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Work Organization and Occupational Health: Perspectives From Latinos Employed on Crop and Horse Breeding Farms

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Background *Agriculture is hazardous and increasingly dependent on Latino workers, a vulnerable population. However, little research has studied how work organization influences Latino farmworker health.*

Methods *Using a work organization framework, this cross-sectional study describes and compares the work organization and occupational health characteristics of a sample of Latino crop (n = 49) and horse production (n = 54) workers in Kentucky.*

Results *Crop workers experienced more physical demands, work-related and environmental stressors, and musculoskeletal and ill-health symptoms. Significantly more crop workers indicated work-related illness or missed work due to work-related illness/injury, though one-fourth of both groups reported work-related injury in the past year. A majority of both groups cited exposure to toxic chemicals, a minority of whom received training on their use.*

Conclusion *Further surveillance is needed to understand the rate and precursors of illness/injury in these populations, as is research on the relationship between supervisory practices, psychosocial stressors, and occupational health.* Am. J. Ind. Med. 55:714–728, 2012. © *2012 Wiley Periodicals, Inc.*

KEY WORDS: Latino farmworkers; organization of work; occupational illness and injury

INTRODUCTION

Latinos represent the largest minority population in the United States and are responsible for the highest percentage in U.S. population growth in the past decade [U.S. Census Bureau, 2011]. Hispanics are estimated to comprise 14% of the U.S. labor force [U.S. Census Bureau, 2009e] yet disproportionately occupy the most dangerous jobs and experience higher rates of occupational illness, injury, and fatality than non-Hispanics [Schenker, 2010]. Recent migration and immigration patterns reveal an expansion of Latino immigrants in rural areas with less exposure to non-native worker groups. Given the increased vulnerability of immigrant workers—who may be unfamiliar with the language or cultural norms at work and who may experience increased non-work related stressors [NORA AgFF Sector Council, 2008]—it is imperative that occupational safety and health researchers and professionals better understand the working conditions and health

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issues faced by this population [Arcury & Marín, 2009]. This exploratory project addresses a gap in the research by exploring the perceived job conditions and organizational practices experienced by Latino workers in the crop and horse production industries in Kentucky. As no known research has assessed the working conditions of Latino horse breeding workers, we prescribed a comparative, descriptive analysis between the two occupational groups to elicit basic and relative findings.

Latinos and Agriculture

Agriculture is among the most dangerous industries for occupational injury and illness [Arcury and Quandt, 2007; Zhang et al., 2008; U.S. Census Bureau, 2009a] with fatality and injury rates seven times the national average [U.S. Census Bureau, 2007]. It is largely comprised of—and is particularly dangerous for— immigrant, Latino workers. It is estimated that nearly 83% of U.S. crop workers [NAWS, 2005] and over two-thirds of workers in animal handling and other front-line farm positions [AHC, 2005], are Latino or foreign-born, though data specific to horse breeding is unavailable. In Kentucky, anecdotal evidence suggests that 80–90% of thoroughbred workers [Anderson et al., 2002] and 70–80% of tobacco workers are estimated to be Latino [Poynter, 1999]. Although Latinos experience the highest fatality rate of all ethnic/racial groups across all industries, 5.0 per 100,000 versus 4.1 for non-Hispanic whites [U.S. Census Bureau, 2004], agriculture is particularly hazardous. From 1996 to 2001, agriculture ranked among the top four industries with the highest fatality rates among foreign-born workers: 15.2 per 100,000 [Loh and Richardson, 2004].

The increased reliance of hazardous industries on this vulnerable population has led the National Institute for Occupational Safety and Health (NIOSH) to rank Latino workers as a research priority [NORA AgFF Sector Council, 2008]. Though the occupational illness and injury rates are high for this population, they are also likely underestimates due to (1) the exemption of small farms from reporting this data, (2) the definition of ''injury'' as one where medical treatment is sought, and (3) the demonstrated tendency of Latinos to delay seeking medical treatment [Azaroff et al., 2002; Frank et al., 2004; Arcury & Marín, 2009; May, 2009].

Conceptual Framework: Organization of Work and Latino Farmworker Health

Although systematic data on the degree to which Latino farmworkers experience occupational injuries and illnesses are limited [Arcury & Quandt, 2009; May, 2009], numerous foundational studies demonstrate that they are exposed to a host of job hazards including heavy and repetitive lifting, sustained awkward postures [Grzywacz et al., 2008], frequent use of force [Faucett et al., 2001], exposure to toxic chemicals [Shipp et al., 2005; Arcury and Quandt, 2006], operation of heavy equipment [U.S. Census Bureau, 2009b], and long work hours and weeks. Studies show that Latino farmworkers experience tremendous physical demands in their jobs [Alderete et al., 1999; McCurdy et al., 2003; Shipp et al., 2005].

However, few studies on occupational safety and health in physically demanding industries, such as agriculture, have included characteristics of work organization in their scope [Grzywacz et al., 2007]. This is a serious oversight given that the social context of work may increase exposure to work hazards [MacDonald et al., 2008] (see Fig. 1). Work organization refers to the way work processes are structured and performed and to the organizational practices that influence the way jobs are designed [Sauter et al., 2002]. Characteristics of work organization include work schedules, job conditions and design, interpersonal aspects of work, job security, management style, production methods, and organizational policies and practices.

Psychological and physical dimensions of the work environment contribute to a variety of health outcomes including musculoskeletal problems, occupational illness and injury, and respiratory problems [Karasek, 1979; Karasek and Theorell, 1990; Hellerstedt and Jeffery, 1997; Benach et al., 2002; Kuper and Marmot, 2003; Swaen et al., 2004; Grzywacz et al., 2007]. Moreover, extant literature indicates that organizational characteristics such as commitment to safety, positive and proactive organizational culture, and decentralized involvement of many persons in safety matters are critical to safe workplaces [Cole et al., 1986]. Therefore, it is likely that certain dimensions of work organization within agriculture may influence the risk of occupational injury or illness among Latino workers [Kivimäki et al., 2005; Lauver et al., 2009].

FIGURE 1. Direct and indirect relationship of work organization to occupational health outcomes.

Kentucky's Agricultural Context

Much of the research on agriculture health and safety among Latino farmworkers has been dominated by studies undertaken on large-scale, crop operations in California [Alderete et al., 1999; McCurdy et al., 2003], North Carolina [Grzywacz et al., 2008], Texas [Shah et al., 2009; Shipp et al., 2005], or has looked at animal processing facilities [Grzywacz et al., 2007; Quandt et al., 2006; Marín et al., 2009]. Though critical to understanding the work conditions and occupational risks and consequences among this vulnerable working population, study findings may not be directly translatable to other agricultural contexts, such as small-scale crop farming or horse production operations common in other areas of the U.S., such as Kentucky.

In Kentucky, the illness and injury rate for agriculture is as high as 7.8 per 100, compared to the national rates of 5.3 for agricultural workers and 3.9 for all industries [U.S. Census Bureau, 2009c,d]. The agricultural work in the state is dominated by horse and tobacco production [NASS, 2007], both of which require long seasons and highly manual labor [Struttmann and Reed, 2002; Löfqvist and Pinzke, 2011]. In addition, Kentucky farms tend to be small. The state's average farm size (164 acres) is around 2.5 times smaller than the U.S. average of 418 acres [NASS, 2007] and a plurality of Kentucky farms (42%) occupy one of the smallest sales classes (<$2,500); only 7% fit the >$100,000 sales class [NASS, 2007]. For comparison, in California, where much of the research on Latino farmworkers has been conducted, 27% of farms fit the $1,000–10,000 sales class and 26% fit the ≥$100,000 sales class [NASS, 2007].

Farm size matters to understanding the work context and the occupational health of farmworkers because smaller farms may have fewer resources for training or personal protective equipment, may be less likely to offer health insurance or workers' compensation coverage in the event of an injury, and may be exempt from systematically documenting and submitting their injuries and illnesses to OSHA [Azaroff et al., 2002; May, 2009]. Conversely, small farms may foster more personal, intimate relationships between owners and workers and may be less likely to practice exploitative labor practices [Mayerfield, 2004].

In summary, little is known about the work conditions and occupational health of Latino workers employed on crop and horse farms in Kentucky or other states with small-scale farms. Before we can determine relationships between various work organization factors and ill health or injury among Latino farmworkers in diverse agricultural settings, more must be understood about the physical and psychosocial work conditions inherent to various types of farms in the U.S. and the nature of the occupational illness and injuries most often experienced by this population. To this end, this descriptive article has two primary objectives:

(1) to describe the work conditions inherent in crop and horse production work from the perspective of Latino workers including differences between the two industries; and
(2) to determine incidence of occupational illness and injury among Latino crop and horse workers.

MATERIALS AND METHODS

Design

Sampling and recruitment

This exploratory, cross-sectional study recruited 103 Latino farmworkers employed in the crop (n = 49) and horse production (n = 54) industries from October 2009 to January 2010 in four counties located in Central Kentucky (Fayette, Scott, Bourbon, and Woodford). These counties are home to 3,370 farms [NASS, 2007a]. To be eligible for this study a participant had to meet all three of the following criteria: she/he had to (1) be at least 18 years of age, (2) be employed on a crop or horse production farm for at least 15 days in the past year, and (3) self-identify as Latino.[1] The study used a community-based, purposive sample, employing a snowball sampling technique when appropriate. Both passive and active recruitment approaches were used to access this hard-to-reach community. Passive recruitment included an article about the study in a local, bilingual newspaper; an interview on a local Spanish-language radio station; and study fliers posted in a range of community venues. In addition, interviewers actively recruited study participants in community venues within the four-county area.

Prior to administering the interview, participants were informed of the study's purpose, procedures, risks, and benefits. Interviewers answered participants' questions and provided an information sheet in Spanish and English with the same information. Oral consent was obtained from all participants before proceeding with the interview. A waiver of documentation of informed consent and other procedures for obtaining informed consent were approved by University of Kentucky's Non-Medical Institutional Review Board. Participants were given a $10 gift card to a local Latino-owned restaurant chain or $10 cash.

[1] If a worker had worked in both horse and crop production, she/he was asked to refer to the site where she/he had worked most recently; 48 of the 49 crop workers who participated worked in tobacco production.

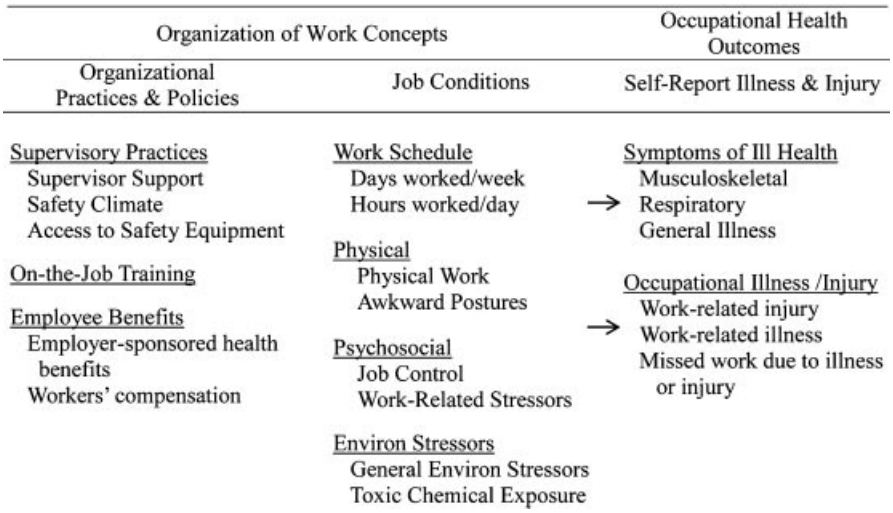

FIGURE 2. Conceptual framework: Characteristics of work organization and measures of occupational health [MacDonald et al., 2008; Sauter et al., 2002; Vandenberg et al., 2002].

Data Collection

Three trained interviewers collected data using face-to-face interviews in Spanish. All interviewers participated in a half-day training covering interview techniques, questionnaire content, human subject protection, and research ethics. When available, standardized measures that had been previously been translated and tested with a Latino workforce were utilized [NAWS, 2005; Grzywacz et al., 2007, 2008; Marín et al., 2009]. Other content was translated into Spanish, back-translated into English [Behling and Law, 2000] and reviewed once more by a native speaker. On average, interviews lasted between 30 and 40 min.

Measures

Organization of work Informed by the work organization conceptual framework illustrated in Figure 2, this study assessed the job conditions and organizational practices and policies inherent to crop and horse production farms. Unless otherwise noted, the following scales utilized frequency-based, ordinal response categories (1 = Seldom or Never to 4 = Almost Always).

Job Conditions: *Work schedule* was determined by probing for the number of hours typically worked per day and the number of days worked per week. Number of hours worked per day was calculated by subtracting arrival time from departure time (see Table I).

Physical job demands. Two variables tapping physical dimensions of the work environment were constructed from 20 items from the Bot Physical Workload Inventory [Bot et al., 2004]. *Physical work* ($\alpha = 0.842$) was measured using four items and *awkward posture* ($\alpha = 0.909$) was assessed using 13 items (see Table II). Both scales were summed with greater scores indicating higher demands.

Psychosocial job demands. Two variables (job control and work-related stressors) were used to measure aspects of psychosocial work demands. *Job control* ($\alpha = 0.801$) was measured using three items (see Table III) from the Job Content Questionnaire (JCQ) ''authority'' subscale [Karasek and Theorell, 1990] which has previously been used with Latino workers [Grzywacz et al., 2007, 2008]. We retained the modifications to a frequency-based response format used in these studies.[2] *Work-related job stressors* ($\alpha = 0.739$) were measured with five items. One item was taken from the Job Content Questionnaire (''How often do you worry about losing your job?''). The other four were created by the research team based on qualitative interviews with members of the target population in preparation for this study (see Table III).

Organizational Practices & Policies: *Supervisory practices*. Participants were asked if they reported to 1 (a contractor), 2 (supervisor, not the owner), or 3 (the owner of the farm) and then were asked how well they communicated with that person: 1 (very well), 2 (somewhat), or 3 (not at all). *Supervisor support* ($\alpha = 0.794$) was assessed with four items from the JCQ's ''supervisor–subordinate relations'' subscale that taps supervisor support, modified to a frequency-based format [Karasek and Theorell, 1990]

[2] Response categories used for the JCQ were modified from affective categories (strongly agree–disagree) to frequency-based categories (never–almost always) consistent with other researchers [Grzywacz et al., 2007, 2008] who have tested instruments with Latino workers.

(see Table V). *Safety climate* ($\alpha = 0.842$) was measured via a validated 10-Item Perceived Safety Climate Scale [Gillen et al., 2002], which had also been used previously with Latino workers [Grzywacz et al., 2007] (see Table V). Responses were coded 1 (strongly disagree) to 4 (strongly agree), with higher scores reflecting greater supervisor commitment to safety.[3] *Access to safety equipment* was measured using six items that assessed whether safety equipment was provided at work [Quandt et al., 2006]. Individual items were summed and coded 0 (no to all items) or 1 (yes to at least one of the six items).

On-the-job training. Training on the job was assessed with a single question intended to capture informal and formal methods (''Who showed you how to do your job?''). Responses were coded 1 (supervisor), 2 (coworker), 3 (no one), and 4 (other).

Employee benefits. Access to employer-sponsored benefits was assessed to determine whether workers have access to policies that assist them if injured or sick on the job [NAWS, 2005]: employer-provided health insurance if injured on the job, employer-provided health insurance if injured outside of work, and workers' compensation insurance. Answers were coded 1 (yes), 2 (no or I don't know).

Environmental stressors. *General environmental stressors* ($\alpha = 0.783$) were assessed with six items from the Job Content Questionnaire [Karasek and Theorell, 1990] (see Table IV). *Toxic chemical exposure* was assessed by combining two questions: one probed for exposure to toxic chemicals more likely to be present in the crop industry (''At this job, have you come into contact with pesticides, herbicides, or insecticides?'') [NAWS, 2005] and a second question probed for toxic chemicals in the horse industry (''Have you come into contact with medicines?'') (see Table IV). Response categories were coded 0 (no) and 1 (yes). The questions were combined for a single toxic chemical exposure variable where responses were coded 0 (no to both questions) and 1 (yes to at least one question). A follow-up question probed participants who had been exposed to toxic chemicals as to whether they had received training related to the use of these chemicals in the past 12 months.

***Occupational Health Outcomes**: Symptoms of Ill Health*. Participants' symptoms of ill health were assessed with three categories of variables tapping occupational health outcomes: musculoskeletal, respiratory, and general illness. These measures were constructed using 20 items from several occupational health symptom inventories, such as the Cohen–Hoberman Inventory of Physical Symptoms [Cohen and Hoberman, 1983] and the Quality of Well-Being, self-administered instrument [Kaplan et al., 1997]. This 20-item composite scale has been used previously with Latino populations in physically demanding industries [Grzywacz et al., 2007; Marín et al., 2009]. Items asked a respondent whether she/he experienced the symptom in the past month, 0 (no) and 1 (yes). *Musculoskeletal symptoms* ($\alpha = 0.716$) were measured using three items (see Table VI) and were summed to create a musculoskeletal symptom score (0–3). *Respiratory symptoms* ($\alpha = 0.609$) were assessed with four items (see Table VI) and were summed to create a respiratory symptom score (0–4). *Overall general illness symptoms* ($\alpha = 0.818$) included 13 items (see Table VI) and were summed to create a general illness symptom score (0–13).

Occupational Illness and Injury. Self-report injury and illness was measured with three questions (see Table VI), asking ''In the past 12 months has participant become injured due to work, sick due to work, or missed work due to a work-related illness or injury?'' Responses were coded as 1 (never), 2 (less than 3 times), 3 (4–7 times) and 4 (more than 7 times), then recoded into a dichotomous variable 1 (yes), 2 (no).

Analyses

Data was entered into SAS (Version 9.2). Bivariate statistics such as cross tabulation, chi-squares, and *t*-tests were used to assess frequencies, means, and standard deviations to describe the organization of horse farm and crop work and to determine differences between the two worker groups. Scales were summed and reliability tests were performed.

RESULTS

Due to the descriptive nature of this study, we will report on a large number of variables. The comparative frequencies on individual items between both worker groups are reported in the tables (note that frequencies may not equal 100 due to rounding). *t*-Test results on the summed scales are presented within the text.

Sample Characteristics

Table I provides the demographic characteristics for the entire sample (N = 103). The majority of horse and crop workers were male, Mexican-born and in their mid-thirties. Only 4% and 6% of horse and crop workers respectively could speak and only 4% and 8% could read English well (see Table I).

Despite the common perception that Latino farmworkers are highly migratory, the average length of time that members of both groups had spent in the United States was over seven years. Approximately half of both

[3] Two items were reverse coded to retain the intent of the scale. The final item in Table V had three response categories, and therefore we divided the score given for that answer by three and multiplied by four make consistent with the rest of scale (this item was also reverse coded).

TABLE I. Demographic Traits as Percentage of Sample

Characteristic	Horse (%)	Crop (%)	χ^2	df
Male[a]	94	98	0.885	1
Country of birth				
Mexico	89	94	6.15	3
Guatemala	9	0		
United States	0	2		
Other[b]	2	4		
Permanent home				
United States	50	51	3.5	2
Mexico	39	47		
Other	11	2		
Ability to speak English[a]				
Not at all	19	20	1.52	3
Somewhat	57	61		
A little	21	12		
Well	4	6		
Ability to read English				
Not at all	35	33	2.6	3
Somewhat	44	51		
A little	17	8		
Well	4	8		
Time worked at this farm[a]				
<3 months	7	35***	23.24	6
3–5 months	7	23		
6–8 months	6	6		
9–11 months	4	4		
1–3 years	44	17		
4–5 years	15	6		
>6 years	17	8		

	Mean (SD)			
Variable	H	C	*t*	df
Age	35 (9.7)	32 (9.3)$^{-}$	−1.78	101
Number of years in US	7.71 (6.1)	7.4 (7.9)	−0.222	101
Number of years with employer[a]	3.4 (4.4)	1.53 (2.5)**	−2.70	87

H, horse, C, crop, N = 103 unless otherwise noted.
$^{-}P < 0.08$, $^{**}P < 0.01$, $^{***}P < 0.001$ (sig. 2-sided).
[a]N = 102.
[b]Other countries included Peru and Honduras.

occupational groups cited the United States as their permanent home, indicating that the other half may intend to return to their native country at some point. Horse workers had longer work tenure than crop workers (3.4 years vs. 1.53 years).

Work Organization Characteristics

Job Conditions: *Work Schedule*. On average, both groups worked six days a week [6.11 for horse vs. 5.84 for crop, t(85) = −1.58, $P = 0.118$, respectively], though crop workers spent significantly more time at work each day than horse workers [11.3 vs. 9.3 hr, t(99) = 6.03, $P = 0.000$, respectively].

Physical Demands. *Physical work* revealed a mean score of 9.31 for horse workers versus 13.0 for crop workers [(range = 4–16), t (101) = 5.46, $P = 0.000$]; *awkward posture* revealed a score of 23.8 for horse workers and 35.8 for crop workers [(range =13–52), t(98) = 6.64, $P = 0.000$]. As illustrated in Table II, crop workers experienced every physical demand more frequently than horse workers except ''squatting,'' for which the difference was not significant.

Psychosocial Job Demands. As noted in Table III there are no statistically significant differences in reported job control between horse and crop production workers. Mean scores were calculated at 6.91 for horse workers and 6.76 for crop workers [(range = 3–12), t(100) = −0.26, $P = 0.795$]. Overall individual items indicate that only between one-quarter and one-third of workers in both groups reported almost always being allowed to make their own decisions on the job, having freedom to decide how to do farm work, or having a lot of say about what happens on the job.

Work-related stressors. *t*-Tests on the summed scale revealed that crop workers ($\mu = 13$) are more likely to be exposed to work-related stressors than are horse workers ($\mu = 10.5$) [(range = 5–20), t(101) = 3.1, $P = 0.003$]. Examination of individual items reveals nuanced differences between the two groups as illustrated in Table III.

Environmental Stressors. Crop workers in our study were more frequently exposed to environmental stressors than horse workers [$\mu = 10.6$ for horse and $\mu = 13$ for crop workers, (range = 6–24), t(100) = 2.62, $P = 0.010$]. However, examination of individual items (see Table IV) indicates that both groups of workers are exposed to a range of environmental stressors. When asked about toxic chemicals, almost three-quarters of workers in both industries reported exposure (Table IV). Of those workers, only 31% of horse and 22% of crop workers had received training on their safe handling in the last 12 months.

Organizational Practices & Policies: *Supervisory practices*. There were significant differences in who supervised the two groups of workers. Whereas the majority of horse workers reported to a supervisor (76%), a quarter directly to the owner (25%), and none to a contractor, only 19% of crop workers reported to a supervisor, 29% directly to the owner, and 52% to a contractor, [$\chi^2(2, N = 101) = 44.5$, $P = 0.000$] (data not shown). Despite the low English acquisition of the population, 59% of horse and 34% of crop workers reported that they communicated with their supervisor very well and 36% and 57% of horse and crop workers communicated with their

TABLE II. Physical Demands as Percentage of Occupational Group

	Almost never		Sometimes		Often		Almost always		
Characteristic	**H (%)**	**C (%)**	**H (%)**	**C (%)**	**H (%)**	**C (%)**	**H (%)**	**C (%)**	χ^2
Physical work									
Moves loads > 10 lbs	20	6	35	12	17	16	28	65***	17.34
Moves loads > 50 lbs	46	14	22	22	11	14	20	49**	14.66
Exerts force with arms/hands	15	6	33	12	15	22	37	59*	10.18
Hard physical work	48	6	24	18	7.4	18	20	57***	28.13
Awkward posture									
Twisted posture for long time	54	20	24	20	9.3	18	13	41***	16.85
Neck twisted for long time	57	20	26	20	9.3	12	7.4	47***	24.7
Bends or twists neck	61	18	28	20	3.7	16	7.4	45***	30.61
Holds wrist in twisted position for long time[a]	52	21	19	21	11	10	19	48**	13.43
Works in same position for long time	30	4.1	26	16	22	22	22	57***	18.77
Works in uncomfortable positions	65	22	24	27	3.7	10	7.4	41***	24.29
Walks on uneven surfaces[a]	55	22	19	16	13	14	13	47***	16.72
Repetitive tasks with arms/hands many times/min	48	10	17	10	9.3	18	26	61***	22.14
Kneels or squats for long time	35	20	31	24	17	12	17	43*	8.83
Works with hands above shoulders	44	24	30	12	15	10	11	53***	21.55
Works with hands below knees	57	41	20	14	9.3	8.2	13	37*	8.0
Squatting[a]	48	44	35	29	9.3	4.2	7.4	23	5.51
Sits or moves on knees	82	53	13	22	0	10	5.6	14**	11.9

H, horse; C, crop; df = 3 and N = 103 unless otherwise noted.
*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$ (sig. 2-sided).
[a]N = 102.

supervisor somewhat. Among both groups, 6% could not communicate with their supervisor at all, [χ^2 (3, $N = 100$) = 6.84, $P = 0.077$] (data not shown).

Three types of supervisory practices were examined: supervisor support, safety climate, and safety equipment. *t*-Tests on the summed *supervisor support* score, with higher scores indicating a higher level of perceived support, revealed significant differences between the two groups [$\mu = 11.9$ for horse vs. $\mu = 10.5$ for crop workers, (range = 4–16), t(97) = −2.05, $P = 0.043$]. However, only

TABLE III. Psychosocial Job Demands as Percentage of Occupational Group

	Seldom or never		Sometimes		Often		Almost always		
Item	**H (%)**	**C (%)**	**H (%)**	**C (%)**	**H (%)**	**C (%)**	**H (%)**	**C (%)**	χ^2
Job control									
Allowed to make own decisions about work[a]	38	41	28	25	11	10	23	24	0.268
Has freedom to decide how to do work	28	29	37	45	11	8.2	24	18	1.02
Has a lot of say about what happens on job	28	25	30	35	11	16	32	24	1.27
Work-related stressors									
Feel exhausted at the end of the day	30	14	48	27	5.6	6.1	17	53***	15.91
Worry about becoming ill due to work	50	25	31	33	3.7	14	15	29*	9.99
Worry about becoming injured due to work	31	16	20	43	13	8.2	35	33⁻	7.21
Worry about receiving pay	65	29	9.3	29	7.4	2.0	19	41***	18.2
Worry about losing your job	33	41	33	16	9.3	4.1	24	39	6.13

H, horse; C, crop; df = 3 and N = 103 unless otherwise noted.
⁻$P < 0.08$, *$P < 0.05$, ***$P < 0.001$ (sig. 2-sided).
[a]N = 102.

TABLE IV. Environmental Stressors as Percentage of Occupational Group

Item	Seldom or never		Sometimes		Often		Almost always		
	H (%)	C (%)	H (%)	C (%)	H (%)	C (%)	H (%)	C (%)	χ^2
General environmental stressors									
Work in areas where dangerous materials are stored	85	59	7.4	20	1.9	4.1	5.6	16*	8.81
Work in dirty or badly maintained areas[a]	57	29	17	27	3.8	12	23	33*	8.97
Work with tools or equipment that could be dangerous	59	33	17	31	7.4	6.1	17	31*	8.25
Dangerous work methods	56	43	20	20	1.9	12	22	24	4.98
Work in areas with dust, smoke, gas, fumes pollution	83	67	13	18	0	4.1	3.7	10	5.15
Risk of catching a disease or becoming injured	28	24	28	29	9.3	6.1	35	41	0.652

Item	Yes				
	Horse (%)	Crop (%)	df	χ^2	N
Toxic chemical exposure					
Have you ever come into contact with toxic chemicals at this job?	72	73	1	0.020	103
If yes, in the past 12 mo. have you received training on how to safely use them?	31	22	1	0.699	75

H, horse; C, crop; df = 3 and N = 103 unless otherwise noted.
[a]N = 102.
*$P < 0.05$ (sig. 2-sided).

one individual item reflected significant differences in the two groups: fewer crop workers reported that their supervisor almost always pays attention to what they are saying.

To understand the full range of supervisor behaviors we examined workers' perceived *safety climate* (Table V). When the scale was summed, analyses revealed no statistical difference between horse and crop workers [$\mu = 23$ for horse, $\mu = 22$ for crop workers, (range = 10.3–37), $t(98) = -0.84$, $P = 0.402$], scores were slightly below the scale midpoint. When workers were asked about the presence of specific safety practices (e.g., safety instructions, safety meetings, safety equipment) a plurality of both horse and crop workers reported that they strongly disagreed such resources were available. Likewise, over half the workers in both industries stated that supervisors are just interested in doing the job fast and cheap.

Examination of the third type of supervisor practice reveals a significant difference in *access to safety equipment* between the two groups. Only 55% of crop workers (versus a full 98% of horse workers) were provided at least one item of protective equipment by their supervisors [χ^2 (1, $N = 100$) = 27.46, $P = 0.000$] (data not shown).

On-the-job training. Access to formal or informal training was low in both industries with 33% and 22% of crop and horse workers answering the question of "Who showed you how to do your job?" with "no one," 41% and 39% of crop and horse workers answering with "coworker" and only 27% and 31% of crop and horse workers answering with "supervisor" [χ^2 (3, $N = 103$) = 4.90, $P = 0.179$] (data not shown).

Employee benefits. Crop workers received significantly fewer benefits. Only 19% of crop (vs. 67% of horse) workers had employer-sponsored health insurance if injured on the job [χ^2 (1, $N = 99$) = 23.2, $P = 0.000$], 10% of crop (vs. 21% of horse) workers had employer-sponsored health insurance for non-work-related illness or injury [χ^2 (1 $N = 101$) = 2.27, $P = 0.123$], and 25% of crop (vs. 70% of horse) workers were covered by workers' compensation [χ^2 (2, $N = 92$) = 21.2, $P = 0.000$] (data not shown).

Occupational Health and Injury

Symptoms of Ill Health. While workers in both industries reported work-related ill-health symptoms, t-tests on the summed-scale items for the three occupational ill-health indicators revealed that crop workers experienced higher risk of musculoskeletal and general illness symptoms. Analysis of summed scales reveals a mean score of 1.57 for crop (versus 0.800 for horse) workers on musculoskeletal symptoms [(range = 0–3), $t(101) = 3.53$, $P = 0.001$] and a score of 3.12 for crop (vs. 1.69 for horse) workers on general illness symptoms [(range = 0–13), $t(77) = 2.77$, $P = 0.007$]. Both worker groups were equally likely to experience respiratory symptoms [$\mu = 1.16$, crop workers; $\mu = 1.07$, horse workers, (range = 0–4), $t(101) = 0.38$, $P = 0.704$]. Responses to individual symptoms are displayed in Table VI.

Occupational Illness and Injury. Crop production workers experienced more work-related illness compared to horse production workers (39% vs. 15%), whereas

TABLE V. Supervisory Practices as Percentage of Occupational Group

Item	Seldom or never		Some times		Often		Almost always		χ^2
	H (%)	C (%)	H (%)	C (%)	H (%)	C (%)	H (%)	C (%)	
Supervisor support									
Concerned about worker well-being[a]	12	20	37	39	17	16	35	24	2.17
Pays attention to what you are saying	5.6	16	19	35	24	12	52	37*	8.62
Motivates people to do their jobs	13	33	22	22	20	12	44	33	6.41
Is successful getting people to work together[a]	11	8.3	15	27	26	17	47	48	3.07

Item	Strongly disagree		Disagree		Agree		Strongly agree		χ^2
	H (%)	C (%)	H (%)	C (%)	H (%)	C (%)	H (%)	C (%)	
Safety climate									
Workers' safety practices are very important to management	1.9	12	15	12	52	59	31	16⁻	6.89
Workers are regularly made aware of dangerous work conditions	19	20	11	22	50	43	20	14	2.87
Workers are regularly praised for safe conduct[a]	30	37	19	18	38	33	13	12	0.536
Workers receive instructions on safety when hired	46	49	15	12	28	29	11	10	0.189
Workers attend regular safety meetings[a]	55	51	15	22	25	18	5.7	8.1	1.49
Proper safety equipment is always available	39	39	13	18	39	31	9.3	12	1.20
Workers have almost total control over personal safety	20	20	9.3	16	48	49	22	14	1.90
Taking risks is not a part of job	46	39	33	31	15	29	5.6	2.0	3.49
Possibility of being injured at work in next 12 months is very likely[a]	1.9	8.3	24	23	50	35	24	33	4.21

	They do as much as possible to make my job safe		They could do more		They are just interested in doing the job fast and cheap		χ^2
	H (%)	C (%)	H (%)	C (%)	H (%)	C (%)	
How much do supervisors seem to care about your safety?[b]	28	16	17	14	56	69	2.39

H, horse; C, crop, df = 3 and N = 103 unless otherwise noted.
⁻$P < 0.08$, *$P < 0.05$ (sig. 2-sided).
[a]N = 102.
[b]df = 2.

about a quarter of workers in both industries were injured due to work in the past year (Table VI). Nearly twice as many crop production workers missed work because of work-related illness or injury (29% vs. 15%), though this difference was not statistically significant.

DISCUSSION

The goal of this study was to broaden our understanding of the work conditions and occupational health outcomes of Latino farmworkers employed on crop and horse breeding farms in Kentucky. Using a work organization framework [Sauter et al., 2002; Vandenberg et al., 2002; MacDonald et al., 2008], this descriptive study provides one of the first systematic assessments of the physical and psychosocial work conditions and the occupational health symptoms experienced by Latino workers employed in two previously understudied areas of agriculture within a region that is increasingly reliant on this population.

Our findings reveal two primary themes of interest. First, both crop and horse workers experienced high demands relative to similar populations in other industries or regions, though crop workers experienced greater demands than horse workers on a number of organizational and job characteristics. Second, both groups reported a high prevalence of respiratory symptoms and injuries, though crop workers generally experienced greater risk of ill-health symptoms and work-related illness than horse workers. The following sections expand on these findings and situate our results within the broader agricultural health and safety literature.

Both Worker Groups Experience High Demands, Though Crop Workers Experience More

Comparing the two groups to each other, we find that crop workers experience job demands in excess of horse workers across several categories including physical

TABLE VI. Health Outcomes as Percentage of Occupational Group

Item	Yes		
	Horse (%)	Crop (%)	χ^2
Musculoskeletal symptoms in past 30 days			
Pain, stiffness, cramps, weakness, numbness in neck or back	28	57**	9.11
Pain, stiffness, cramps, weakness, numbness in hands/arms	26	49*	5.86
Pain, stiffness, cramps, weakness in hips/sides, or legs/feet	26	51**	6.88
Respiratory symptoms in past 30 days			
Any coughing or wheezing	26	18	0.846
Shortness of breath or difficulty breathing	11	14	0.235
Sore throat, difficulty swallowing, or hoarse voice	43	37	0.368
Stuffy or runny nose or bleeding from nose	28	47*	4.05
General illness symptoms in past 30 days			
A headache	35	43	0.637
Upset stomach, abdominal pain, nausea, heartburn, vomiting	11	31**	6.02
Fever, chills, or sweats	11	24–	3.18
Problems with vision	19	22	0.245
Eye pain, irritation, discharge, sensitivity to light	31	39	0.601
Dizziness, earache, or ringing in ears	15	29	2.89
Chest pain, pressure, fast/skipped heartbeat, chest discomfort	15	22	0.995
Pain, burning, or blood in urine	1.9	6.1	1.26
Loss of bladder control, frequent/difficult urination	5.6	18*	4.10
Swelling of ankles, hands, feet or abdomen	0	24***	14.97
Loss of consciousness, fainting, or seizures	0	4.1	2.25
Difficulty with your balance, standing, or walking	3.7	20**	6.96
Dry skin, rashes, or other skin problems	20	29	0.940
Occupational Illness or Injury in past year			
Were you injured because of your work?	24	27	0.082
Have you become sick because of your work?	15	39**	7.63
Did you miss work because of a work-related illness or injury?	15	29	2.9

H, horse; C, crop; df = 1 and N = 103.
–$P < 0.08$, *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$ (sig. 2-sided).

demands, awkward postures, work-related and environmental stressors, and length of workday. In addition, crop workers received less supervisor support and were less likely to have access to employer-sponsored health insurance, workers' compensation, or safety equipment.

Though horse work was found to be less demanding than crop work, the two industries share many hazardous job conditions and organizational practices that should not be minimized. Regarding job conditions, both worker groups reported physical demands near or above the scale midpoint. These findings are consistent with research documenting the high postural load associated with mucking stalls [Löfqvist and Pinzke, 2011], the physical demands of crop work [Grzywacz et al., 2008] and the highly manual nature of burley tobacco farming [Struttmann and Reed, 2002]. In addition, both worker groups reported work hours that exceed the 42-hr average workweek reported by a national sample of farmworkers [NAWS, 2005].

Job control, another important job condition examined in this study, is hypothesized to moderate the relationship between certain job demands and ill-health outcomes [Karasek, 1979]. Although scores fell below the mid-point for both worker groups, workers cited higher levels of job control than has been reported in research with similar populations using the same measure [Grzywacz et al., 2007, 2008]. Such results may suggest that workers in both tobacco and in horse breeding perceive more freedom in how they conduct their work than similar populations in larger farms or other industries. Nonetheless, in light of recent research that has suggested that immigrant workers may not experience the same positive effects of job control as native workers [Rosmond et al., 1998; Wadsworth et al., 2007; Hoppe, 2011], additional research is needed

to understand the meaning of job control among immigrant workers and its relationship to occupational health.

Exposure to environmental stressors is another area where more research is needed to fully understand the scope and health implications of hazards on small-scale tobacco and horse breeding farms. In this study, both worker groups ranked their exposure to environmental stressors below the scale midpoint. Yet a large proportion of both worker groups stated that they were almost always at risk of catching a disease or becoming injured. In addition, almost three-quarters of both groups cited exposure to toxic chemicals, while under a third had received training in the last year on their safe use. This low training rate is consistent with other reports in similar populations [Arcury et al., 2001] and indicates that many of these workers regularly encounter risk of illness and injury without sufficient safeguards.

Similar to job conditions, the organizational practices cited by workers, specifically findings related to supervisory practices, demonstrate the need for improvement in both industry sectors. For both groups, safety climate scores ranked slightly below the midpoint. Similarly, when responding to questions related to specific practices, a plurality of both worker groups perceived that safety resources were scarce. We did note that a majority of workers in both industries agreed that safety was very important to management, although the majority of both groups also replied that supervisors were ''just interested in doing the job fast and cheap'' when asked about their concern for worker safety. This may reflect a dissonance between workers' perception of managers' commitment to safety and the actual presence of safety practices. It may also indicate that the affective-based response categories are problematic with this population [Grzywacz et al., 2008] making it difficult to interpret workers' responses to these questions. Regardless, these findings highlight the need for researchers to probe for specific practices related to health and safety when working with a population that may accept risk in the work environment [Arcury and Marín, 2009]. Findings also highlight the need to develop culturally appropriate measures and response categories.

In addition to information on the job and organizational characteristics, this study also reveals that both worker groups report low ability to read and speak English, which is consistent with national trends [NAWS, 2005]. Further, the majority of crop workers and over 40% of horse workers could only communicate with their supervisors somewhat or not at all. This may prevent them from understanding how to safely apply ointments, use equipment, or communicate perceived dangers with others on the job. Given that exposure to toxic chemicals was high and training on how to use them was low, the inability to read or easily communicate puts these workers at increased risk. Conversely, it should be noted that despite their reported low language proficiency, over half of horse workers reported that they are able to communicate very well with their supervisor. This may indicate that some supervisors use Spanish, sign language, or other means of communicating. More specific probes should be included in future research assessing communication quality between Latino workers and their supervisors.

Our research on the supervisor–subordinate relationship among Latinos contributes to the work organization and the agriculture safety and health literature by exploring the nuanced relationships between workers and their supervisors as they play out day-to-day. Evidence from other studies reveals that this relationship may be more important for immigrant workers' well-being than it is for native workers [Hoppe et al., 2010; Hoppe, 2011]. Our study illuminates how perceived supervisor attitudes toward safety may influence the overall climate of safety on the farm. However, more research is needed to explore how Latinos experience their supervisors, how language and cultural differences may influence the supervisor–subordinate relationship, and how workers' experiences of their supervisors—including negative interactions (e.g., abusive behavior)—may influence occupational safety and well-being.

Both Worker Groups Experience Ill-Health Outcomes, Though Crop Workers Experience More

We learned from this formative study that crop workers experienced significantly higher prevalence of work-related illness, musculoskeletal symptoms, and general-illness symptoms than horse workers and that both groups experienced high rates of injury and respiratory symptoms compared with similar populations.

Focusing first on crop work, we found that in addition to reporting higher prevalence of musculoskeletal symptoms than horse workers, crop workers reported higher rates of ill-health symptoms than a similar sample of Latino poultry processing workers across many individual items [Quandt et al., 2006]. For example, 57% of crop workers cited back pain in the last month versus 36% of Latino poultry processing workers [Quandt et al., 2006], and 10% of a non-Latino racially diverse clinical sample [Jackson et al., 2003, cited in Quandt et al., 2006]. Contextually, these differences further underscore ill health experienced by crop workers, even in comparison to workers in other demanding industries. Given their lack of workplace supports if ill or injured, these findings suggest that crop workers must often choose between missing a paycheck and working while sick or in pain.

As previously mentioned, almost the entire sample of crop workers represented tobacco work. In light of what

is known about the health consequences of tobacco production, including green tobacco sickness and pesticide exposure [Arcury and Quandt, 2006], ill health in this population may not be surprising. However, although the consequences are well known, their causes are not well understood by all farmworkers or even farmers. Previous research has demonstrated that many farmworkers have differing beliefs of how to protect themselves against pesticide exposure [Arcury et al., 2001] and many farmers have diverging ideas about the causes of green tobacco sickness [Arcury et al., 2003]. Differences in beliefs about the causes of risk may decrease the provision and use of adequate safety protections. Future research should address both worker and employer perceived risk.

We found the prevalence of injury in both industries to be high compared to similar populations. Roughly a quarter of both crop and horse workers reported a work-related injury in the past year, similar to the prevalence of illness or injury reported by a sample of Latino poultry processing workers [Quandt et al., 2006; Grzywacz et al., 2007]. For additional context, the injury prevalence in our sample was three times higher than Kentucky's agricultural injury rate: 7.8 per 100 full-time equivalent workers [U.S. Census Bureau, 2009d]. Though not directly comparable, we believe that the marked difference in these rates is notable as many of the injuries reported in our study may not be reported in traditional surveillance methodologies that exclude smaller farms and only include injuries associated with lost work time or medical care [Azaroff et al., 2002; Quandt et al., 2006]. To our knowledge, our study is one of the first in Kentucky to gather information about the prevalence of injuries from a Latino worker perspective.

As with injury, we also found the respiratory symptoms experienced by both crop and horse workers to be high compared to other occupational groups. Quandt et al. [2006] found that 11% of a sample of Latino poultry processing workers had experienced coughing and wheezing in the past month versus the 18% of crop and 26% of horse workers in our sample. While other studies have documented significantly higher rates of respiratory symptoms in stable hands compared to a control population [Mazan et al., 2009], qualitative interviews conducted in preparation for this study did not indicate this as a major area of concern for workers [Swanberg and Clouser, unpublished work]. This may be because workers do not associate their respiratory symptoms with their farm job, and as a result may not take the necessary precautions to protect themselves. To fully understand the scope of hazards and health consequences of farm work experienced by Latinos, future research should assess Latino workers' perceived risks associated with their job and develop methodologies that assess whether occupational conditions contribute to respiratory symptoms.

Limitations

As this is an exploratory project with a hard-to-reach, under-researched population, study results are not widely generalizable. Due to the following limitations, we advise interpreting the data with caution. First, as there is no list of Latinos residing in Central Kentucky from which a sample could be drawn, randomization was not possible. Site-based or cluster sampling by residential area was rejected because these workers reside in several communities, not in the labor camps that frequently house migrant workers in other regions. Worksite-based cluster sampling was rejected because study questions targeted working conditions and we did not want participants to feel their jobs were in jeopardy. For these reasons a purposive technique was used which may not accurately represent this population.

Both passive and active recruiting was used in order to increase participation, introducing a potential threat of selection bias. In addition, workers were eligible if they had worked more than 15 days at a qualifying farm in the past year—a range that may increase the threat of inaccurate recall if a worker had only worked in the early part of the year. The research team decided to include such a broad span for three reasons: to include work tasks associated with all seasons in the scope of the research, to include seasonal workers, and to attain the desired sample with limited resources. Results indicated that crop workers had significantly less work tenure than horse workers which should be noted when interpreting results. Similarly, on some measures participants were asked if they had experienced a symptom in the past month, when they may not have been working at the farm in the past month. These ''symptoms'' should therefore be interpreted as descriptive of the worker rather than the work environment.

Self-report measures were widely used, which introduce the threat of inaccurate recall. Utilizing alternative and longitudinal methods for measuring injury and illness would improve surveillance of these outcomes as well as the ability to determine causation with work-related hazards.

We tried to avert issues pertaining to the language barrier by using previously translated scales and having a bilingual, Mexican-born team member review them. We retained the translation of several instruments from an affective-response format in their original form to a frequency-based response format which has been shown to be better understood by this demographic in cognitive testing while not adversely affecting the quality of the responses [Grzywacz et al., 2008, 2009]. However, the research team had not encountered the 10-Item Perceived Safety Climate translated into a frequency-based response format, and retained its original wording. Interviewers noted that the response format proved difficult for many participants,

who either answered in a frequency-based or a yes/no format.

Finally, based on the results from the preliminary qualitative interviews, this study explores a new domain of work-related stress. Previous studies that have used the Demand Control Model—which contributed to our theoretical framework—to assess relationships between psychological demands and occupational health outcomes have found that although Latino and/or immigrant workers may experiences these stressors in excess of the general population, they may not translate into increased incidence of occupational illness or injury [Grzywacz et al., 2008]. The authors, therefore, constructed a series of questions that reflected stressors experienced by workers in the qualitative interviews conducted prior to survey development. However, this scale has not previously been validated or tested with this population and it should be interpreted with caution.

CONCLUSION

Despite the limitations, study results provide evidence that work organization for Latino workers in Kentucky crop and horse production includes high physical demands, psychosocial and environmental stressors, and low emphasis on safety, although the risks associated with crop work are significantly greater than those with horse work. Moreover, workers in both industries are vulnerable to injury and a range of musculoskeletal, respiratory and general illness symptoms.

Our findings for crop workers fit within a context of work organization and occupational safety and health research that has documented demanding working conditions of Latino farmworkers [e.g., NAWS, 2005; Grzywacz et al., 2007; Arcury and Quandt, 2009]. Our findings for Latino horse workers are new. Coupled with the high demands and minimal access to job-related benefits, crop work on the generally smaller farms in Kentucky is revealed to be dangerous and in need of interventions that could reduce its hazards or better prepare its workers for the risks they face. Horse work also has hazards which should be addressed. However, as very little research has been published on the dangers present for Latino workers in the horse production industry, our study findings underscore the need for additional research on this population, particularly data which further our understanding of the psychosocial nature of the work environment. Specifically, this research should consist of a systematic assessment of the industry's occupational hazards including an exploration of the causal agent(s) of work-related respiratory symptoms, musculoskeletal disorders, and occupational injury and illness. As training was low in both industries, research exploring culturally appropriate training techniques is also warranted.

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