Work Organization and Health Among Immigrant Women: Latina Manual Workers in North Carolina

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Immigrant and low-income workers constitute a vulnerable population that is at significant risk for occupational injury and illness. These workers often have the most demanding jobs in the most dangerous industry sectors (e.g., agriculture, construction).[1-5] When they work in less hazardous sectors, such as manufacturing, they generally work in industries such as poultry and meat processing, which have substantial hazards and few protections.[6-7] These manufacturing hazards include exposure to toxicants (e.g., cleaners, solvents), exposure to biological materials (e.g., feces, dander), repetitive motion injuries, slips and falls, and lacerations and amputation from sharp tools and machinery.

Although addressing conventional risk factors (e.g., chemical and mechanical exposures) remains important for improving the health of immigrant and low-income workers, greater attention is being given to how work organization affects their health and safety.[5,8] The National Institute for Occupational Safety and Health (NIOSH)[9] defines "work organization" as the processes and organizational practices that influence job design. Work organization domains include the timing of when work is performed, such as shifts and hours worked, seasonality, and flexibility; the physical and psychological demands of work; the control or decision latitude workers have, including variation in effort and choice in performing work; and style of supervision and support, including supervisor support and control and work safety climate.[10,11]

Work organization has most often been considered in its effects on job satisfaction and health of white-collar workers. Although work organization is believed to be particularly influential in the health and safety of vulnerable workers, little research has examined work organization and health outcomes for vulnerable populations such as immigrant workers.[5,8,12] Even less research has focused on work organization among immigrant

Objectives. We sought to describe work organization attributes for employed immigrant Latinas and determine associations of work organization with physical health, mental health, and health-related quality of life.

Methods. We conducted a cross-sectional survey with 319 employed Latinas in western North Carolina (2009–2011). Measures included job demands (heavy load, awkward posture, psychological demand), decision latitude (skill variety, job control), support (supervisor control, safety climate), musculoskeletal symptoms, mental health (depressive symptoms), and mental (MCS) and physical component score (PCS) health-related quality of life.

Results. Three fifths reported musculoskeletal symptoms. Mean scores for depression, MCS, and PCS were 6.2 (SE = 0.2), 38.3 (SE = 0.5), and 42.8 (SE = 0.3), respectively. Greater job demands (heavy load, awkward posture, greater psychological demand) were associated with more musculoskeletal and depressive symptoms and worse MCS. Less decision latitude (lower skill variety, job control) was associated with more musculoskeletal and depressive symptoms. Greater support (supervisor's power and safety climate) was associated with fewer depressive symptoms and better MCS.

Conclusions. Work organization should be considered to improve occupational health of vulnerable women workers. Additional research should delineate the links between work organization and health among vulnerable workers. (*Am J Public Health.* 2014;104: 2445–2452. doi:10.2105/AJPH.2013.301587)

women. For example, recent analyses of work organization and health among US immigrant workers in agriculture[13-15] and construction[16-18] have shown that, among agricultural workers, job demands are associated with poorer physical health[13]; high worker control is associated with better mental health[14]; and poor safety climate is associated with greater musculoskeletal discomfort.[15] Among construction workers, poor work safety climate is associated with poor work safety behavior.[16] However, participants in these studies have been almost exclusively male.

Recent analyses of work organization and health among immigrant poultry processing workers have included a substantial number of women.[19-22] These analyses showed that management practices, such as poor safety commitment, and job design, such as authority, variety, psychological workload, frequent awkward posture, and repetitive movement, are associated with risk of recent musculoskeletal problems, respiratory problems, and

self-reported injury or illness.[19-21] In a similar way, organizational hazards, including low job control and high psychological demand, are associated with increased risk for epicondylitis, rotator cuff syndrome, and back pain.[22] However, these analyses have not focused on women or on gender differences. A qualitative analysis of female immigrant household domestic workers in Spain reported that such work organization factors as job control affect health.[23,24]

The job demand–control–support model[10,11] provides a framework for examining the association of work organization and health among women immigrant manual workers. This model posits that jobs with greater physical and psychological demand or stressors will result in poorer health. However, jobs with greater control or decision latitude can result in better health and can offset the effects of demand leading to poor health. Finally, support of peers and supervisors, including perceived safety climate[25] (how workers perceive supervisors' valuing

safety over production) reduces occupational injury and buffers the effects of job demands.

The place of work organization in the health of immigrant women is particularly important. These women have major family, child care, and domestic responsibilities that they need to integrate into their work responsibilities.[12,26] Immigrant women are also extremely vulnerable to workplace physical and sexual harassment, as they often do not speak English, do not know their rights, and may lack proper work documents.[27-29]

This analysis had 2 goals. The first was to delineate work organization attributes of full-time employed immigrant Latinas with manual occupations. The work organization attributes included indicators of job demands, decision latitude, and support. The second goal was to determine the associations of work organization attributes with health characteristics of these women, including physical health, mental health, and health-related quality of life. We tested 3 hypotheses: (1) greater job demands will be associated with poorer physical health, mental health, and health-related quality of life; (2) greater decision latitude will be associated with better physical health, mental health, and health-related quality of life; and (3) greater job support (higher perceived supervisor control, better job safety climate) will be associated with better physical health, mental health, and health-related quality of life.

METHODS

Our data were from a cross-sectional study conducted from 2009 to 2011 of Latino manual workers residing in 4 western North Carolina counties. A focus of the research was the association of manual work in the poultry processing industry with occupational health; therefore, about one half of the study participants were employed in one of the poultry processing plants in the counties. This analysis was limited to the women who participated in the study. We included participants employed in poultry processing and other manual work in this analysis, as they are all manual workers with similar occupational exposures; inclusion of all participants increased the overall size of the sample.

Sample

The sample design included 2 components. First, the study team mapped neighborhoods composed largely of Latino residents. Second, the study team surveyed other areas to identify dispersed dwellings that were likely inhabited by Latino residents. The lists of neighborhood and dispersed dwellings contained 4376 possible Latino dwellings, with about two thirds in neighborhoods. The investigators randomized the lists proportionally with two thirds from neighborhoods and one third from dispersed dwellings.

Recruiters visited randomly selected dwellings. They screened residents for inclusion criteria: self-identified as Latino or Hispanic, worked 35 hours or more per week in a manual labor job, and aged 18 years or older. We defined manual labor in poultry processing as nonsupervisory work in a poultry processing plant with job categories from receiving through sanitation. We excluded poultry farm employees. We defined other manual labor as employment in nonmanagerial jobs in industries such as landscaping, construction, restaurant work, hotel work, child care, and manufacturing. Non–poultry workers with previous work in poultry only qualified if lifetime employment in poultry processing was 6 months or less, and not within the past 2 years. More than 1 resident per dwelling could be recruited. Of 1681 dwellings selected, interviewers screened 965, for a screening rate of 57%. Of 1526 individuals screened, 957 were eligible for enrollment, with 742 completing interviews (77.5% participation rate). The participants included 319 women (77.6% participation rate), with 173 employed as poultry processing workers (82.0% participation rate), and 146 employed as other manual workers (73.0% participation rate).

Participants completed face-to-face interviews in their homes. All interviews were conducted in Spanish. Interviews took approximately 60 minutes to complete and included information on work history, work environment, symptoms and disability, and psychosocial characteristics. The respondent was given a $10 incentive for participation.

Measures

We considered measures from the 3 work organization domains: job demands, decision latitude, and support. We measured 2 of the 3 job demands measures—heavy load and awkward posture—with an established physical workload instrument[30] that has been used in previous research with immigrant Latinos (scale items in English and Spanish are available as a supplement to the online version of this article at http://www.ajph.org).[19] Response options ranged from "seldom/never" (1) through "almost always" (4). We assessed heavy load with the average of 12 items ($\alpha = 0.70$), and we assessed awkward posture with the average of 6 items ($\alpha = 0.80$), coded such that higher values indicated greater exposure.

We assessed 1 job demand—psychological demand—and the 2 decision latitude measures—skill variety and job control—by using items modified from the Job Content Questionnaire[31] with response options ranging from "seldom/never" (1) through "almost always" (4). Psychological demand was the mean of 4 items ($\alpha = 0.74$). Skill variety was the mean of 3 items ($\alpha = 0.70$), and job control was the mean of 3 items ($\alpha = 0.81$). Higher values indicate greater levels for each concept. Each of these measures has been used with immigrant Latino worker populations.[14,20]

We assessed the first support measure—perceived supervisor control—with 7 items from an established instrument.[32] The selected items asked the participant to judge whether her supervisor had control over pay, benefits, promotions, job assignments, and making work difficult. The perceived potential of a supervisor to affect these conditions is a perception of supervisor control. Response options ranged from "strongly disagree" (1) through "strongly agree" (4). Perceived supervisor control was the mean of the 7 items ($\alpha = 0.74$) coded such that higher scores indicated greater perceived control. This measure has been used with immigrant Latino worker populations.[19]

We assessed the second support measure—work safety climate—with the Perceived Safety Climate Scale.[33] This measure has been used in several studies of immigrant Latino workers.[13,15,22] Nine of the items in the scale used a 4-point Likert format. The 10th item included 3 response categories. After an analysis of internal consistency, we discarded 1 of the 9 Likert 4-point format items because of lack of fit within the scale. We calculated a total work safety climate by summing the remaining 9 items ($\alpha = 0.73$). Values for the scale ranged from 9 to 37, with higher values indicating better work safety climate.[21,22] We did not

apply measures of perceived supervisor control and work safety climate to women who reported being self-employed.

We examined 3 sets of health measures (physical health, mental health, and health-related quality of life). We assessed physical health by the location and number of upper body musculoskeletal symptoms in 6 sites: (1) neck, (2) upper or lower back, (3) forearms, (4) wrist or hands, (5) shoulders, and (6) elbows.[34] Participants reporting a symptom for a particular body site were asked whether they experienced discomfort at that site that lasted longer than 1 day in the past 12 months. The extent of a worker's upper body musculoskeletal symptoms was the sum of the number of sites for which she reported symptoms lasting longer than 1 day. We categorized the resulting count variable into 3 levels (no upper body sites with symptoms, 1 to 3 upper body sites with symptoms, 4 to 6 upper body sites with symptoms). We assessed mental health with the Spanish validated short version of the Center for Epidemiological Studies Depression scale (CES-D).[35] This 10-item version of the scale delineates the frequency and severity of current depressive symptoms.[36] We scored items in a 4-point scale and summed. Possible scores ranged from 0 to 30 ($\alpha = 0.72$); greater scores reflect higher levels of depressive symptoms.[37] We assessed health-related quality of life with the Spanish version of the Short Form-12 (SF-12; $\alpha = 0.60$).[38] We used proprietary scoring procedures to create mental (MCS-12) and physical (PCS-12) component summary scores that ranged from 0 to 100, had a mean score of 50, and a standard deviation of 10. Higher scores reflect better perceived health.

Personal characteristics included age and years lived in the United States. Language had the values of Spanish and indigenous, based on the language spoken at home when the participant was a child.

Analysis

We adjusted all statistical analyses for the stratified sampling design of the study. We summarized the overall sample by using means and standard errors for the continuous characteristics and frequencies and percentages for the categorical characteristics. We compared personal, health, and work organization characteristics between poultry processing and other manual workers by using linear regression models for the continuous variables and the Rao-Scott χ^2 test for the categorical variables. We examined associations between the work organization indicators and the health outcomes by using both bivariate and multivariate models. In particular, we used relative risk regression models for the binary health outcome musculoskeletal symptoms. We used a generalized estimating equation approach to estimate the prevalence ratio (PR). In situations where models fit by using log link with a binomial distribution failed to converge, we used a normal distribution instead. We modeled the number of musculoskeletal symptoms by using nominal logistic regression to allow the association between predictors and outcome to differ across outcome levels. We presented maximum likelihood estimates of odds ratios, and used the Wald χ^2 test in aforementioned analyses.

We used linear regression models to analyze CES-D scores and health-related quality of life. Least square estimates for regression coefficients are presented, and the F test was used for statistical inferences. We note that the continuous variables (including all work organization indicators) were not standardized in the analyses. Therefore, all association is interpreted as the effect on an outcome with 1 unit increase of a predictor. We performed all analyses with SAS version 9.3 (SAS Institute, Cary, NC) and we considered P values less than .05 statistically significant.

RESULTS

Participant personal and health characteristics are presented in Table 1. Work organization measures are presented in Table 2.

The job demands indicators of work organization were consistently associated with the health indicators (Table 3). Heavy load was positively associated with having musculoskeletal symptoms and with CES-D score; awkward posture was positively associated with having musculoskeletal symptoms and CES-D score, and inversely associated with the SF-12 MCS; and psychological demand was positively associated with musculoskeletal symptoms and CES-D score, and inversely associated with the SF-12 MCS. The decision latitude indicators were also consistently associated with the health indicators. Increased skill variety decreased the odds for having musculoskeletal symptoms and was inversely associated with CES-D score. Increased job control decreased the odds of having musculoskeletal symptoms and had a significant positive association with the SF-12 MCS. The support indicators had limited association with the health indicators.

We ran multivariate models predicting health with and without the support indicators (Table 4). The associations of number of musculoskeletal symptoms with each of the work organization measures were the same whether the supervision indicators were included in the models. Heavy load had no association with number of musculoskeletal symptoms. Awkward posture and psychological demand were directly associated with the number of musculoskeletal symptoms when we compared 1 to 3 symptoms or 4 to 6 symptoms with no symptoms. Among the decision latitude indicators, job control had no association with number of musculoskeletal symptoms. Skill variety was inversely associated with the number of musculoskeletal symptoms, when we compared 1 to 3 symptoms with no symptoms.

The associations of depressive symptoms with each of the work organization measures were also the same whether we included the support indicators in the models. Awkward posture was directly associated with the CES-D score. Skill variety was inversely associated with the CES-D score, and psychological demand was positively with the CES-D score. It was surprising that job control was positively associated with the CES-D score. In the model that included the supervision indicators, work safety climate was inversely associated with CES-D score at the trend level. The association of mental health–related quality of life with the work organization measures differed little when we included the support indicators. Of the job demands indicators, psychological demand was inversely associated with the SF-12 MCS.

DISCUSSION

Similar to other low-income workers, these immigrant women manual workers experienced relatively high levels of musculoskeletal and depressive symptoms, and relatively low

TABLE 1—Personal and Health Characteristics of Latina Woman Manual Workers: Western North Carolina, 2010

Characteristics	All Women Manual Workers, No. (%) or Mean ±SE	Poultry Processing Workers, No. (%) or Mean ±SE	Other Manual Workers, No. (%) or Mean ±SE	P
Age, y	34.3 ±0.5	35.2 ±0.7	33.3 ±0.8	.08
Years lived in United States	11.1 ±0.3	12.0 ±0.4	10.1 ±0.5	.01
Language				
Spanish	258 (81.4)	138 (80.1)	120 (82.2)	.72
Indigenous	59 (18.6)	33 (19.9)	26 (17.8)	
Musculoskeletal symptoms, location				
Neck	54 (16.9)	32 (18.5)	22 (15.1)	.39
Upper or lower back	108 (33.9)	61 (35.3)	47 (32.2)	.58
Forearms	88 (27.6)	52 (30.1)	36 (24.7)	.28
Wrists or hands	111 (34.8)	69 (39.9)	42 (28.8)	.04
Shoulders	98 (30.7)	58 (33.5)	40 (27.4)	.25
Elbows	22 (6.9)	20 (11.6)	2 (1.4)	< .01
No. of musculoskeletal symptoms				.1
None	132 (41.4)	62 (35.8)	70 (48.0)	
1–3	135 (42.3)	79 (45.7)	56 (38.4)	
4–6	53 (16.3)	32 (18.5)	20 (13.7)	
Depression (CES-D)	6.2 ±0.2	6.5 ±0.3	5.8 ±0.4	.22
Health-related quality of life (SF-12)				
Physical	42.8 ±0.3	42.9 ±0.4	42.7 ±0.5	.84
Mental	38.3 ±0.5	38.5 ±0.6	38.1 ±0.8	.74

Note. CES-D = Center for Epidemiological Studies Depression scale; SF-12 = Short Form-12. The sample size for all women manual workers was n = 319; for poultry processing workers, n = 173; for other manual workers, n = 146.

health-related quality of life.[5] The manner in which their work is organized includes high physical and psychological work demands, and limited decision latitude, indicting "passive jobs."[10] These women perceived their supervisors to have a high level of control and

TABLE 2—Work Organization Indicators for Latina Woman Manual Workers (n = 319): Western North Carolina, 2010

Organization of Work	Total Sample Mean ±SE	Range	Poultry Processing Workers, Mean ±SE	Other Manual Workers, Mean ±SE	P
Job demands					
Heavy load	1.76 ±0.43	1.0–3.5	1.75 ±0.03	1.77 ±0.04	.64
Awkward posture	2.00 ±0.79	1.0–4.0	2.30 ±0.06	1.64 ±0.06	< .01
Psychological demand	2.42 ±0.92	1.0–4.0	2.78 ±0.07	1.99 ±0.06	< .01
Decision latitude					
Skill variety	1.85 ±0.76	1.0–4.0	1.68 ±0.05	2.06 ±0.07	< .01
Job control	1.85 ±0.95	1.0–4.0	1.56 ±0.05	2.21 ±0.09	< .01
Support					
Perceived supervisor control[a]	2.31 ±0.51	1.0–3.8	2.24 ±0.04	2.44 ±0.05	< .01
Work safety climate[a]	24.63 ±3.61	13.0–37.7	24.65 ±0.25	24.61 ±0.43	.93

[a]Excludes self-employed; for perceived supervisor control, the sample size was n = 273; for work safety climate n = 269.

reported work safety climates similar to those of other Latino manual workers.[13,15] Work organization characteristics were consistently associated with multiple health outcomes among these immigrant women employed in manual occupations. Greater physical (awkward posture) and psychological job demands among these Latina manual workers were associated with poorer health as indicated by greater musculoskeletal symptoms, more depressive symptoms, and less mental health–related quality of life, and these associations remained in models in which we included decision latitude, support, and personal characteristics. Likewise, lower decision latitude (skill variety and job control) for these workers was associated with greater musculoskeletal symptoms and more depressive symptoms; it had little association with health-related quality of life. However, support measures—perceived supervisor control and work safety climate—had little association with worker health.

Research on the associations of work organization and health among immigrant manual workers remains limited.[14,15,19-22] This analysis builds upon this research and supports the importance of the demands–control–support model[10-11] for understanding and improving the occupational health of vulnerable workers. This is among the first attempts to include measures from each component of the demands–control–support model in one analysis.

Like other analyses, these results document the association of demands and decision latitude (control) with the occupational health of vulnerable workers. For example, a recent analysis by Swanberg et al.[15] reported on both work organization and health outcomes for male immigrant crop and livestock farmworkers, indicating that they have high physical demands and low job control, while experiencing high levels of musculoskeletal and respiratory symptoms. High physical demands and little decision latitude are hallmarks of the jobs held by vulnerable workers. The associations of heavy load and awkward posture with musculoskeletal and depressive symptoms found in this analysis reflect other studies of immigrant female and male poultry processing workers.[19,20] Although the strong associations of psychological demand with musculoskeletal symptoms, depressive symptoms, and health-related quality of life found in this

TABLE 3—Bivariate Associations of Work Organization With Health Indicators for Latina Woman Manual Workers (n = 319): Western North Carolina, 2010

Health Indicators	Job Demands								Decision Latitude				Support[a]	
	Heavy Load, Ratio (95% CI) or Mean ±SE	P	Awkward Posture, Ratio (95% CI) or Mean ±SE	P	Psychological Demand, Ratio (95% CI) or Mean ±SE	P	Skill Variety, Ratio (95% CI) or Mean ±SE	P	Job Control, Ratio (95% CI) or Mean ±SE	P	Perceived Supervisor Control, Ratio (95% CI) or Mean ±SE	P	Work Safety Climate, Ratio (95% CI) or Mean ±SE	P
Musculoskeletal symptoms, location,[b] PR		<.01		<.01		<.01		.01		.02		.45		.2
Neck	1.43 (0.86, 2.38)		1.49 (1.10, 2.01)		1.30 (1.00, 1.69)		0.93 (0.65, 1.32)		0.87 (0.65, 1.16)		1.06 (0.64, 1.74)		0.96 (0.89, 1.04)	
Upper or lower back	1.54 (1.14, 2.07)		1.21 (1.00, 1.45)		1.37 (1.16, 1.61)		0.88 (0.71, 1.08)		0.76 (0.61, 0.95)		1.19 (0.80, 1.65)		1.01 (0.96, 1.06)	
Forearms	1.53 (1.11, 2.10)		1.29 (1.06, 1.58)		1.44 (1.20, 1.73)		0.74 (0.57, 0.96)		0.82 (0.67, 1.01)		1.26 (0.87, 1.81)		1.02 (0.96, 1.08)	
Wrists or hands	1.31 (0.95, 1.81)		1.49 (1.28, 1.73)		1.44 (1.24, 1.67)		0.86 (0.69, 1.06)		0.76 (0.62, 0.93)		1.12 (0.82, 1.53)		0.98 (0.94, 1.03)	
Shoulders	1.34 (0.99, 1.80)		1.32 (1.09, 1.58)		1.32 (1.13, 1.55)		0.86 (0.70, 1.06)		0.96 (0.80, 1.15)		1.23 (0.86, 1.76)		1.03 (0.98, 1.09)	
Elbows	0.92 (0.34, 2.48)		2.16 (1.38, 3.38)		1.93 (1.13, 3.29)		0.72 (0.41, 1.27)		0.42 (0.24, 0.74)		0.68 (0.31, 1.51)		0.94 (0.85, 1.05)	
No. of musculoskeletal symptoms,[c] OR		.02		.02		<.01		<.01		.04		.13		.2
1–3 vs none	2.50 (1.32, 4.72)		1.98 (1.43, 2.75)		1.84 (1.39, 2.44)		0.61 (0.44, 0.84)		0.74 (0.58, 0.96)		0.99 (0.60, 1.64)		0.93 (0.97, 1.00)	
4–6 vs none	2.72 (1.24, 5.93)		2.38 (1.57, 3.59)		2.37 (1.59, 3.55)		0.71 (0.46, 1.08)		0.64 (0.41, 0.98)		1.55 (0.73, 3.29)		0.99 (0.90, 1.11)	
Depression (CES-D)[b]	1.54 ±0.69	.02	1.47 ±0.39	<.01	0.82 ±0.31	<.01	−0.75 ±0.38	.04	0.08 ±0.29	.78	−1.32 ±0.58	.02	−0.21 ±0.08	<.01
Health-related quality of life[d]														
SF-12 PCS	−0.24 ±0.80	.76	−0.82 ±0.49	.09	0.00 ±0.40	.99	0.76 ±0.50	.13	0.18 ±0.49	.71	−0.47 ±0.84	.57	0.19 ±0.12	.09
SF-12 MCS	−1.63 ±1.33	.22	−1.33 ±0.70	.05	−1.64 ±0.58	<.01	1.27 ±0.70	<.01	1.06 ±0.51	.03	2.20 ±1.01	.02	0.35 ±0.16	.02

Note. CES-D = Center for Epidemiological Studies Depression scale; CI = confidence interval; MCS = mental component score; OR = odds ratio; PCS = physical component score; PR = prevalence ratio. The organization of work indicators are not standardized; therefore, the associations presented are for a 1-unit change in the independent variable.
[a] Excludes self-employed; for perceived supervisor control n = 273; for work safety climate n = 269.
[b] Relative risk regression models with Score test.
[c] Nominal logistic region models with Wald χ^2 test.
[d] Linear regression models with F test.

analysis differs from analyses of immigrant male farmworkers,[14,39] it is similar to results for analyses of female and male Latino poultry processing workers and male Latino construction workers,[17,18,40] which found that skill variety and psychological demands were associated with musculoskeletal problems, respiratory problems, and self-reported injury or illness.

The important associations of job demands and decision latitude with health found in this analysis are in direct contrast with Grzywacz et al.[14] who found relatively little support for the job demands–control–support model in analyses of job demands and control in immigrant farmworker health. However, like Grzywacz et al., given the limitations of this study, it is important to avoid overinterpreting the pattern of results.

The limited association of supervisor support for health outcomes among these vulnerable workers is surprising. Arcury et al.[21,22] reported on one aspect of support—work safety climate—among female and male immigrant poultry processing workers, relating work safety climate and the use of personal protective equipment; however, those analyses did not examine how work safety climate is related to health. This is also in contrast with Grzywacz et al.[19,20] who reported abusive supervision and poor safety commitment to be associated with risk of recent musculoskeletal problems, respiratory problems, and self-reported injury or illness among female and male Latino poultry processing workers. Likewise, immigrant male farmworkers who perceived work safety climate to be poor reported greater musculoskeletal discomfort and elevated depressive symptoms, and were more likely to work when injured or ill.[13] These differences could reflect the difference in gender composition of this study (all women) and the previous studies (mixed men and women). They could also indicate that supervisor support may not be as important as demands and decision latitude in the health of immigrant and other vulnerable workers.

The positive association of perceived supervisor control on mental health–related quality of life reflects other research. Swanberg et al.[15] suggested that perceived supervisor attitudes toward safety may increase safety climate among immigrant farmworkers. Hoppe et al.[41]

TABLE 4—Multivariate Associations of Work Organization With Health Indicators for Latina Woman Manual Workers: Western North Carolina, 2010

Organization of Work Indicators	Musculoskeletal Symptoms[a]			Depression (CES-D)[b]		Mental Health-Related Quality of Life (SF-12 MCS)[b]	
	1–3 vs None, OR (95% CI)	4–6 vs None, OR (95% CI)	Overall P	Mean ±SE	P	Mean ±SE	P
			Models without supervision indicators (n = 319)				
Demands							
Heavy load	2.19 (0.90, 5.30)	1.78 (0.64, 4.96)	.21	0.59 ±0.71	.4	−0.28 ±1.42	.84
Awkward position	1.60 (1.05, 2.42)	2.00 (1.05, 2.42)	.02	1.43 ±0.49	<.01	−1.10 ±0.83	.18
Psychological demand	1.51 (1.06, 2.15)	1.89 (1.11, 3.20)	.02	0.65 ±0.35	.06	−2.08 ±0.69	<.01
Decision latitude							
Skill variety	0.61 (0.41, 0.89)	0.85 (0.45, 1.58)	.04	−1.07 ±0.40	<.01	1.08 ±0.80	.18
Job control	1.00 (0.72, 1.38)	0.79 (0.44, 1.40)	.71	0.80 ±0.32	.01	0.32 ±0.65	.62
Personal characteristics							
Age	1.00 (0.97, 1.04)	1.04 (0.99, 1.08)	.13	−0.01 ±0.03	.66	0.09 ±0.06	.13
Years lived in United States	1.03 (0.99, 1.03)	0.99 (0.88, 1.00)	<.01	0.09 ±0.06	.11	−0.28 ±1.42	<.01
Indigenous vs nonindigenous language	3.56 (1.57, 8.02)	5.20 (1.95, 13.87)	<.01	−0.26 ±0.69	.70	1.21 ±1.56	.43
Poultry vs nonpoultry	0.73 (0.37, 1.45)	0.63 (0.24, 1.66)	.55	0.94 ±0.67	.16	−3.85 ±1.26	<.01
			Models with supervision indicators (n = 269)				
Demands							
Heavy load	2.19 (0.90, 5.30)	1.78 (0.64, 4.96)	.21	0.58 ±0.82	.47	0.74 ±1.42	.6
Awkward position	1.81 (1.56, 2.85)	2.25 (1.20, 4.21)	.01	1.34 ±0.52	.01	−1.30 ±0.90	.15
Psychological demand	1.32 (0.90, 1.93)	1.81 (1.05, 3.14)	.08	0.71 ±0.36	.05	−2.17 ±0.71	<.01
Decision latitude							
Skill variety	0.55 (0.33, 0.90)	1.01 (0.53, 1.94)	.02	−0.85 ±0.42	.04	0.55 ±0.89	.54
Job control	1.03 (0.72, 1.38)	0.79 (0.44, 1.40)	.71	1.32 ±0.42	<.01	−0.09 ±0.85	.91
Support							
Perceived supervisor control	0.92 (0.50, 1.67)	0.56 (0.25, 1.23)	.29	0.30 ±0.52	.56	2.10 ±1.18	.07
Work safety climate	0.94 (0.85, 1.05)	1.02 (0.87, 1.19)	.38	−0.16 ±0.09	.07	0.30 ±0.16	.05
Personal characteristics							
Age	1.01 (0.97, 1.05)	1.04 (0.99, 1.09)	.27	−0.01 ±0.04	.84	0.13 ±0.07	.06
Years lived in United States	1.04 (0.99, 1.09)	0.96 (0.90, 1.03)	.04	0.08 ±0.06	.19	−0.29 ±0.11	.01
Indigenous vs nonindigenous language	3.61 (1.24, 10.48)	5.41 (1.55, 18.90)	.01	−0.50 ±0.78	.52	0.65 ±1.73	.7
Poultry vs nonpoultry	0.95 (0.42, 2.12)	0.69 (0.22, 2.10)	.8	0.65 ±0.72	.36	−3.71 ±1.32	<.01

Note. CES-D = Center for Epidemiological Studies Depression scale; MCS = mental component score; OR = odds ratio; SF-12 = Short Form-12.
[a] Logistic regression models with Wald χ^2 test.
[b] Linear regression models with F test.

found that supervisor support was related to well-being among Latino warehouse workers. These studies suggest that research should focus on how Latino manual workers' perceptions of their supervisors may influence occupational safety and well-being.

These results should be interpreted in light of study limitations. The data came from 1 region of 1 state in 1 year. Generalizations of results to other regions should be made with caution. In this study, we used a cross-sectional design; therefore, causal relationships can only be inferred. However, the study has a number of strengths, including strong sample design, a large sample size and high participation rate, extensive collection of information, and use of existing work organization measures.

Occupational safety policy must consider work organization. Efforts must continue to control such conventional risk factors as chemical, mechanical, and noise exposures among all workers, particularly vulnerable

workers.[42] Ergonomic changes can reduce the risk of some musculoskeletal injuries.[43,44] However, the psychological demand of work and value placed on safety by supervisors require that new approaches be used in the design of jobs. For example, Landsbergis et al.[5] suggested micro- and macrolevel interventions for improving the psychosocial working conditions of immigrant, women, and racial/ethnic minority workers, including increased job autonomy, social support, and management

training (microlevel), and job skills training programs and wage premiums for hazardous jobs (macrolevel). Future research should expand the work organization characteristics that are examined in 2 directions, incorporating (1) additional measures of supervisor and co-worker support (e.g., abuse, harassment), and (2) additional job characteristics (e.g., contingent work, work schedule). Future research should examine clinically assessed measures of health. Finally, longitudinal research is needed to determine the specific causal associations of work organization with injury among immigrant women workers. ∎

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Contributors

T. A. Arcury, J. G. Grzywacz, H. Chen, and S. A. Quandt conceptualized and designed the overall study. S. A. Quandt supervised all aspects of the study's implementation, and D. C. Mora managed the study. T. A. Arcury developed the aims for this specific analysis, and led the writing. H. Chen completed the statistical analysis. All authors helped to conceptualize ideas, interpret findings, and review drafts of the article.

Human Participant Protection

The Wake Forest School of Medicine institutional review board approved this study. All participants provided written informed consent.

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