 (13.1)	3 (5.8)	17 (7.7)	1 (1.9)
Grade 12								
0–4	7 (1.5)	12 (1.5)	28 (5.8)	31 (3.8)	7 (3.2)	0 (0.0)	8 (3.6)	1 (1.9)
5–8	4 (0.8)	9 (1.1)	14 (2.9)	22 (2.7)	2 (0.9)	0 (0.0)	4 (1.8)	1 (1.9)
9–19	16 (3.3)	28 (3.4)	42 (8.7)	74 (9.0)	6 (2.7)	2 (3.8)	5 (2.3)	0 (0.0)
20+	92 (19.1)	132 (16.0)	35 (7.3)	54 (6.6)	14 (6.3)	3 (5.8)	13 (5.9)	3 (5.8)
Total	481 (100)	823 (100)	481 (100)	823 (100)	221 (99.9)	52 (99.9)	221 (99.9)	52 (99.8)
		1304 ^b		1304		273		273

^aThe category 0–4 hr includes those teens who left the question unanswered.

^bOne teen in the non-farm group who did not mention sex and grade, worked 9–19 hr in summer and during school hours.

TABLE VI. Self-Reported Injury Information by Work Status Among 2,044 Working Rural Minnesota Adolescents, 1998

	Male injuries (%)	Total males	Female injuries (%)	Total females
Farm work only		221		52
Farm injury	19 (8.6) ^a		4 (7.7)	
Non-farm work only		481		823
Non-farm injury	40 (8.3)		44 (5.3)	
Worked on farm and non-farm		269		197
Any injury	34 (12.6)		12 (6.1)	
Farm injury only	19 (7.1)		6 (3.0)	
Non-farm injury only	11 (4.1)		5 (2.5)	
Farm and non-farm injuries	4 (1.5)		1 (0.5)	
Total reported injuries	93 (9.6)	971	60 (5.6)	1,072

One person's (who was not injured) sex is unknown.

^aPercentages are calculated by dividing male injuries by total males.

any studies that have previously shown high school students to be working 40 or more hours per week.

The purpose of this study was not to evaluate the impact of adolescent work on current or future socio-economic status or academic performance. However, rural teenagers appear to work excessive hours at jobs that are usually considered dangerous. Long work hours may result in more absence from school, less time doing homework, lower academic performance, and the potential for increased substance abuse [Finch and Mortimer, 1985; Lillydahl, 1990; Kablaoui and Pautler, 1991; Steel, 1991]. The adverse impact of prolonged work on academic performance is not surprising. It is reasonable to anticipate that teachers will reward students who spend time studying [Mortimer and Finch, 1986; Lillydahl, 1990]. Mortimer and Finch [1986] note that education, occupation, and future socioeconomic attainment are closely linked.

While work may offer students skills with regard to social attributes that impact future employment, students who leave school with higher academic performance are more likely to be competitively employed in the future [Benz et al., 1997]. Given these findings, rural teachers, counselors, and parents may need to carefully examine the work burden that is placed on or voluntarily acquired by youth. It is also important to examine whether students are working when they should otherwise be in school.

A second aspect of this study is the nature of work conducted by rural youth. Farm-related and non-farm work is done by youth who live on and off the farm. Approximately 17% of non-farm students reported doing farm work. Once off the farm, rural youth continue many of their farm-related activities. Thus measures that are aimed at impacting work in rural communities should consider a broad target. Farm safety efforts that are targeted only at farm families are likely to miss a significant portion of young farm workers. This should include both farm and non-farm work. Hazard communication should allow youth to identify the broadest range of hazardous work conditions. For example, although it is more likely that farm work will entail the use of hazardous machinery (e.g., power take off), issues related to machine guarding and moving parts are not unique to any specific environment.

CONCLUSIONS

Additional research is needed to more fully ascertain the magnitude of student work in rural communities. Our data indicate that rural youth often work long hours in a variety of jobs on and off the farm. Work hours increase substantially when rural youth obtain their drivers' license. In a review of the health impact of work on youth, Kinney [1993] notes the cost of work-related injury is transferred from employers to youth and their families. The long-term socio-economic consequences of youth work may be significantly greater in rural communities than was previously considered. As

suggested by Steinberg and Dornbusch [1991] parents and school administrators need to carefully monitor the work hours of adolescents during the school year.

Current labor practices are brought about by a mix of social, economic, and demographic factors [Kinney, 1993]. The faltering farm economy combined with an aging population is likely to place more pressure on rural teens to work in the future. If long hours of work facilitate psychosocial problems [Bachman and Schulenberg, 1993], long hours of work among selected youth in rural communities may represent an enormous problem.

If our results are confirmed by other researchers' work, it is likely that work represents a serious problem for youth in many parts of rural America. These data are quite significant in the context of national policy discussion concerning the failure of the Fair Labor Standards Act to regulate the agricultural environment.

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