ORIGINAL ARTICLE

Summer work and injury among middle school students, aged 10–14 years

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Occup Environ Med 2004;**61**:518–522. doi: 10.1136/oem.2003.010546

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Accepted 28 November 2003

Background: Little information exists on injury and factors associated with injury in working youth aged 10–14 years. Most studies do not involve children younger than 15.
Methods: A cross-sectional anonymous survey was administered to middle school students in five school districts and one large urban school in October 2001.
Results: Of the 3189 working middle school students who responded to the survey, the majority were employed in informal job settings, such as working for someone in a home, newspaper delivery, and working on family farms or in family businesses. Overall, 18% of children reported being injured at work. Of those injured, 26% reported that their injury was severe enough to affect their activities for more than three days. Variables that were associated with injury included having a ''near-miss'' incident at work (AOR 6.61, 95% CI 4.92 to 8.89), having a co-worker injured (AOR 2.65, 95% CI 1.95 to 3.60), and being asked to do something dangerous (AOR 2.25, 95% CI 1.61 to 3.14).
Conclusions: Children are working and being injured in jobs that are not covered by existing child labour laws. Injury rates in non-covered occupations are high, warranting review of current laws.

While recent attention has been focused on the unique aspects of teens in the workplace, most studies to date have evaluated working high school students.[1–4] In response, injury prevention measures such as improved safety training and work permit systems are being designed for 15–18 year olds. Less attention has been given to the children as young as 9 who are working in the United States and being injured or even killed on the job. In May 2000, a 9 year old Wisconsin boy was killed while delivering newspapers and in February 2001, a 14 year old Alabama boy was killed when he fell off the roof on which he was working.[5] Although injuries that result in death are reported, almost no information exists on the number of middle school children who are working, the types of jobs they are doing, the injuries they are receiving, and the job training they are being given.

Nationally, the official estimate of employment derived from the Current Population Survey conducted by the Bureau of the Census does not provide information for youth under the age of 15. State specific data are limited to individual research projects or analyses of workers' compensation data. However, workers' compensation is paid only for injuries that meet certain criteria. For example, in the state of Wisconsin, workers can receive compensation only if they are unable to work for three consecutive days because of a work related injury. An additional limitation in workers' compensation data is that the data do not cover informal work situations, such as working for an individual doing lawn care or babysitting, or working on a family farm. Furthermore, youth might not apply for workers' benefits because they might not realise that they are eligible for benefits.

Results from the National Longitudinal Survey of Youth, 1997 (NLSY) indicate that nearly 50% of the youth in the study reported working at some point while they were 12 years old. Females of this age were more likely to work in babysitting, whereas males were more likely to be involved in yard work.[6] Although the NLSY provides insight into young workers, the age range is limited to those children age 12 years and older.

The lack of state and federal data regarding working children age 10–14 years prompted this study to provide a better picture of the type of employment, injuries sustained, and hazards encountered on the job. Collection of these types of data can provide information for states to introduce interventions targeted at preventing injury among working children.

METHODS

Data collection

In 1999, the Wisconsin Division of Public Health, Bureau of Occupational Health (BOH) began a project to implement a new model for childhood occupational injury surveillance. As a component of the project, a cross-sectional anonymous survey was developed to investigate employment, injury, work related habits, and school performance among Wisconsin youth. Some of the survey questions were taken from youth employment surveys developed by the Injury Prevention Research Center at UNC–Chapel Hill and from the Industrial Accident Prevention Association in Toronto, Ontario. Once the survey was developed, it was pilot tested in one Wisconsin high school to ensure that the students understood the questions and to determine the amount of time it would take to complete the survey.

Once the pilot test was completed, five school districts and one large urban school were chosen to participate in the study. The school districts were selected from the five public health regions of Wisconsin, to ensure that the survey results would be representative of youth throughout the state. To be included in the study each of the school districts had to: (1) have a diverse population; (2) be willing to participate in the survey process twice a year for three years; (3) have a work permit programme on site or be willing to establish a site; (4) be willing to pilot a computerised work permit programme at their school; and (5) maintain updated occupational safety and health educational materials.

In October 2001, during a preselected time of the day, each teacher in the schools was asked to administer the survey to students. An instruction sheet was provided and read prior to the students taking the survey. Working students required 5–10 minutes to complete the survey, whereas non-working students required 1–3 minutes to finish. When the students

were finished, the teachers collected the surveys and returned them to the district office, where an employee of the Department of Health and Family Services, Division of Public Health picked them up.

Of the 10 366 students in the participating middle schools, 5499 (53%) students completed the survey. Although we are uncertain as to why the response rate was only 53%, we suspect that not all teachers administered the surveys as directed or that some of the teachers forgot to return them.

However, among students in participating classrooms, 89% responded to the survey. On review of the surveys, 35 were removed from the study because of inappropriate responses. Therefore, a total of 5464 surveys were included in the analysis for the 2001 summer.

Statistical analysis

Data from the surveys were analysed using SAS (Cary, NC). To obtain a description of injury and employment among working youth, aged 10–14 years, frequencies and counts on the survey questions were done for all students who responded to the survey. Comparisons between male and female students were done using χ^2 analysis.

To examine the individual effects of predictor variables, sociodemographic variables, and work characteristics on injury status, simple logistic regression, modelling each independent variable on injury status was used to calculate crude prevalence odds ratios (OR) and 95% confidence intervals (CI). To evaluate the effect of several predictor variables on injury status, multivariate logistic regression was used to calculate adjusted odds ratios (AOR) and CIs. The variables that were statistically significant in the crude analysis were used in the multivariate logistic regression to determine the strongest predictors of injury after controlling for other independent variables. Independent variables and interaction terms that were significant at $p < 0.05$ were maintained in the model.

RESULTS

Characteristics of the respondents

Of the 5464 surveys included for analysis, 58% (n = 3189) of the students marked ''Yes'' to the question ''During the past summer, have you worked?''. Table 1 displays the characteristics of the 3189 students. The majority were white (56%), attended school in a medium sized city (70%), and were between the ages of 12 and 13 years (64%). Forty six per cent worked one job during the summer, 27% worked two jobs, and 22% worked three or more jobs during the summer months. Most (60%) students reported that they worked at the same job during the school year.

The children worked from less than five hours a week to over 40 hours a week. Most (62%) of the students worked 10 or fewer hours per week; however, 5% reported working 40 or more hours per week. Males were more likely than females to work 40 hours or more per week (6.1% *v* 4.2%; p = 0.034).

During the week, 43% of the students reported working before 7 00 pm, 32% reported working between 7 00 and 11 00 pm, and 6.0% reported working after 11 00 pm. Females were more likely to work after 11 00 pm than were males (8% *v* 5%, p = 0.014). Over half of the students reported working before 8 00 am at least one day between Monday and Friday.

Jobs and tasks

Table 2 shows the jobs most frequently reported by students. For both males and females, the greatest number of students (n = 1575) worked in a category that was defined as ''employed by an individual for services at his/her home, e.g. babysitting, lawn care''. Of the 1007 females who reported working in this category, 92% responded that their major task was babysitting. Of the 568 males who reported working in this category, 66% responded that the major task was lawn care.

Many (509) students reported being ''self-employed''. The tasks the female students reported doing included babysitting (n = 218), dishwashing (n = 99), and cleaning tables, floors, and rooms (n = 88). The tasks the males reported included lawn mowing (n = 179), babysitting (n = 124), and dishwashing (n = 81).

Working in family owned businesses and family owned farms was frequently reported by both males and females. However, the tasks that the students performed at the jobs differed by sex. On family farms, males were more likely to be involved with animal care (n = 89), lawn mowing (n = 89), and harvesting and planting crops (n = 82), whereas females were more involved with babysitting (n = 103), animal care (n = 90), and harvesting and planting crops (n = 52). In family businesses, males were more likely to be involved with lawn mowing (n = 117), babysitting (n = 84), and painting (n = 62), whereas females were more likely to be involved with babysitting (n = 136), cleaning tables, floors, and rooms (n = 64), and dishwashing (n = 49).

Many students reported that they worked jobs in a category defined as ''other''. Jobs that were frequently mentioned by students included working at auto repair places, golf courses, cleaning companies, movie theatres, fairs/carnivals or concession stands, landscaping, and umpiring/refereeing.

Injuries

Table 3 shows injury characteristics. Of the 3189 students who worked during the summer, 18% reported that they were injured on the job. When injuries were analysed by the industries where they occurred, 37% of students who worked on family farms were injured, 24% of students with jobs in newspapers were injured, 21% of students who worked in family businesses were injured, 20% of students who were self-employed were injured, and 14% of students who worked for an individual doing services in the home were injured.

More males were injured than females (22% *v* 15%, $p < 0.001$). The injuries that occurred most frequently among both males and females were cuts, bruises, and sprained muscles. Males were injured frequently in the hands (26%) and arms (20%); whereas females were frequently injured in the hands (37%) and legs (20%). The major causes of injury for both sexes included slips, trips, and falls from flat surfaces, knives or sharp objects, and falling objects.

Of the 575 students who were injured, 149 (26%) reported that the injury affected their activities at home, work, or school for longer than three days. Overall, more males reported being affected by their injury than did females (29% *v* 21%, $p < 0.0001$).

Besides being injured more often, males were also more likely to have a ''near-miss'' incident at work and to be asked to do something they felt was dangerous. Fifteen per cent of the male students reported being almost injured at work compared with 7% of females ($p < 0.0001$). Thirteen per cent of males reported being asked to do something they felt was dangerous compared with only 5% of females ($p < 0.0001$).

Overall, 41% of the middle school students who worked reported that they received safety training before starting their jobs, 22% received a safety manual, and 50% were informed of their legal rights. However, females were more likely to report receiving training (46% *v* 35%, $p < 0.0001$), receiving a safety manual (30% *v* 19%, $p < 0.0001$), and being informed of their legal rights as employees (55% *v* 45%, $p < 0.0001$) than were their male counterparts.

Table 1 Characteristics of middle school working youth (n = 3189)*

Characteristic†	Males† (n = 1533) (%)	Females† (n = 1635) (%)	Total† (n = 3189) (%)
Race			
White	863 (56)	929 (57)	1801 (56)
Black	171 (11)	225 (14)	400 (13)
Hispanic	129 (8.4)	132 (8.0)	263 (8)
Other	343 (22)	324 (20)	669 (21)
Type of school district			
Rural	173 (11)	171 (10)	345 (11)
Small town	203 (13)	158 (10)	363 (11)
Medium city	1040 (68)	1188 (73)	2243 (70)
Large city	117 (7.6)	118 (7.2)	238 (7.5)
Age			
10 years old	38 (2.5)	29 (1.8)	67 (2)
11 years old	286 (19)	302 (18)	594 (19)
12 years old	454 (30)	522 (32)	978 (31)
13 years old	478 (31)	572 (35)	1058 (33)
14 years old	209 (14)	146 (8.9)	357 (11)
Hours per week worked			
Less than 5 hours	504 (33)	543 (33)	1054 (33)
6–10 hours	430 (28)	497 (31)	933 (29)
11–16 hours	132 (8.6)	192 (12)	325 (10)
17–22 hours	102 (6.7)	94 (5.7)	197 (6)
>23 hours	231 (15)	213 (14)	446 (14)
How late worked			
Earlier than 7 pm	723 (47)	641 (39)	1368 (43)
Between 7–11 pm	398 (26)	601 (37)	1007 (32)
Later than 11 pm	83 (5.4)	124 (7.6)	207 (6)
Days per week worked before 8 am			
Never	492 (32)	553 (34)	1053 (33)
One day	192 (13)	246 (15)	441 (14)
2–3 days	288 (19)	339 (21)	627 (20)
3 days or more	325 (21)	297 (18)	626 (20)
Worked same job during school			
Yes	839 (55)	1056 (65)	1906 (60)
No	620 (40)	515 (31)	1144 (36)
Number of different jobs held			
1 job	676 (44)	762 (47)	1451 (46)
2 jobs	385 (25)	474 (29)	863 (27)
3 jobs	172 (11)	165 (10)	338 (11)
4 jobs	51 (3.3)	51 (3.1)	103 (3)
More than 4 jobs	167 (11)	105 (6.4)	273 (8.5)

*Gender was missing for 21 students.
†Percentages may not add to 100% because of missing responses.

Table 2 Jobs reported by middle school youth, Wisconsin, 2001*

Job category	Males	Females	Total
Employed by an individual for services at his/her home (e.g. babysitting, lawn care)	568	1007	1575
Other	288	296	584
Self-employed	253	256	509
Family business	256	181	437
Family farm	177	137	314
Newspaper	188	82	270
Restaurant/fast food	87	76	163
Farm (not family's farm)	76	74	150
Construction	116	15	131
Tree trimming/tree farming	86	26	112
Grocery store	54	38	92
Gift/variety/hobby shops	28	40	68
Hospital/nursing home/clinic	19	34	53
Hotel/motel/resort	17	31	48
Gas station	25	19	44
Department store	18	20	38
Lumber yard	31	7	38
Hardware store	18	7	25
Manufacturing	10	9	19
Lumber mill	11	1	12

*Students could choose multiple job categories.

Factors associated with injury

Table 4 shows the results of the bivariate and multivariate analysis. The factors most strongly associated with a child having an injury were: having a "near-miss" incident (AOR 6.61, 95% CI 4.92 to 8.89), having a co-worker injured (AOR 2.65, 95% CI 1.95 to 3.60), and being asked to do something dangerous (AOR 2.25, 95% CI 1.61 to 3.14). Other positively associated variables included being non-white, and living in a large city.

Middle school students who responded that they received safety training before starting their job and those who stated they were informed of their legal rights were not less likely to be injured than their peers.

DISCUSSION

There is a common misperception that middle school children, aged 10–14 years, are not working in the United States. However, the results of our study show that over half of middle school students surveyed were working during the summer, and the majority of the students worked the same job during the school year.

Many of these students and their parents may not know what the child labour laws are, what tasks they can legally do, when they need to get a work permit, and what to do if they become injured on the job. As Barrett states in a recent article on working teens, "many youth are working in unsafe conditions, and without proper training or supervision, and their parents aren't even aware of it".[5]

Table 3 Injury characteristics of middle school students (n = 3189)

Characteristic	Total (n = 3189) (%)	Males (n = 1533) (%)	Females (n = 1635) (%)	p value
Injured at work	575 (18)	336 (22)	239 (15)	<0.0001
"Near-miss" incident at work	343 (11)	232 (15)	110 (6.7)	<0.0001
Co-worker injured at work	312 (10)	196 (13)	115 (7.0)	<0.0001
Been asked to do something you felt was dangerous at work	290 (10)	200 (13)	89 (5.4)	<0.0001
Been given safety training	1311 (41)	543 (35)	760 (46)	<0.0001
Been given a safety manual	789 (25)	290 (19)	494 (30)	<0.0001
Informed of legal rights	1593 (50)	683 (45)	900 (55)	<0.0001
	Total (n = 575) (%)	**Males (n = 336) (%)**	**Females (n = 239) (%)**	**p value**
Injury affect your normal activities for 3 or more days	149 (26)	98 (29)	51 (21)	<0.0001
File workers' compensation	64 (11)	42 (13)	22 (9.2)	0.1858

Table 4 Factors associated with injury in children aged 10–14 years

Factor	Crude OR	95% CI	Adjusted OR	95% CI
Gender				
Female	0.57*	0.48 to 0.69	0.81	0.65 to 1.02
Male	Referent		Referent	
Race				
Others	1.79*	1.49 to 2.16	1.67*	1.33 to 2.11
White	Referent		Referent	
Age	1.02 (per year)	1.00 to 1.04	N/A	
School location				
Large city	2.02*	1.48 to 2.77	1.82*	1.23 to 2.70
Small town	1.18	0.89 to 1.56	1.06	0.75 to 1.49
Rural	1.01	0.75 to 1.36	0.93	0.64 to 1.34
Medium city	Referent		Referent	
Hours per week worked				
>23 hours	1.66*	1.27 to 2.16	0.96	0.67 to 1.35
17–22 hours	1.98*	1.40 to 2.80	1.46	0.95 to 2.24
11–16 hours	0.95	0.68 to 1.32	0.73	0.48 to 1.09
6–10 hours	0.94	0.74 to 1.19	0.86	0.65 to 1.14
Less than 5 hours	Referent		Referent	
How late worked				
Later than 11 pm	1.64*	1.18 to 2.29	1.40	0.93 to 2.11
Between 7–11 pm	1.20	0.98 to 1.46	1.04	0.81 to 1.32
Earlier than 7 pm	Referent		Referent	
Days per week worked before 8 am				
More than 3 days	1.79*	1.42 to 2.26	1.27	0.94 to 1.72
2–3 days	1.20	0.93 to 1.53	1.08	0.80 to 1.46
One day	1.04	0.78 to 1.39	1.25	0.90 to 1.76
Never	Referent		Referent	
Number of jobs worked				
More than 4	2.30*	1.70 to 3.10	1.27	0.86 to 1.87
4 jobs	1.81*	1.13 to 2.91	1.52	0.85 to 2.70
3 jobs	1.73*	1.30 to 2.32	1.29	0.91 to 1.84
2 jobs	1.19	0.95 to 1.49	1.02	0.78 to 1.34
1 job	Referent		Referent	
Received safety training				
Yes	1.41*	1.17 to 1.70	1.26	1.00 to 1.59
No	Referent		Referent	
Given a safety manual				
Yes	1.1	0.90 to 1.36	N/A	
No	Referent			
Informed of legal rights				
Yes	1.22*	1.01 to 1.47	1.01	0.80 to 1.28
No	Referent			
Asked to do something dangerous				
Yes	6.11*	4.70 to 7.90	2.25*	1.61 to 3.14
No	Referent		Referent	
Co-worker injured				
Yes	5.46*	4.26 to 6.99	2.65*	1.95 to 3.60
No	Referent		Referent	
Had a "near-miss" incident				
Yes	10.6*	8.23 to 13.5	6.61*	4.92 to 8.89
No	Referent		Referent	

*Significant at $p<0.05$.
N/A, not used in multivariate model, since not significant in bivariate analysis.

In our study, males were more likely to be injured than females and were more likely to report that their injury affected their activities for three or more days. Males may be injured more frequently and more severely, because the tasks they do at work are potentially more hazardous. For example, in most job categories, males predominately reported doing lawn care or lawn mowing as their major task. Females, however, were more likely to report babysitting as their major task.

Factors from the multivariate analysis that were associated with injury, such as having a near-miss incident, being asked to do something dangerous, and having a co-worker injured may be ''warning signs'' that suggest needed changes in working conditions or working behaviours.

The findings from this study should be interpreted with caution. While we chose schools representative of the five public health regions of Wisconsin, some schools or classes may not have participated in the study. Because the study was completely anonymous, we were not able to determine what classes and/or schools did not participate in the survey.

State and federal child labour laws may not adequately reflect today's workplaces, work hazards, and job tasks. While children under age 14 are prohibited from being employed in non-agricultural occupations covered by the Fair Labor Standards Act (FLSA), jobs such as informal employment, newspaper delivery, and work on family farms or in family businesses are exempt from child labour laws. The prevalence of reported injuries in these occupations was high. Thirty seven per cent of the children working on family farms reported being injured, 24% working in newspaper delivery reported being injured, and 21% of the children working in family businesses reported being injured. Since high rates of injury are occurring in occupations not currently covered by child labour laws, review of the existing federal laws is warranted.

While high school students get very little occupational safety and health training before they start working, middle school students are provided with even less information. Less than half of the students in our survey reported receiving any type of safety training. Even when the students did receive training, they were no less likely to be injured than were their working peers. Further investigation of ways in which to make safety training more effective in this age group is needed. Perhaps methods such as developing age appropriate and developmental level appropriate safety materials is one way to improve safety knowledge. Another method may be to incorporate general safety education and training into a school curriculum.

ACKNOWLEDGEMENTS

NIOSH Grant U01-OH07298, Youth Employment Training Pilot Program, Terry Moen, JD, Wisconsin Division of Public Health.

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