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Severe Back Pain Among Farmworker High School Students From Starr County, Texas: Baseline Results

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PURPOSE: This cohort study is among the first to estimate the prevalence of and examine potential risk factors for severe back pain (resulting in medical care, 4+ hours of time lost, or pain lasting 1+ weeks) among adolescent farmworkers. These youth often perform tasks requiring bent/stooped postures and heavy lifting.

METHODS: Of 2536 students who participated (response rate across the three public high schools, 61.2% to 83.9%), 410 students were farmworkers (largely Hispanic and migrant). Students completed a self-administered Web-based survey including farm work/nonfarm work and back-pain items relating to a 9-month period.

RESULTS: The prevalence of severe back pain was 15.7% among farmworkers and 12.4% among nonworkers. The prevalence increased to 19.1% among farm workers (n = 131) who also did nonfarm work. A multiple logistic regression for farmworkers showed that significantly increased adjusted odds ratios for severe back pain were female sex (4.59); prior accident/back injury (9.04); feeling tense, stressed, or anxious sometimes/often (4.11); lifting/carrying heavy objects not at work (2.98); current tobacco use (2.79); 6+ years involved in migrant farm work (5.02); working with/around knives (3.87); and working on corn crops (3.40).

CONCLUSIONS: Areas for further research include ergonomic exposure assessments and examining the effects of doing farm work and nonfarm work simultaneously.

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KEY WORDS: Back Pain, Migrants, Adolescents, Agricultural Workers.

INTRODUCTION

Back pain is a global public health issue, with a lifetime prevalence of 84% (1). Extreme discomfort, costly medical treatments, and time lost from work are common sequelae. Individual factors are associated with back pain, but a growing literature supports that occupational exposures contribute to its occurrence (2). For example, Punnett et al. (3) attributed 37% of low-back pain worldwide to occupation. Annually in the United States, the back is involved in about one quarter of nonfatal occupational injuries and illnesses and half the musculoskeletal cases with lost work time (4, 5). Finally, low-back pain alone accounts for 33% of costs from workers' compensation claims (6). This health outcome also affects adolescent workers (7). Data from worker's compensation claims showed overrepresentation of the back among occupationally injured adolescents (8, 9). Two large population-based studies supported an association between back pain and work in youth (10, 11). However, the role of work in the development of back pain is not entirely understood. As such, the National Institute for Occupational Safety and Health listed low-back disorders among the 21 priority research areas on the first decade of the National Occupational Research Agenda (12).

Agriculture consistently ranks among the most hazardous industries in the United States in terms of fatal and nonfatal occupational injuries (13, 14). Largely foreign-born (78%) and unauthorized (53%) (15), 1 to 4 million farmworkers are employed in this industry (16). Despite their contribution to the agricultural economy, farmworkers are impoverished, with an estimated median annual family income less than $14,500, and underinsured, with only 23% having some type of employer-provided health insurance (15). A substantial number of farmworkers are children. Based on

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Selected Abbreviations and Acronyms

ISD = independent school district
OR = odds ratio
CI = confidence interval

data from the 2001 to 2002 National Agricultural Workers Survey, 4% of all authorized and 8% of all unauthorized hired farmworkers are 14 to 17 years of age (15). In 1996, there were approximately 290,000 farmworkers aged 15 to 17 years (17).

Farmworkers perform tasks that may be particularly harmful to the back (7, 18, 19). Such tasks as harvesting produce from the ground require sustained bent, stooped, and awkward postures; repeated bending and twisting; and heavy lifting (20–27). Specific mechanisms for back injury described by Kidd et al. (7) are "normal stress to abnormal tissue, abnormal stress to normal tissue, and normal stress to normal tissue that is already fatigued or does not have sufficient recovery time between episodes of exposure." Of interest, some farm chores place physical demands on adolescents that are similar to or greater than those of high-risk industrial jobs (28). However, very little published research examines back pain among farmworkers. Narrow in scope, the majority of literature often is limited by small sample size or focuses on males, adults, or farmers. Although the consequences of back strain during adolescence are unknown (29), these young workers may be more vulnerable to injury because the musculoskeletal system is not developed (7). Given that a history of back pain is one of the strongest predictors of future back problems (30, 31), these youth may be predisposing themselves to back problems in adulthood (29). Many of the research needs identified in 2002 during a National Institute for Occupational Safety and Health–sponsored conference that focused on prevention of musculoskeletal disorders for children and adolescents working in agriculture have not been addressed (19). Therefore, the present study describes the presence of severe back pain experienced by adolescent high school farmworker students from Starr County, TX, and identifies work-related factors associated with severe back pain.

METHODS

Study Population

Data for the present study are from the first year of a cohort study, A Study of Work Injuries in Farmworker Children (U50 OH07541), designed to estimate the frequency of and identify risk factors for acute nonfatal work-related injuries among adolescent farmworkers from Starr County, TX (approved by the Texas A & M University Institutional Review Board). Located along the Texas–Mexico border, Starr County (population, 53,597 in 2000) (32) includes three independent school districts (ISDs), each with one public high school. In 2003, Rio Grande City Consolidated ISD was the largest district, enrolling 59.5% of the county's students, followed by Roma ISD (38.9%) and San Isidro ISD (1.6%) (33). The majority of students in the county are Hispanic (99.6%) and economically disadvantaged (86.0%) (33).

Sampling and Recruitment

The sampling frame included all public high school students enrolled in an English class (n = 3,584) during the initial months of the 2003 to 2004 school year. More than 92% of the student body is enrolled in an English course each semester. To avoid labeling or excluding students, we allowed all with parental consent or older than 18 years and in attendance during the survey period to participate. However, analyses and response rates are based on the sampling frame. Multiple waves of parental consent forms, sent home with all students, were used for recruitment. Students received a school spirit towel for returning a parental consent form (irrespective of consent or refusal) and a school shirt for their participation.

Data Collection

The data collection instrument was an Internet-based, self-administered, and confidential survey. Items were adapted from an instrument translated from English into Spanish and back translated that was developed for prior study of migrant farmworkers (34). The majority of items, including those measuring work exposure and severe back pain, referred to a 9-month period between January 1, 2003, and September 30, 2003, to capture the typical migration period of farmworkers from Starr County. The follow-up survey was pilot tested by native speakers, interviewers, and high school students from the Texas–Mexico border. Baseline data collection occurred between September 2003 and January 2004 during the first year of the original cohort study. Students were surveyed during English in a classroom with 20 to 30 computer workstations and at least one bilingual staff member. The survey required less than 45 minutes. All students (e.g., farmworkers and nonfarmworkers) were presented the demographic, nonwork, and back-pain sections. Absent students and students without English were surveyed during other classes (e.g., art and physical education). After giving their assent electronically, students chose to take the survey in Spanish or English.

The response rate in Roma was 83.9% (n = 1247), followed by 67.6% (n = 46) in San Isidro and 61.2% (n = 1,243) in Rio Grande City (70.8% overall). Strong administrative support appeared to facilitate teacher, parental, and student cooperation. There was no significant difference

between participants and nonparticipants with respect to grade level, the only other available variable for comparison.

Independent and Dependent Variables

Independent variables of primary interest were those describing aspects of farm work (e.g., crop, task, work intensity, location, employer type, farm hazards, and number of years involved in migrant and nonmigrant farm work). Farm work is defined as any work that involved an aspect of food production in the United States (e.g., field work, packing sheds, and butchering) for pay or not for pay. Migrant farm work is defined as work that required spending the night away from their home in Starr County. Although used in our prior study (34), these definitions differ from other research. For example, the National Agricultural Workers Survey includes nearly all workers involved in crop agriculture and the production of silage and other animal fodder, but does not include poultry, livestock, or fishery workers. In addition, migrants are defined as persons who travel at least 75 miles during a 12-month period to obtain a farm job (16). In our study, nonfarm work is defined as nonfarm work done for pay (35).

Variables describing demographics, nonwork activities, physical health, overweight as defined by body mass index for age (36), mental health (e.g., feeling tense, stressed, and anxious), sleep, smoking, alcohol use, grades, and study habits were assessed as potential confounders and independent main effects.

A standardized instrument measuring back pain among adolescent workers is lacking. Six back-pain items were developed based on the Nordic Musculoskeletal Questionnaire, among others (37). Severe back pain is defined as experiencing pain, aching, stiffness, burning, numbness, or tingling in the back that met at least one of three criteria, including lasted every day for 1+ weeks, resulted in loss of 4+ hours of time from regular activities (e.g., work, school, or time with friends), or resulted in medical treatment (35). Because back pain frequently is labeled nonspecific (38) and different people may describe back problems by using various terms (37–40), our definition of pain included many descriptors. We were not able to exclude menstrual pain from the definition. The body diagram from the Nordic Musculoskeletal Questionnaire (37) was provided to help identify the back area. Although surveys were self-administered, Staes et al. (41) found that face-to-face and self-administered interviews conducted with Flemish youth yielded similar data for severity, location of problems, and medical consultation for back pain.

Statistical Analyses

Data were analyzed by using Intercooled Stata, version 9.0 (Stata Corp., College Station, TX) (42). The prevalence of back pain was stratified by work and migrant status. Unadjusted odds ratios (ORs) and 95% confidence intervals (CIs) for each independent variable and the presence versus absence of severe back pain were computed by using logistic regression. Variables significant at the $p < 0.25$ level in univariate models were entered one at a time into a multiple logistic regression by using forward selection. Variables significant at the $p < 0.05$ level or those inducing a 15% or greater change in OR for another significant variable in the model were allowed to remain (43). Then previously eliminated variables, including variables not significant at the $p < 0.25$ level in univariate models, were entered one at a time to ensure that all important variables had a chance to appear in the final model. Next, all first-order interaction terms were tested one at a time. The final model included significant main effects (at the $p < 0.05$ level), confounders (those inducing a 15% change in OR of another variable), and effect modifiers (interaction terms significant at the $p < 0.05$ level).

RESULTS

Descriptive Statistics

Of the total sample (n = 2536), the majority were females (52.9%). About 29.8%, 25.7%, 22.2%, and 22.4% were in the 9th, 10th, 11th, and 12th grades, respectively. About 19.6% were 14 years or younger, 25.1% were aged 15 years, 24.9% were aged 16 years, 20.9% were aged 17 years, and 9.6% were 18 years or older. A total of 410 students participated in farm work between January 1, 2003, and September 30, 2003. Based on standard parameters ($\alpha = 0.05$; $\beta = 0.20$, two-sided test) and the fixed sample size (n = 410), there was sufficient power to detect relative risk ratios from 2.02 to 3.10 given a range of exposure (10% to 30%) and back-pain prevalence (15% to 25%) (44). Because of unexpected problems with server computers, records for 197 students (7.8%) overall and 65 of 410 farmworkers (15.9%) lacked back-pain data. Demographics for farmworkers with and without data were compared by using Pearson chi-square statistics to assess potential bias. The only variable that differed significantly was sex. Compared with farmworkers with data, a significantly smaller proportion of farmworkers without data were female (23.4%; 1 *df*; chi-square = 9.46; $p = 0.002$). Although explored, the reason for this difference remains unclear. Of 345 farmworkers with data, the majority were male (56.0%), right handed (94.2%), born in the United States (73.5%), and a member of a migrant farmworker family (82.9%). About 26.5% were in 9th grade, 26.2% were in 10th grade, 23.2% were in 11th grade, and 24.1% were in 12th grade. About 16.4% were 14 years or younger, 26.8% were aged 15 years, 22.3% were aged 16 years, 24.1% were aged 17 years, and 10.4% were

TABLE 1. Frequency of demographic and nonwork variables and unadjusted odds ratios for severe back pain

Variable	n (%)	Odds ratio	95% Confidence interval	*p*
Demographics				
Sex				
Male	188 (56.0)	1.00		
Female	148 (44.1)	2.08	1.15–3.76	0.015
School grade				
9	89 (26.5)	1.00		
10	88 (26.2)	1.58	0.69–3.62	0.284
11	78 (23.2)	1.69	0.72–3.93	0.225
12	81 (24.1)	1.23	0.51–2.97	0.641
Age (years)				
≤14	55 (16.4)	1.00		
15	90 (26.8)	1.27	0.50–3.20	0.612
16	75 (22.3)	1.12	0.42–2.96	0.820
17	81 (24.1)	1.23	0.48–3.16	0.671
≥18	35 (10.4)	0.76	0.21–2.73	0.672
Country of birth				
United States	247 (73.5)	1.00		
Mexico/other	89 (26.5)	0.67	0.33–1.36	0.268
Language most comfortable speaking				
Spanish/both equally	268 (80.2)	1.00		
English	66 (19.8)	1.73	0.89–3.37	0.109
Years involved in migrant farmwork				
<1	80 (23.2)	1.00		
1–2	94 (27.3)	0.92	0.38–2.21	0.849
3–5	83 (24.1)	1.16	0.49–2.78	0.731
≥6	88 (25.5)	1.61	0.71–3.66	0.253
Health characteristics and tobacco use				
Overweight				
No	241 (76.5)	1.00		
Yes	74 (23.5)	1.37	0.69–2.72	0.363
Diagnosis of scoliosis/spinal disorder				
No	317 (92.2)	1.00		
Yes	27 (7.9)	5.24	2.29–11.96	0.000
History of prior back injury				
No	299 (86.9)	1.00		
Yes	45 (13.1)	7.05	3.54–14.04	0.000
Feeling tense, stressed, anxious				
Never/not often	191 (56.2)	1.00		
Often/sometimes	149 (43.8)	3.26	1.75–6.08	0.000
Frequency of headaches/stomachaches				
Never/not often	159 (46.8)	1.00		
Often/sometimes	181 (53.2)	2.84	1.48–5.47	0.002
Frequency of colds or minor illnesses				
Never/not often	209 (61.5)	1.00		
Often/sometimes	131 (38.5)	2.89	1.59–5.28	0.001
Physical fitness (compared with peers)				
Same/better	314 (92.6)	1.00		
Worse	25 (7.4)	1.79	0.68–4.73	0.237
Current use of tobacco				
No	242 (70.8)	1.00		
Yes	100 (29.2)	2.19	1.20–4.02	0.011
Nonwork physical activities Lifting/carrying heavy items not at work				
No	174 (51.0)	1.00		
Yes	167 (49.0)	2.63	1.41–4.88	0.002
Participated in 4-H/Future Farmers of America activities				
No	256 (74.9)	1.00		
Yes	86 (25.2)	2.05	1.10–3.81	0.023
Playing sports (hours/week)				
0–5	272 (79.3)	1.00		
≥6	71 (20.7)	1.79	0.93–3.44	0.081

N = 345. Numbers may not sum to 345 because of missing values.

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TABLE 2. Frequency of work tasks and hazards with significantly elevated unadjusted odds ratios for severe back pain

Variable	n (%)	Odds ratio	95% Confidence interval	*p*
Crop/commodity				
Animals				
No	306 (88.7)	1.00		
Yes	39 (11.3)	2.40	1.11–5.18	0.025
Beans				
No	316 (91.6)	1.00		
Yes	29 (8.4)	3.25	1.42–7.46	0.005
Corn				
No	275 (79.7)	1.00		
Yes	70 (20.3)	2.06	1.08–3.94	0.028
Grapes				
No	326 (94.5)	1.00		
Yes	19 (5.5)	3.46	1.30–9.25	0.013
Melon (all types)				
No	291 (84.4)	1.00		
Yes	54 (15.7)	2.19	1.10–4.40	0.026
Potatoes				
No	323 (93.6)	1.00		
Yes	22 (6.4)	2.74	1.06–7.08	0.037
Tomatoes				
No	330 (95.7)	1.00		
Yes	15 (4.4)	5.27	1.82–15.21	0.002
Wheat				
No	325 (94.2)	1.00		
Yes	20 (5.8)	4.04	1.57–10.43	0.004
Work tasks				
Cleaning vegetables or fruits				
No	296 (85.8)	1.00		
Yes	49 (14.2)	2.56	1.27–5.17	0.009
Weeding				
No	318 (92.2)	1.00		
Yes	27 (7.8)	3.03	1.28–7.17	0.011
Work hazards				
Bend or stoop over again and again				
No	204 (61.8)	1.00		
Yes	126 (38.2)	2.24	1.24–4.06	0.008
Lift bucket/objects again and again				
No	231 (70.0)	1.00		
Yes	99 (30.0)	2.45	1.34–4.70	0.004
Push, pull or lift heavy loads above your shoulder				
No	239 (72.4)	1.00		
Yes	91 (27.6)	2.14	1.16–3.94	0.015
Worked harder and faster than you like				
No	224 (67.9)	1.00		
Yes	106 (32.1)	2.37	1.30–4.31	0.005
Worked without taking rest breaks				
No	286 (86.7)	1.00		
Yes	44 (13.3)	4.96	2.47–9.97	0.000
Worked without drinking water for long periods				
No	292 (88.9)	1.00		
Yes	37 (11.3)	4.70	2.24–9.86	0.000
Worked with or around knives				
No	245 (75.4)	1.00		
Yes	80 (24.6)	2.30	1.22–4.32	0.010
Worked with or around tall plants				
No	256 (74.9)	1.00		
Yes	86 (25.2)	2.05	1.10–3.81	0.023
Used insect repellent while working				
No	241 (73.3)	1.00		
Yes	88 (26.8)	2.74	1.49–5.04	0.001

N = 345. Numbers may not sum to 345 because of missing values.

18 years or older. Additional frequencies are listed in Tables 1 to 2. A substantial proportion engaged in migrant farm work for 6+ years (25.5%). On average, farmworkers labored 5.1 days per week and 8.3 hours per day and had 1.92 farm employers (range, one to six employers). Farm jobs were in 29 states. A large proportion (46.1%) worked only within Texas. Additional frequencies are listed in Tables 1 to 3.

Prevalence of Severe Back Pain

Prevalences of severe back pain between January 1, 2003, and September 31, 2003, for the entire sample of students with back pain data (2339) and only farmworkers (n = 345) were 13.3% and 15.7%, respectively (Table 3). The prevalence of severe back pain was lowest among nonworkers (12.4%) and highest among farmworkers who also held nonfarm jobs (19.1%). The prevalence was higher among migrant farmworkers (16.4%) compared with nonmigrant farmworkers (12.3%). Of 54 farmworkers reporting severe back pain, 32 (59.7%) had pain every day for 1+ weeks; 25 (46.3%) lost 4+ hours from their work, school, or social activities; 24 (44.4%) sought medical care, and 18 (33.3%) described their average degree of pain as mild; 21 (39.9%), as medium; 7 (13.0%), as severe; and 3 (5.6%), as the worst pain ever in life. Twelve (22.2%) had a prior diagnosis by a medical professional of a spinal disorder (e.g., scoliosis), 21 (39.9%) had a history of back injury, and 7 (13.0%) reported that their most severe acute nonfarmwork- or farmwork-related injury between January 1, 2003, and September 31, 2003, involved their back.

Unadjusted Logistic Regression Analyses

Of variables listed in Table 1, significantly increased unadjusted ORs were found for female sex (2.08); scoliosis/spinal disorder diagnosis (5.24); history of prior back injury (7.05); tense, stressed, or anxious feelings experienced sometimes/often (3.26); headaches/stomachaches experienced sometimes/often (2.84); colds/minor illnesses experienced sometimes/often (2.89); current use of tobacco (e.g., cigarettes, cigars, or chew) (2.19); lifting/carrying heavy items not at work (2.63); and participating in 4-H or Future Farmers of America (2.05).

Farm work variables with significantly increased ORs for severe back pain were found for working animals (2.40); a variety of crops (2.06 to 5.27); cleaning vegetables or fruits (2.56); weeding (3.03); bending or stooping over again and again (2.24); lifting buckets/objects again and again (2.45); pushing, pulling, or lifting heavy loads above your shoulder (2.14); working harder and faster than you like (2.37); working without taking rest breaks (4.96); working without drinking water for long periods (4.70); working with or around knives (2.30); working with or around tall plants as high as your face or higher (2.05); and using insect repellent while working (2.74; Table 2).

TABLE 3. Prevalence of severe back pain stratified by work status among high school students from Starr County, TX, in 2003

Work status	n	% (95% Confidence interval)
All students	2339	13.3 (11.9–14.7)
Nonworkers	1547	12.4 (10.7–14.0)
Nonfarmworkers only	447	14.8 (11.5–18.1)
Farmworkers only	214	13.6 (8.9–18.2)
Farm and nonfarm only	131	19.1 (12.3–25.9)
All farmworkers	345	15.7 (11.8–19.5)
Migrant farmworkers	280	16.4 (12.1–20.8)
Nonmigrant farmworkers only	65	12.3 (4.1–20.5)

For the period between January 1 and September 30, 2003.

Adjusted Logistic Regression Analyses

Based on farmworkers with complete data (n = 306), the final multiple logistic regression included eight variables significant at the $p = 0.05$ level (Table 4). For comparison, unadjusted ORs were recomputed based on the 306 farmworkers with complete data. Nonwork variables were female sex (4.59); history of back injury (9.04); feeling tense, stressed, or anxious sometimes/often (4.11); current tobacco use (2.79); and lifting/carrying heavy objects not at work (2.98). Work variables were participating in migrant farm work for 6+ years (5.02), working with or around knives (3.87), and working on corn crops (3.40). When forced into the model, age did not make a significant contribution or markedly affect point estimates of other variables and was dropped from the model. An interaction of prior back injury and heavy lifting was significant ($p < 0.018$), but the 95% CI was very wide (0.02–0.68). Inclusion of this term also dramatically increased the OR and CI for a history of back injury (OR, 39.8; 95% CI, 8.37–189.4), indicating a numeric problem (e.g., zero cells) (45). As such, the more parsimonious model with only main effects is presented. The Hosmer-Lemeshow goodness-of-fit test statistic (45) provided no evidence that the model did not fit the data (8 *df*; chi-square = 9.49; $p = 0.303$).

It was suggested that a minimum of 10 outcome cases is required for each independent variable in the model to avoid biasing regression coefficients (46). This would limit the number of independent variables in the final model to five. All eight independent variables were allowed to remain in the final model because unadjusted and adjusted ORs and CIs did not differ substantially.

DISCUSSION

Overall, the prevalence of severe back pain in our study was similar to estimates from adolescent studies in Denmark and Canada that included workers (10, 11). In addition, 25.0%

TABLE 4. Final multiple logistic regression model examining severe back pain

	Frequency	Unadjusted models			Adjusted model		
Variable	(%)	Odds ratio	95% Confidence interval	*p*	Odds ratio	95% Confidence interval	*p*
Sex							
Male	55.6	1.00			1.00		
Female	49.4	1.94	1.04–3.63	0.037	4.59	1.80–11.67	0.001
History of back injury							
No	87.6	1.00			1.00		
Yes	12.4	6.19	2.95–12.98	0.000	9.04	3.55–23.01	0.000
Feeling tense, stressed, anxious							
Not often/never	56.2	1.00			1.00		
Sometimes/often	43.8	3.84	1.96–7.51	0.000	4.11	1.78–9.51	0.001
Current tobacco user							
No	71.9	1.00			1.00		
Yes	28.1	2.31	1.22–4.36	0.010	2.79	1.23–6.31	0.014
Lifting/carrying heavy objects not at work							
No	51.0	1.00			1.00		
Yes	49.0	2.65	1.37–5.12	0.004	2.98	1.33–6.72	0.008
Years involved in migrant farmwork							
<1	22.9	1.00			1.00		
1–2	27.8	0.90	0.35–2.36	0.837	0.77	0.23–2.56	0.668
3–5	24.8	1.27	0.50–3.23	0.615	2.30	0.73–7.29	0.156
≥6	24.5	1.99	0.82–4.81	0.128	5.02	1.55–16.27	0.007
Working with/around knives							
No	75.2	1.00			1.00		
Yes	24.8	2.31	1.21–4.42	0.011	3.87	1.56–9.62	0.004
Working corn							
No	79.4	1.00			1.00		
Yes	20.6	1.99	1.00–3.95	0.050	3.40	1.43–8.09	0.006

N = 306. Records with missing values = 39.

of 15- to 18-year-olds (n = 33) employed in fresh-market vegetable production in Wisconsin reported disabling low-back discomfort in the prior year (47). Among adult participants in the California Agricultural Worker Health Survey, the prevalence of back pain lasting 1+ weeks during the prior year was 20% to 25% (48). Using the same definition in our study, the prevalence is lower (9.3%), possibly because of age and cumulative risk differences.

Based on the multiple logistic regression, the strongest nonwork variable is a history of back injury (9.04). By compromising the stability of the back, prior injury could predispose adolescents to subsequent or more severe back problems (7). Although prior injury often is associated with future back problems in adults, measures of association typically are of a lesser magnitude (49, 50). An increased OR among females also was reported in other adolescent studies (10, 51, 52) and in working youth (10). This finding could be the result of increased body awareness among females and increased reporting of body pain (53) or differences in stature or strength. Height, weight, overweight, and self-assessed physical fitness compared with peers were examined, but none was significant. Other adolescent studies did not show a sex difference (54, 55). Numerous studies supported an association between psychosocial factors and back pain (26, 51, 56–59). In the present study, feeling tense, stressed, or anxious sometimes/often increased the risk. Among students aged 11 to 14 years in England, mechanical factors were not associated with low-back pain. However, conduct/emotional problems and having a part-time job were significant (51). Although not specific to the back, a study of 354 adolescent workers in Brazil showed that high psychological job demands increased the risk for body pain (OR, 3.3; 95% CI, 1.6–6.7) (60). In the current study, the OR for current use of tobacco and severe back pain was increased. Data describing the relationship with tobacco use among adults and adolescents yielded mixed results (57, 59, 61–64). Despite several hypotheses based on human and animal research, a mechanism of action is unknown (65–68). The observed relationship could arise if tobacco use is a risk indictor for an unidentified, but causal, risk factor (e.g., tobacco use correlates with more hazardous work) (68).

Adjusting for these nonwork variables, the strongest work variable was engaging in 6+ years of migrant farmwork, a possible surrogate for cumulative work exposures. The variable also could be correlated with age, a reported risk factor for back pain (54). To ensure that age was not an important variable, it was forced into the final model.

Age was not significant or collinear with years involved in migrant farm work. Reasons for the increased ORs observed for working with or around knives and working corn crops are unclear. They could be surrogates for a combination of sustained awkward postures, repetitive motions, or unmeasured hazards. Each of these postures and motions alone was not significant, possibly because of insufficient power. Various combinations of crops and tasks were examined with respect to ergonomic hazards, but none was statistically significant or otherwise meaningful.

This study is among the first to identify factors associated with severe back pain among adolescent farmworkers with many migrants. Because of their mobility, migrant farmworkers can be a difficult, albeit feasible, population to locate and follow up (69). Additional strengths of this study are many, including a large sample of farmworkers (n = 345) and the ability to compare the prevalence with two comparison groups, nonfarmworkers and nonworkers. Supporting the validity of students' responses, work patterns were the same as those reported by mothers in a prior cohort study of acute work-related injuries among migrant farmworker families from Starr County (34).

Reports from community contacts and public school administrators indicated that very few students attend private or alternative schools in Starr County; however, sampling through public schools excluded dropouts. Based on national data from 2000 to 2001, a total of 8.8% of Hispanic youth 15 to 24 years of age dropped out of grades 10 through 12 (70). The percentage may be even greater among youth working long hours. Sampling bias of this type could lead to underestimating the prevalence if dropouts are more likely to experience severe back pain. The lower response rate in Rio Grande City High School also could impact on generalizability. However, the prevalence of severe back pain (15.2%) was similar to that in Roma High School (15.8%). The loss of data for 65 of the farmworkers could have introduced bias. Because females reported a greater prevalence of severe back pain, the significant difference in sex for those with and without data may result in an overestimated prevalence and OR. This study likely lacked power to identify important work exposures that had a low prevalence or correlated with a similar crop or task. Survey items did not differentiate between upper- and lower-back pain, which may have separate causes. Outcome and exposure data referred to the same period (January 1, 2003, to September 31, 2003), but the temporal relation between independent and dependent variables could not be established. Data were self-reported, which may be viewed as a limitation. Nevertheless, self-report may be the best available measure of back pain.

Areas for further research include ergonomic and more precise exposure assessments and examining the association between working a farm along with a nonfarm job, total work hours, and severe back pain. A study of adult farmers yielded a similar recommendation (71). Although Munshi et al. (72) focused on acute occupational injury, their results suggested that youth simultaneously employed in farm and nonfarm jobs experienced a higher proportion of injuries, but lower annual rate. They also identified the need for examining total work hours. Regarding nonwork factors, research is needed to establish temporality of psychosocial factors and tobacco use and determine whether tobacco use is a surrogate for an unmeasured exposure. Overall, results add to the limited body of evidence documenting work hazards in farmworker youth and support policy that increases awareness of the need to protect young agricultural workers. For example the recent Children's Act for Responsible Employment (CARE Bill, HR 3482) would give youth working in agriculture the same protections (e.g., minimum age requirements and limitations on work hours and job tasks) as youth working in other industries. Although not directly a result of this analysis, sustained bent or stooped postures are considered risk factors for back pain among adults. Therefore, such legislation as the recent ban on hand-pulling of weeds in California also may help reduce severe back pain among young workers in the fields (73).

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