



The effects of work organization on the health of immigrant manual workers: A longitudinal analysis

Thomas A. Arcury, Haiying Chen, Dana C. Mora, Francis O. Walker, Michael S. Cartwright & Sara A. Quandt

To cite this article: Thomas A. Arcury, Haiying Chen, Dana C. Mora, Francis O. Walker, Michael S. Cartwright & Sara A. Quandt (2016) The effects of work organization on the health of immigrant manual workers: A longitudinal analysis, *Archives of Environmental & Occupational Health*, 71:2, 66-73, DOI: [10.1080/19338244.2014.955164](https://doi.org/10.1080/19338244.2014.955164)

To link to this article: <http://dx.doi.org/10.1080/19338244.2014.955164>



Accepted author version posted online: 26 Aug 2014.
Published online: 26 Aug 2014.



[Submit your article to this journal](#)



Article views: 106



[View related articles](#)



[View Crossmark data](#)

The effects of work organization on the health of immigrant manual workers: A longitudinal analysis

Thomas A. Arcury^a, Haiying Chen^b, Dana C. Mora^c, Francis O. Walker^d, Michael S. Cartwright^d, and Sara A. Quandt^b

^aDepartment of Family and Community Medicine, Center for Worker Health, Wake Forest School of Medicine, Winston-Salem, North Carolina, USA; ^bDepartment of Biostatistical Sciences, Division of Public Health Sciences, Center for Worker Health, Wake Forest School of Medicine, Winston-Salem, North Carolina, USA; ^cDepartment of Epidemiology and Prevention, Division of Public Health Sciences, Center for Worker Health, Wake Forest School of Medicine, Winston-Salem, North Carolina, USA; ^dDepartment of Neurology, Center for Worker Health, Wake Forest School of Medicine Winston-Salem, North Carolina, USA

ABSTRACT

This analysis uses a longitudinal design to examine the associations of work organization and health outcomes among Latino manual workers. Participants included 247 Latino workers who completed baseline and 1-year follow-up interviews and clinical examinations. Health outcome measures were epicondylitis, rotator cuff syndrome, back pain, and depressive symptoms. Independent measures were measures of job demand, job control, and job support. Workers commonly experienced rotator cuff syndrome (6.5%), back pain (8.9%), and depressive symptoms (11.2%); fewer experienced epicondylitis (2.4%). Psychological demand was associated with rotator cuff syndrome; awkward position and decision latitude were associated with back pain. Decreased skill variety but increased decision latitude was associated with elevated depressive symptoms. Work context factors are important for health outcomes among vulnerable workers. Further research is needed to expand upon this work, particularly cultural perspectives on job support.

ARTICLE HISTORY

Received 28 February 2014
Accepted 10 July 2014

KEYWORDS

Health disparity; immigrant health; immigrant workers; longitudinal study; minority health; occupational health; organization of work

The way in which work is organized affects worker health. Work organization is conceptualized at 3 levels, external context (eg, economic developments, regulation and policy), organizational context (eg, organizational restructuring, alternative employment arrangements), and work context (eg, culture and climate, task attributes, worker roles).¹ Work context reflects the components of the job demand-control-support model.^{2–4} For immigrant workers, the components of work context are particularly important. Immigrant workers constitute a vulnerable population with little control over the work environment. Most of these workers are employed in manual industries with the highest rates of injury and fatalities, including agriculture, meat processing, food service, personal care, and construction.^{5–9} Within these industries, immigrant workers are concentrated in jobs described as “3-D,” dirty, demeaning, and dangerous,¹⁰ and which are the lowest-skilled and the most dangerous.¹¹ The manual work in which most immigrant workers are engaged provides little flexibility in how the work can be done and includes structural constraints, such as high speed and extreme force, that increase the risk of injury.¹² Immigrant workers in the United States

experience rates of occupational injury and mortality greater than the native worker population.¹³

Analyses have begun to delineate the associations of work context factors with the health of immigrant workers. For example, Swanberg and colleagues report that abusive supervision and awkward postures were associated with occupational illness among immigrant farmworkers in Kentucky.¹⁴ Grzywacz and colleagues’ analysis of National Agricultural Workers Survey (NAWS) data shows that psychological demand is associated with poor self-reported health and elevated depressive symptoms.¹⁵ Grzywacz and colleagues report that manufacturing workers with high psychological demand and low control are more likely to experience diagnosed musculoskeletal injuries (epicondylitis, rotator cuff syndrome).¹⁶ Arcury and colleagues report that among immigrant Latino women workers employed in manual jobs, greater job demand (heavy load, awkward posture, greater psychological demand) is associated with more musculoskeletal and depressive symptoms, as well as increased risk of epicondylitis, rotator cuff syndrome, and carpal tunnel syndrome; that less job control (lower skill variety and decision latitude) is associated with more musculoskeletal symptoms, as well as increased risk of

epicondylitis and carpal tunnel syndrome; and that greater support (perceived supervisor's power, safety climate) is associated with fewer depressive symptoms.^{17,18}

Investigations of work context and the health of Latino immigrant workers in the United States have relied on cross-sectional data. Confounding factors cloud the temporal association between work context and health outcomes. The goal of this analysis is to determine the effects of the job demand, job control, and job support components of work context on the presence of the health outcomes epicondylitis, rotator cuff syndrome, back pain, and depressive symptoms among immigrant Latino manual workers using longitudinal data collected at a 1-year interval. These 4 health outcomes are commonly experienced by immigrant manual workers.^{14–18}

Methods

This analysis uses data from a study comparing Latino poultry processing workers occupational injuries with those among other Latino manual workers.^{19–22} Base-line data were collected in 2009–2010; follow-up data were collected in 2010–2011. The study was approved by the Wake Forest School of Medicine Institutional Review Board. All participants provided signed informed consent.

Participants

Participants for the baseline data collection were recruited from a 4-county area in western North Carolina. Two procedures were used to locate potential participants. First, dwellings in Latino neighborhoods in the 4 counties were mapped and listed. Second, the 4 counties were surveyed to identify dispersed dwellings with Latino residents; these dispersed dwellings were identified either by having local informants (store employees, clergy) indicating their location or by physical symbols indicative of Latino residents (eg, parked vehicles with Mexican flag or Virgin of Guadalupe decals; satellite dishes from the company with Spanish language channels). Two thirds of the 4,376 potential Latino dwellings that were listed were in neighborhoods. Dwellings were randomly listed, with two thirds from neighborhoods and one third from dispersed dwellings.

Interviewers visited randomly selected dwellings and screened residents for the inclusion criteria: self-identified as Latino or Hispanic, worked 35 hours or more per week in a manual job, and aged 18 years or older. More than 1 resident per dwelling could be recruited. Manual labor in poultry processing was defined as nonsupervisory work in a poultry processing plant with job categories from receiving through sanitation. Other manual labor was defined 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 were excluded if they had more than 6 months' employment in poultry processing or had worked in poultry processing in the previous 2 years. Of 1,681 dwellings contacted, 965 were screened, for a screening rate of 57%. Of 1,526 individuals screened, 957 were eligible for enrollment, with 742 completing interviews (77.5% participation rate), and 518 completing a baseline clinic (69.8% clinic participation retention rate).

Participants who did not have a diagnosis of carpal tunnel syndrome or of a dermatological condition (infectious or inflammatory dermatitis) at the baseline clinic were invited to participate in a 1-year follow-up. A total of 268 participants (51.7% of those completing the baseline clinic) met the inclusion criteria, and 254 were recruited to the follow-up (94.8% participation rate). Monthly contacts with telephone calls or in person by the interviewers helped to retain participation. At the end of the year, the participants were invited to participate in a follow-up data collection, with 247 completing the follow-up for a retention rate of 97.2%.

Data collection

Baseline data collection included an interviewer-administered questionnaire that collected participant personal characteristics, the items to construct the work organization measures, and the items to construct the depressive symptoms measure, and a clinical evaluation conducted by a physician to diagnose epicondylitis, rotator cuff syndrome, and back pain. The baseline interviews were completed in the participants' homes. The clinical evaluations were completed in a series of research clinics conducted in central locations within the 4 research counties within 1 month of when the participants completed the baseline interviews. Follow-up data collection included a short interviewer-administered questionnaire that included information to construct the depressive symptoms measure and a clinical evaluation to diagnose epicondylitis, rotator cuff syndrome, and back pain. The follow-up questionnaire also included items to measure changes in employment, which occurred for only 12 participants and is not considered in this analysis. The follow-up interviews and clinical evaluations were completed in a series of research clinics conducted in central locations in the 4 research counties.

Measures

Measures for the work context domains job demand, job control, and job support were constructed from the baseline interview data. The job demand measures, heavy

load and awkward position, were based on an established workload instrument.²³ Response options ranged from “seldom/never” (1) through “almost always” (4). Heavy load was the mean of 12 items ($\alpha = .83$), and awkward position was the mean of 6 items ($\alpha = .78$). High values for each indicated greater exposure. Psychological demand, the final job demand measure, was assessed with the mean of 4 items modified from the Job Content Questionnaire²⁴ ($\alpha = .70$). Response options ranged from “seldom/never” (1) through “almost always” (4). High values indicated greater psychological demand. Job control measures included skill variety ($\alpha = .71$) and decision latitude ($\alpha = .83$), each based on 3 items modified from the Job Content Questionnaire.²⁴ The skill variety items addressed requirements to learn new things, be creative, and develop special skills; the decision latitude items addressed being allowed to make decisions, deciding how to do work, and having a say about what happens on the job. Response options ranged from “seldom/never” (1) through “almost always” (4). High values indicated greater variety and latitude. These measures have been used previous research with immigrant Latino workers.¹⁷

The support measure, perceived supervisor control, was assessed with 7 items from an established instrument.^{17,25} Response options ranged from “strongly disagree” (1) through “strongly agree” (4). Perceived supervisor control is the mean of the 7 items ($\alpha = .64$) coded such that higher scores indicate greater perceived control. The second support measure, work safety climate, was assessed with the Perceived Safety Climate Scale.^{14,19,26,27} 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, 1 of the 9 4-point Likert format items was discarded due to lack of fit within the scale. A total Work Safety Climate was calculated by summing the remaining 9 items ($\alpha = .72$). Values for the scale ranged from 9 to 39, with higher values indicating better work safety climate. Measures of perceived supervisor control and work safety climate were not applied to participants who reported being self-employed.

Physician diagnosed epicondylitis was defined as self-reported pain at either epicondyle area on 2 or more days in the previous month and one of the following on examination: presence of pain at the lateral epicondyle with resisted active wrist extension, pain at the medial epicondyle with resisted active wrist flexion, or tenderness to palpation over the medial and lateral epicondyle regions physical examination.^{22,28} Rotator cuff syndrome was defined as self-reported pain at the shoulder on 2 or more days in the previous month and one of the following on examination: presence of pain with resisted

abduction, internal rotation, external rotation, or forward flexion of the shoulder, or tenderness to palpation over the bicipital groove or lateral shoulder. Low back pain was defined as self-reported low back pain on 2 or more days in the previous month and one of the following on examination: presence of pain with active flexion, extension, side-bending to right or left, or twisting to right or left, or tenderness to palpation in the lumbar region. Depressive symptoms were assessed with the Spanish validated short version of the Center for Epidemiological Studies Depression scale (CES-D).²⁹ This 10-item version of the scale delineates the frequency and severity of current depressive symptoms.³⁰ Items were scored in a 4-point scale and summed. Possible scores range from 0 to 30 ($\alpha = .72$); greater scores reflect higher levels of depressive symptoms. Elevated depressive symptoms were defined as having a score of 10 or higher.

Personal and work characteristics considered in the analysis are age in years, gender, indigenous language, and industry. Indigenous language indicates that an indigenous language was spoken in the participant’s home when a child. Industry indicates whether the participant worked in poultry processing or in another industry.

Analysis

Although data are from a study comparing outcomes in poultry processing workers and other manual workers, both groups of workers were treated as 1 sample for this analysis. Descriptive statistics (means and standard deviations for continuous variables and counts and percentages for categorical variables) were used to describe the personal, work organization, and health characteristics for the overall sample. Next, logistic regression models were fit to examine the association between baseline work organization characteristics and prevalence of rotator cuff syndrome, back pain, and elevated depressive symptoms at 1 year. Since the status of a condition at baseline is likely to be strongly associated with the corresponding status at 1 year, we include the baseline condition in all models to (1) account for potential confounding effect of baseline status and (2) to reduce residual variability to improve precision of the parameter estimates. All models were also adjusted for gender, age, indigenous language, and industry while accounting for the stratification and clustering of sample design. Specifically, strata were defined based on the county in which the participants resided and the clusters were defined based on households. Two sets of multivariate logistic models were fit with and without the job support measures (perceived supervisor control and work safety climate), since these 2 measures were not applicable to participants who were self-employed. Adjusted odds

ratios (ORs) and 95% confidence intervals (CIs) were reported. Multivariate analysis was not completed for epicondylitis due to the small number of cases. All analyses were performed using SAS 9.3 (Cary, NC) and *p* values less than .05 were considered statistically significant.

Results

Participant personal, work organization, and health characteristics

All of the participants were immigrants to the United States who were born in Mexico or a Central American country. The mean age of the participants was 31.6 years (*SD* = 9.1) (Table 1). About one half of the participants were female. One in 5 spoke an indigenous language. About one third (36.0%) worked in poultry processing. Very few (4.9%) had changed jobs in the previous year. The mean and standard deviations for each of the work organization scales are presented in Table 1. The number of participants with musculoskeletal injuries and depression decreased during the year (Table 2). At baseline, 9 participants (3.6%) were diagnosed with epicondylitis, 30 (12.2%) with rotator cuff syndrome, 43 (17.4%) with back pain, and 41 (16.7%) with depression. At the follow-up, 6 participants (2.4%) were diagnosed with epicondylitis, 16 (6.5%) with rotator cuff syndrome, 22 (8.9%) with back pain, and 27 (11.2%) with depression. Of the 6 participants with epicondylitis at follow-up, 3 were new cases and 3 were chronic cases diagnosed at

Table 1. Baseline personal and work context characteristics, Latino manual workers, Western North Carolina, 2009–2011 (*N* = 247).

Personal and work context characteristics	<i>n</i>	%	Mean	<i>SD</i>	Range
<i>Personal characteristics</i>					
Age			31.6	9.1	
Gender					
Female	124	50.2			
Male	123	49.8			
Indigenous language	50	20.3			
Industry					
Poultry	89	36.0			
Other	158	64.0			
Changed job	12	4.9			
<i>Work context</i>					
<i>Job demand</i>					
Heavy load			2.1	0.6	1–4
Awkward posture			2.1	0.8	1–4
Psychological demand			2.4	0.8	1–4
<i>Job control</i>					
Skill variety			2.1	0.8	1–4
Decision latitude			2.0	1.0	1–4
Support					
Perceived supervisor control (excludes self-employed)			2.4	0.5	1–4
Work safety climate (excludes self-employed)			24.9	3.4	10–39

Table 2. Health characteristics at baseline and follow-up, Latino manual workers, Western North Carolina, 2009–2011 (*N* = 247).

Health outcomes	Baseline		Follow-up	
	<i>n</i>	%	<i>n</i>	%
Epicondylitis	9	3.6	6	2.4
Rotator cuff syndrome	30	12.2	16	6.5
Back pain	43	17.4	22	8.9
Elevated depressive symptoms	41	16.7	27	11.2

baseline; of the 16 participants with rotator cuff syndrome at follow-up, 6 were new cases and 10 were chronic cases diagnosed at baseline; of the 22 participants with low back pain at follow-up, 12 were new cases and 10 were chronic cases diagnosed at baseline; and of the 27 participants with epicondylitis at follow-up, 20 were new cases and 7 were chronic cases diagnosed at baseline.

Effects of work context on and health characteristics

The associations of job demand and job control measures with rotator cuff syndrome, back pain, and elevated depressive symptoms were very similar in the models with and without the job support measures (Table 3). Psychological demand increased the odds of having rotator cuff syndrome (OR = 4.09, 95% CI = 1.51 – 11.12 without the job support measures in the model, and OR = 3.80, 95% CI = 1.42 – 10.08 with the job support measures in the model). Awkward position increased the odds of having back pain (OR = 2.43, 95% CI = 1.19 – 4.97 without the job support measures in the model, and OR = 4.20, 95% CI = 1.54 – 11.49 with the job support measures in the model), whereas decision latitude decreased the odds of having back pain (OR = 0.15, 95% CI = 0.04 – 0.53 only with the job support measures in the model). Skill variety decreased the odds of having elevated depressive symptoms (OR = 0.45, 95% CI = 0.25 – 0.80 without the job support measures in the model, and OR = 0.39, 95% CI = 0.20 – 0.76 with the job support measures in the model). Decision latitude increased the odds of having elevated depressive symptoms (OR = 1.92, 95% CI = 1.06 – 3.48 without the job support measures in the model, and OR = 2.60, 95% CI = 1.33 – 5.09 with the job support measures in the model). The job support measures were not significantly associated with any of the outcomes.

Comment

Rotator cuff syndrome, back pain, and depression are common among the Latino manual workers who participated in this study, with rates of between 1 in 10 and 1 in 20 in this population. The measures of work

Table 3. Effects of worker context characteristics on health characteristics, Latino manual workers, Western North Carolina, 2009–2011 ($N = 247$).

Work Context	Health characteristics								
	Rotator cuff syndrome*			Back pain*			Elevated depressive symptoms*		
	Odds ratio	95% CI	<i>p</i> value	Odds ratio	95% CI	<i>p</i> value	Odds ratio	95% CI	<i>p</i> value
Models without supervision indicators ($N = 247$)									
Job demand									
Heavy load	0.80	0.16–3.95	0.78	1.35	0.60–3.20	0.46	0.64	0.24–1.71	0.38
Awkward posture	1.77	0.79–3.98	0.16	2.43	1.19–4.97	0.01	1.64	0.70–3.81	0.25
Psychological demand	4.09	1.51–11.12	0.00	0.57	0.27–1.19	0.13	0.61	0.10–1.22	0.16
Job control									
Skill variety	1.02	0.40–2.61	0.96	1.16	0.61–2.22	0.64	0.45	0.25–0.80	0.00
Decision latitude	1.39	0.65–2.93	0.37	0.58	0.27–1.24	0.16	1.92	1.06–3.48	0.03
Models with supervision indicators ($N = 215$)									
Job demand									
Heavy load	0.59	0.10–3.59	0.57	2.27	0.78–6.53	0.12	0.77	0.27–2.16	0.62
Awkward posture	2.10	0.83–5.27	0.11	4.20	1.54–11.49	0.00	1.23	0.48–3.16	0.65
Psychological demand	3.80	1.42–10.08	0.00	0.65	0.31–1.36	0.25	0.82	0.41–1.66	0.59
Job control									
Skill variety	0.78	0.26–2.34	0.66	1.45	0.59–3.51	0.40	0.39	0.20–0.76	0.00
Decision latitude	1.48	0.28–3.49	0.36	0.15	0.04–0.53	0.00	2.60	1.33–5.09	0.00
Support									
Perceived supervisor control	3.45	0.77–15.48	0.10	3.00	0.79–11.40	0.10	0.55	0.19–1.56	0.26
Work safety climate	1.00	0.80–1.26	0.96	1.04	0.90–1.20	0.55	1.04	0.87–1.24	0.61

*Analyses adjusted for diagnosis of condition at baseline, gender, age, indigenous language, and industry.

organization used in this analysis have values similar to those reported in other studies.^{14–19,27,31} Psychological demand has an association with the occurrence of rotator cuff syndrome and awkward posture has an association with back pain among these workers. Decision latitude decreased the odds of back pain among these workers. Skill variety is protective of elevated depressive symptoms, whereas decision latitude increases the odds of elevated depressive symptoms. The low prevalence of epicondylitis does not allow for multivariate analysis. Job support measures do not have statistically significant associations with any of the health measures.

Although the occurrence of 3 of the 4 conditions is related to measures of work organization, interestingly, the rates of each of the 4 conditions declined between baseline and follow-up. The reason for the decline in the rates is uncertain. Perhaps the decline reflects a healthy worker effect. Alternatively, this decline may reflect cyclic change in the occurrence of these conditions. For example, depression had the largest number of new cases between baseline and follow-up; the level of depression experienced by an individual is known to vary substantially.

The percentage of participants with epicondylitis is lower among the Latino manual workers participating in this study (2.4% at follow-up) than reported by Fan and colleagues for largely non-Hispanic white manufacturing workers at 12 Washington State worksites (5.5%).³² The level of rotator cuff syndrome among the participants in this study (6.5% at follow-up) is similar to the prevalence of 7.5% in the same 12 Washington State worksites.^{33,34}

Bonauto and colleagues' analysis of Workers' Compensation claims for nontraumatic back disorders among Washington State workers does not provide comparative data on prevalence, but does document that more Spanish language workers compared with English language workers have Workers' Compensation claims for back disorders.³⁵ The percentage of Latino manual workers participating in this study with elevated depressive symptoms at follow-up (11.2%) is relatively high compared with other studies. For example, Fan and colleagues report 5.2% of Washington state workers with depression, but this varies by occupation, with those in manual occupations (ie, truck drivers) having a greater odds of having depression compared with those in management occupations.³⁶ Using data from a national study of farmworkers, most of whom are Latino manual workers, Grzywacz and colleagues report that 8.7% had elevated depressive symptoms.¹⁵

Specific work context characteristics increase the odds of these immigrant workers experiencing rotator cuff syndrome, back pain, and elevated depressive symptoms. Taken together, these results build on previous research indicating that work organization factors affect the health of immigrant and manual workers.^{14,17,18,37} Swanberg and colleagues find that immigrant livestock and crop workers experience high job demand, little job control support, little job support, and high rates of occupational injury.¹⁴ Psychological demand increases the odds of having *rotator cuff syndrome* a year later among the Latino manual workers in this study. Silverstein and

colleagues report that the associations of work organization factors, such as structural constraints, decision latitude, and job satisfaction, with rotator cuff are suggestive.³⁴

Awkward position, a measure of job demand, increases the odds of the Latino manual workers in this study having *back pain* a year later, and decision latitude, a measure of job control, decreases the odds of these workers having back pain a year later. Smith and colleagues find that being in a high strain job (one with high demand and low control) increases the incidence of shoulder symptoms.³⁸

Skill variety, a measure of job control, decreases the odds of the Latino manual workers in this study having *elevated depressive symptoms* a year later, whereas decision latitude increases the risk of these workers having elevated depressive symptoms. Grzywacz and colleagues report that greater psychological demand is associated with elevated depressive symptoms among Latino farmworkers.¹⁵ Similar to earlier analyses, job support does not contribute to any of the health outcomes among the Latino manual workers in this study.¹⁸

The positive association of job control with depression is surprising; the expected effect of greater job control would be to decrease depressive symptoms. However, this result is consistent with earlier, cross-sectional analysis with the female participants in this study.¹⁷ The 3 items used to construct the job control measure are reasonably reliable ($\alpha = .83$). A possible explanation is that the “control” provided to these workers, largely with limited formal education, but which they fear losing, is perceived as a risk that could cause failure and economic jeopardy. The more choices that a worker has, the more errors the worker can make. This interpretation is consistent with analyses indicating that the well-being of Latino immigrant workers is associated with perceived supervisor control. Arcury and colleagues report a positive association of perceived supervisor control on mental health-related quality of life.¹⁷ Swanberg and colleagues argue that supervisor attitudes toward safety increase safety among immigrant farmworkers.¹⁴ Similarly, Hoppe and colleagues report that supervisor support increases well-being among Latino warehouse workers.³⁹ Future work organization research should focus on how Latino manual workers’ perceptions of decision latitude and supervisor power affect worker health and well-being.

The results of this analysis should be considered within its limitations and strengths. The study design required that only those participants without carpal tunnel or dermatological conditions (infectious or inflammatory dermatitis) were followed over the 1-year period and included in this analysis. Those with carpal tunnel

or dermatological conditions could also have had 1 of the 4 health outcomes that are the focus of this analysis (epicondylitis, rotator cuff syndrome, back pain, and depressive symptoms). Those included in this analysis could be healthier than those not followed. Some workers with injuries or elevated depressive symptoms may have left the work force. Workers with part-time employment may experience different rates of injury. Only a small number of participants had each of the 4 health outcomes at the second point. However, even with this small number of events, significant effect sizes with small confidence intervals were detected, indicating that they were robust. Further, ORs from bivariate analyses were compared with those reported in Table 3; the results do not differ substantially. These data are from 1 region of 1 state, which limits the generalizability of the results to other locales. However, the study has a number of strengths, including a longitudinal design and strong sample design, a large sample size and high participation rate, extensive collection of information, and use of existing work organization measures.

This analysis provides additional evidence that work context characteristics, particularly job control and job demand, are associated with the presence of clinically diagnosed musculoskeletal injuries and self-reported depressive symptoms among immigrant manual workers. It suggests that future conceptual development of the organization of work model¹ and job demand-control-support model²⁻⁴ needs to consider different “cultural” contexts for how job control and job support affect health, particularly psychological health. The vulnerability of many manual workers includes a lack of familiarity with the work environment, the belief that any error that they make will result in a penalty, and greater familiarity with a hierarchical employment and social system.¹⁷ Having greater control in some aspects of work provides the opportunity for flexibility, as in the time work begins and ends, and improves life in such areas as work-family balance. Greater control in other aspects of work may provide the opportunity for greater creativity and fulfillment. It also provides the opportunity for making mistakes.

Future research on work organization and health among immigrant workers should expand the use of longitudinal designs that will allow specifying which work organization characteristics are causally related which health outcomes. This research should also expand measurement of the work organization characteristics and the types of health outcomes considered, with preference given to objective measures, such as clinical evaluation. This research should try to build alliances with employers so that better exposure measurement can be considered; unfortunately, experience with employers shows

that they are little interested in research on the health of immigrant and other manual workers.⁴⁰ Future research would benefit from a large sample that is diverse in occupation, gender, immigration status, and ethnicity that would allow comparisons of health outcomes and delineation of work organization effects. Funding for such large studies is difficult to obtain; efforts focused on comparisons of specific populations should endeavor to expand the measures used.

This research also suggests strategies to improve the occupational health of immigrant workers. Work demands, particularly in terms of posture and psychological demand, need to be examined in light of current ergonomic standards. Ergonomic changes can reduce the risk of some musculoskeletal injury.^{41,42} Increasing the frequency of breaks can reduce work injuries, sometimes without impeding productivity.^{43,44} The psychological demands of workers in these manual industries reflect the high levels of productivity demanded of these workers.^{17,45–47} For poultry processing, the industry in which half of the study participants are employed, a current policy initiative from the US Department of Agriculture would increase work demands by increasing the rate of production (line speed) (*Federal Register*, Volume 77, Number 228 [Tuesday, November 27, 2012]), even in the face of evidence showing the detrimental health effects of this policy.⁴⁸

In conclusion, aspects of work context are associated with health outcomes among immigrant manual workers, some of which are not consistent with expectations based on previous research in nonimmigrant populations. Further research is needed to expand upon this work. Policy initiatives need to consider how work organization affects occupational health.

Funding

Research support was provided by the National Institute for Occupational Safety and Health, grant number R01-OH009251.

References

1. Sauter SL, Brightwell WS, Colligan MJ, et al. *The Changing Organization of Work and the Safety and Health of Working People*. Cincinnati, OH: Department of Health and Human Services; 2002. Report No. DHHS (NIOSH) No. 2002–116.
2. Karasek RA Jr. Job demands, job decision latitude, and mental strain: implications for job. *Admin Sci Q*. 1979;24:285–308.
3. Johnson JV, Hall EM. Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. *Am J Public Health*. 1988;78:1336–1342.
4. Snyder LA, Krauss AD, Chen PY, Finlinson S, Huang Y-H. Occupational safety: Application of the job demand-control-support model. *Accid Anal Prev*. 2008;40:1713–1723.
5. Bureau of Labor Statistics. 2013. Foreign-born workers: Labor force characteristics—2012. USDL-13-0991. Available at: <http://www.bls.gov/news.release/pdf/forbrn.pdf>. Accessed January 6, 2014.
6. Chung-Bridges K, Muntaner C, Fleming LE, et al. Occupational segregation as a determinant of US worker health. *Am J Ind Med*. 2008;51:555–567.
7. Forst L, Avila S, Anozie S, Rubin R. Traumatic occupational injuries in Hispanic and foreign born workers. *Am J Ind Med*. 2010;53:344–351.
8. Pransky G, Moshenberg D, Benjamin K, Portillo S, Thackeray JL, Hill-Fotouhi C. Occupational risks and injuries in non-agricultural immigrant Latino workers. *Am J Ind Med*. 2002;42:117–123.
9. Sears JM, Bowman SM, Silverstein BA. Trends in the disproportionate burden of work-related traumatic injuries sustained by Latinos. *J Occup Environ Med*. 2012;54:1239–1245.
10. Quandt SA, Arcury-Quandt AE, Lawlor EJ, et al. 3-D jobs and health disparities: The health implications of Latino chicken catchers' working conditions. *Am J Ind Med*. 2013;56:206–215.
11. Singer A. Immigrant workers in the U.S. labor force. Brookings Institute; 2012. Available at: <http://www.brookings.edu/research/papers/2012/03/15-immigrant-workers-singer#2>. Accessed April 18, 2013.
12. Niedhammer I, Chastang JF, David S, Kelleher C. The contribution of occupational factors to social inequalities in health: Findings from the national French SUMER survey. *Soc Sci Med*. 2008;67:1870–1881.
13. Byler CG. Hispanic/Latino fatal occupational injury rates. *Mon Labor Rev*. 2013;136:14–23.
14. Swanberg JE, Clouser JM, Westneat S. Work organization and occupational health: perspectives from Latinos employed on crop and horse breeding farms. *Am J Ind Med*. 2012;55:714–728.
15. Grzywacz JG, Alterman T, Gabbard S, et al. Job control, psychological demand, and farmworker health: Evidence from the National Agricultural Workers Survey. *J Occup Environ Med*. 2014;56:66–71.
16. Grzywacz JG, Arcury TA, Mora D, et al. Work organization and musculoskeletal health: clinical findings among immigrant Latino workers. *J Occup Environ Med*. 2012;54:995–1001.
17. Arcury TA, Grzywacz JG, Chen H, Mora DC, Quandt SA. Work organization and health among immigrant women: Latina manual workers in North Carolina. *Am J Public Health*. 2014; 104:2445–2452.
18. Arcury TA, Cartwright MS, Chen H, et al. Musculoskeletal and neurological injuries associated with work organization among immigrant Latina manual workers in North Carolina. *Am J Ind Med*. 2014; 57:468–475.
19. Arcury TA, Grzywacz JG, Anderson AM, et al. Employer, use of personal protective equipment, and work safety climate: Latino poultry processing workers. *Am J Ind Med*. 2013;56:180–188.

20. Cartwright MS, Walker FO, Blocker JN, et al. The prevalence of carpal tunnel syndrome in Latino poultry-processing workers and other Latino manual workers. *J Occup Environ Med.* 2012;54:198–201.
21. Pichardo-Geisinger R, Muñoz-Ali D, Arcury TA, et al. Dermatologist-diagnosed skin disease among Latino immigrant poultry processing and other manual workers in North Carolina, USA. *Int J Dermatol.* 2013;52:1342–1348.
22. Rosenbaum DA, Grzywacz JG, Chen H, et al. Prevalence of epicondylitis, rotator cuff syndrome, and low back pain in Latino poultry workers and manual laborers. *Am J Ind Med.* 2013;56:226–234.
23. Bot SD, Terwee CB, van der Windt DAWM, et al. Internal consistency and validity of a new physical workload questionnaire. *Occup Environ Med.* 2004;61:980–986.
24. Karasek R, Brisson C, Kawakami N, Houtman I, Bongers P, Amick B. The job content questionnaire (JCQ): An instrument for internationally comparative assessments of psychosocial job characteristics. *J Occup Health Psychol.* 1998;3:322–355.
25. Hinkin TR, Schriesheim CA. Development and application of new scales to measure the French and Raven (1959) bases of social power. *J Appl Psychol.* 1989;74:561–567.
26. Gillen M, Baltz D, Gassel M, Kirsch L, Vaccaro D. Perceived safety climate, job demands, and coworker support among union and nonunion injured construction workers. *J Saf Res.* 2002;33:33–51.
27. Arcury TA, O'Hara H, Grzywacz JG, Isom S, Chen H, Quandt SA. Work safety climate, musculoskeletal discomfort, working while injured, and depression among migrant farmworkers in North Carolina. *Am J Public Health.* 2012;102:S272–S278.
28. Werner RA, Franzblau A, Gell N, Hartigan A, Ebersole M, Armstrong TJ. Predictors of persistent elbow tendonitis among auto assembly workers. *J Occup Rehabil.* 2005;15:393–400.
29. Grzywacz JG, Hovey JD, Seligman LD, Arcury TA, Quandt SA. Evaluating short-form versions of the CES-D for measuring depressive symptoms among immigrants from Mexico. *Hisp J Behav Sci.* 2006;28:404–424.
30. Kim G, DeCoster J, Huang CH, Chiriboga DA. Race/ethnicity and the factor structure of the Center for Epidemiologic Studies Depression Scale: a meta-analysis. *Cultur Divers Ethnic Minor Psychol.* 2011;17:381–396.
31. Arcury TA, Mills T, Marín AJ, et al. Work safety climate and safety practices among immigrant Latino residential construction workers. *Am J Ind Med.* 2012;55:736–745.
32. Fan ZJ, Silverstein BA, Bao S, et al. Quantitative exposure-response relations between physical workload and prevalence of lateral epicondylitis in a working population. *Am J Ind Med.* 2009;52:479–490.
33. Silverstein BA, Viikari-Juntura E, Fan ZJ, Bonauto DK, Bao S, Smith C. Natural course of nontraumatic rotator cuff tendinitis and shoulder symptoms in a working population. *Scand J Work Environ Health.* 2006;32:99–108.
34. Silverstein BA, Bao SS, Fan ZJ, et al. Rotator cuff syndrome: personal, work-related psychosocial and physical load factors. *J Occup Environ Med.* 2008;50:1062–1076.
35. Bonauto DK, Smith CK, Adams DA, Fan ZJ, Silverstein BA, Foley MP. Language preference and non-traumatic low back disorders in Washington State workers' compensation. *Am J Ind Med.* 2010;53:204–215.
36. Fan ZJ, Bonauto DK, Foley MP, Anderson NJ, Yragui NL, Silverstein BA. Occupation and the prevalence of current depression and frequent mental distress, WA BRFS 2006 and 2008. *Am J Ind Med.* 2012;55:893–903.
37. Swanberg JE, Clouser JM, Browning SR, Westneat SC, Marsh MK. Occupational health among Latino horse and crop workers in Kentucky: The role of work organization factors. *J Agromedicine.* 2013;18:312–325.
38. Smith CK, Silverstein BA, Fan ZJ, Bao S, Johnson PW. Psychosocial factors and shoulder symptom development among workers. *Am J Ind Med.* 2009;52:57–68.
39. Hoppe A, Heaney CA, Fujishiro K. Stressors, resources, and well-being among Latino and White warehouse workers in the United States. *Am J Ind Med.* 2010;53:252–263.
40. Johnson AM, Dale AM, Strickland JR, Venditti P, Evanoff BA. Employers' concerns regarding research participation. *Int J Occup Environ Health.* 2008;14:11–17.
41. Kim S, Nussbaum MA. Performance evaluation of a wearable inertial motion capture system for capturing physical exposures during manual material handling tasks. *Ergonomics.* 2013;56:314–326.
42. Lin D, Nussbaum MA, Madigan ML. Efficacy of three interventions at mitigating the adverse effects of muscle fatigue on postural control. *Ergonomics.* 2012; 55:103–113.
43. Dababneh AJ, Swanson N, Shell RL. Impact of added rest breaks on the productivity and well being of workers. *Ergonomics.* 2001;44:164–174.
44. Tucker P, Folkard S, Macdonald I. Rest breaks and accident risk. *Lancet.* 2003;361:680.
45. Fink D. *Cutting Into the Meatpacking Line: Workers and Change in the Rural Midwest.* Chapel Hill, NC: University of North Carolina Press; 1998.
46. Horton RA, Lipscomb HJ. Depressive symptoms in women working in a poultry-processing plant: A longitudinal analysis. *Am J Ind Med.* 2011;54:791–799.
47. Lipscomb HJ, Dement JM, Epling CA, Gaynes BN, McDonald MA, Schoenfisch AL. Depressive symptoms among working women in rural North Carolina: A comparison of women in poultry processing and other low-wage jobs. *Int J Law Psychiatry.* 2007;30:284–298.
48. Musolin K, Ramsey JG, Wassell JT, Hard DL, Mueller C. *Musculoskeletal Disorders and Traumatic Injuries Among Employees at a Poultry Processing Plant.* Interim Report HHE No. 2012–0125. National Institute for Occupational Safety and Health; 2013.