

Illnesses and Injuries Reported by Latino Poultry Workers in Western North Carolina

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Background Poultry processing is the largest sector of the meat products industry. Many workers are immigrants; few data exist on their illness and injury rates and the impact of workplace safety environment.

Methods Survey interviews were conducted with a representative sample of 200 Latino poultry workers employed by three different companies in western North Carolina; topics included symptoms, work-related illnesses and injuries, and plant safety climate.

Results Most respondents were <35 years of age and had been in the US <10 years. Frequency of self-reported symptoms was high, particularly for musculoskeletal symptoms. Despite symptoms, workers reported not missing work or seeking medical care. Occupational injuries and illnesses and symptoms varied by company. Between-company differences in injury and illness rates were consistent with perceived safety and company provision of personal protective equipment.

Conclusions Symptoms reported exceeded rates reported by other community, clinical, and occupational samples. Findings suggest policy changes and research are needed to reduce the high rates of occupational illnesses and injuries in this vulnerable population. Am. J. Ind. Med. 49:343–351, 2006. © 2006 Wiley-Liss, Inc.

KEY WORDS: occupational injury; immigrant worker; poultry processing; occupational safety; symptoms

INTRODUCTION

Poultry is now the largest and fastest growing sector of the U.S. meat products industry, both in pounds produced and in number of workers. Nationwide, workers in processing plants numbered about 235,100 in 2004 [Bureau of Labor

Statistics, 2005a], concentrated largely in five southern states: Georgia, Arkansas, Alabama, Mississippi, and North Carolina [US Department of Agriculture, 2004]. Because the workforce turns over every year [Government Accountability Office, 2005], far more than a quarter million people have been and will be poultry workers. Poultry has historically employed many minority workers (particularly African Americans), those with few employment options and little power to organize and demand better working conditions. Over the last few decades, the industry has replaced many of these workers with immigrants [Fink, 1998; Grey and Woodrick, 2002]. The majority is from Mexico and Guatemala, with substantial numbers from Southeast Asia and the Pacific in some plants [Government Accountability Office, 2005].

Poultry processing workers have some of the highest occupational injury rates of all U.S. industries [Government Accountability Office, 2005]. In 2004, close to 20,000 poultry workers nationwide reported occupational injuries or

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illnesses severe enough to miss work or seek medical care, for a rate of 7.8 per 100 full-time workers. The nonfatal injury rate was 5.5/100 workers [Bureau of Labor Statistics, 2005a], and the illness rate, 2.3/100 [Bureau of Labor Statistics, 2005b]. Poultry processing had the sixth highest occupational illness rate of any private industry in the US in 2004 [Bureau of Labor Statistics, 2005c].

Poultry processing plants are designed for rapid slaughtering, butchering, and packaging of meat. The process combines rapid line speed with distinct divisions of labor on the processing line [Lipscomb et al., 2005]. Musculoskeletal injuries and illnesses are thought to be the principal on-the-job safety problems for workers on the processing line. Other aspects of the work environment—dampness, animal proteins, contamination from poultry excreta, feathers and other organic substances, knives and scissors in crowded conditions—are thought to be responsible for other types of injuries and illnesses. Dermatological injuries and illnesses are common (Quandt et al., unpublished data), as are respiratory injuries and illnesses [Campbell, 1999]. Despite the high rates of injury alleged to occur in the poultry processing industry and the large number of studies that have examined the health effects of poultry production, there are virtually no studies that document occupational injuries and illnesses in workers in poultry processing.

The reported rates of illnesses and injuries in the poultry industry are likely to be the tip of the iceberg [National Research Council, 2003]. Workers often see the hazards as part of the job, or they move on to other jobs as they begin to develop symptoms, especially when those symptoms limit work activity [Human Rights Watch, 2004; Lipscomb et al., 2005]. Among immigrant—particularly undocumented—workers, reporting illnesses and injuries is difficult because of language barriers and brings with it the fear of job loss or deportation [Fink, 1998; Government Accountability Office, 2005]. Because the only sources of occupational health statistics for the poultry industry are Occupational Safety and Health Administration (OSHA) reports, symptoms or illnesses not reported or not considered by worker or supervisor to be work-related are not included [Azaroff et al., 2002].

Workplace safety training and policies have been shown in other industries to change safety practices and prevent occupational illnesses and injuries [Becker and Morawetz, 2004; Hooper and Charney, 2005]. However, there is no evidence for such prevention in the poultry industry. The poultry industry is covered by the General Duty Clause of the federal Occupational Safety and Health Standards, which sets general standards for protection from environmental toxins (e.g., radiation, noise, hazardous substances) and for personal protective equipment (PPE), machinery, and other aspects of the work environment [OSHA, 2005a]. While the industry is also covered by some OSHA regulations for issues such as fire safety and electrical hazards, there are no special

standards for the poultry industry for ergonomic hazards and other significant hazards.

The primary purpose of this study is to document the self-reported specific symptoms consistent with occupational injuries and illnesses among Latino poultry workers in western North Carolina. The secondary purpose is to relate illnesses and injuries reported to the workers' perceptions of poultry plant safety climate and practices.

METHODS

This study was conducted as part of a 4-year project funded by the National Institute for Occupational Safety and Health. The project forms a partnership of environmental health scientists, health care providers, a community-based organization (Centro Latino of Caldwell County), and poultry workers to document the physical and psychosocial impacts of poultry employment on Latino workers in western North Carolina, and to develop ways of assisting workers individually and collectively in protecting themselves from the demands of this work. Prior to the survey described here, study personnel engaged in formative research that included in-depth interviews with workers and community leaders. This formative research, plus strong ties to the community through Centro Latino, helped provide access to this study population.

Sampling and Recruitment

Current poultry workers were recruited in a six-county area of western North Carolina, including Alexander, Burke, Caldwell, Surry, Wilkes, and Yadkin Counties. This region has a total of five processing plants belonging to three different companies. To be eligible, a respondent had to be 18 years of age, currently employed as a worker in a poultry processing plant, and of Latino ethnicity. The sampling plan called for 100 males and 100 females, with 100 located in Wilkes County, 50 in Burke, Alexander, or Caldwell; and 50 in Surry or Yadkin Counties, based on the estimated relative sizes of the immigrant poultry worker population living in the counties. In the absence of a census listing of all eligible poultry workers, a site-based sampling method was used to recruit a representative sample [Arcury and Quandt, 1999; Muhib et al., 2001]. Briefly, such an approach reasons that every person is a member of at least one residential group, or "site." Sites can include residential enclaves, areas of high concentrations of workers, or dispersed residences, workers living apart from other poultry workers. If sites that vary across characteristics of the community (e.g., being composed of single men vs. families) are chosen and respondents are selected from a variety of sites, the resulting sample reflects the variability in the community.

During the formative research, the project staff compiled a list of 41 residential enclaves (sites) in the study counties

known to have a high concentration of Latino poultry workers. Individuals at the sites were approached for participation. Respondents were recruited at all 41 enclaves proportional to the estimated number of eligible residents. Because not all workers live in enclaves, a total of 70 workers who lived outside these enclaves were also recruited, proportional to the estimated size of the immigrant poultry worker population. Interviewers explained the purpose of the study, the study procedures, and the risks and benefits of the study. They stated that the respondent would receive ten dollars as a thank you at the end of the interview. The interviewers answered any questions of the worker and asked for consent to proceed with the interview. The respondent was given an information sheet in Spanish with the same information on it that had been reviewed orally. This sheet contained the contact information for the Wake Forest University School of Medicine Institutional Review Board, which approved the procedures for data collection and for obtaining informed consent.

Data Collection

Interview content was developed from existing Spanish translations of questions and scales, where available. Vocabulary and meaning were reviewed carefully by Spanish-speaking staff and pretested in the target population to ensure that fidelity to the original intent of questions was retained. Data were collected in face-to-face interviews conducted in Spanish by seven trained interviewers. All interviewers were native Spanish speakers familiar with the study counties. Interviewers participated in a 1-day training, which covered interview techniques, questionnaire content, human subject protection, and ethics. Interviewers were required to conduct a minimum of two practice interviews before beginning study data collection. Field supervisors collected and reviewed questionnaires on a weekly basis. The protocol called for at least 10% of each interviewer's respondents to be recontacted to verify the interview. In all, 14% of respondents were recontacted; no cases of inaccuracies or fabricated data were discovered.

Measures

Current poultry job was measured with 15 questions asking a respondent if she/he currently worked in a range of jobs in the poultry processing industry. The specific jobs that were queried were organized by major stages of poultry production (e.g., "receiving and killing," "evisceration") recognized by OSHA [2005b] and named by informants in the formative research.

Self-rated health was assessed using a single item asking respondents "How would you rate your overall physical health?" Response options were "poor," "fair," "good," "very good," and "excellent."

Illness symptoms were assessed with 20 questions asking whether the respondent experienced the symptom in the past month. The items were selected from several symptom inventories, including the Cohen-Hoberman Inventory of Physical Symptoms [Cohen and Hoberman, 1983] and the Quality of Well-being, Self-Administered instrument [Kaplan et al., 1997]. Five symptoms potentially related to poultry processing work are the focus of this study. Respiratory symptoms was coded 1 for respondents reporting "yes" to the items asking about "coughing or sneezing" or "shortness of breath or difficulty breathing." Skin problems was coded 1 for respondents reporting "yes" to the item asking about "dry skin, rashes, or other skin problems." Neck or back problems was coded 1 for respondents responding "yes" to the item about "pain, stiffness, cramps, or weakness in neck or back." Arm, wrist, or hand problems was coded 1 if the respondent responded "yes" to the item asking about "pain, stiffness, cramps, or weakness in arms, wrist or hands." Leg or foot problems was coded 1 if the respondent responded "yes" to the item asking about "pain, stiffness, cramps, or weakness in the legs or feet."

Individuals reporting one or more of these five poultry work-related symptoms in the past month were asked "About how many days out of 365 in the past 12 months were you *totally unable* to work or carry out your normal activities because of your [symptom]?" Work-loss days was coded such that individuals reporting one or more lost work-days in the past year were coded 1; the remaining individuals were coded 0.

Treatment for poultry work-related symptoms was measured with a single question asking "How many times did you see a doctor or other health professional in the past 12 months for treatment of your [symptom]?" Individuals who answered one or more were coded 1; others were coded 0.

Occupational Injury/Illness was assessed with a single question asking respondents "In the past 12 months, how many times were you injured while doing poultry work, or become sick because of your poultry work?" Individuals reporting one or more times were coded 1 and reports of no times injured were coded 0.

Safety climate was measured with the 10-item Perceived Safety Climate Scale [Gillen et al., 2002]. Nine items asked respondents how strongly they agree or disagree with statements about safety practices in their workplace. The final item asked individuals' overall appraisal of their organization's commitment to safety, and provided three response options, "Supervisors do as much as possible to make my job safe," "Supervisors could do more to make my job safe," and "Supervisors are only interested in doing the job fast and cheap." The item responses were summed for all 10 questions for a total score ranging from 10 to 39; a lower score indicates a safer work environment, as perceived by the worker. Cronbach's alpha for the scale was 0.798.

Availability of PPE was assessed with nine questions asking whether the respondent's employer provided the employee with specific pieces of equipment (e.g., eye protection, ear protection, specialized tools), and an "other" category. Individuals responding "yes" were coded 1 as having that form of PPE available, whereas those responding "no" were coded 0. Company-paid PPE was measured with follow-up probes to each form of PPE the respondent reported being available in her/his company. Specifically, if a respondent said "yes" to any type of PPE, she/he was asked "Does your employer provide this without cost to you? Would you say they pay all of the costs, some of the costs, or none of the costs?" Company-paid PPE was coded 1 if respondents reported that their employer pays "all of the costs" and were coded 0 otherwise.

Data Analysis

Data from questionnaires were entered into a database and converted to an SPSS (version 13.0; SPSS, Inc., Chicago, IL) data set for analysis. Percentages with standard errors and mean with standard deviations were calculated to describe each variable, depending on whether the variable was dichotomous or continuous. Differences between groups such as gender or company in dichotomous variables were evaluated based on chi-square statistics. Means of continuous variables were compared using one-way ANOVA.

RESULTS

The sample included 99 women and 101 men. About 60% of those interviewed were less than 35 years of age and had been in the United States less than 10 years (Table I). The median years lived in the US and in North Carolina were 8 and 6, respectively. Slightly less than half (47.5%) of the workers were born in Mexico. Although the proportion of males and females in the sample was similar by design, the sample included more men than women who were born in Guatemala (38.6% vs. 27.3%), and more women than men who were born in Honduras (8.1% vs. 1.0%).

Workers interviewed reported a wide range of jobs currently performed (Table II). Some, such as chicken catching, hanging, killing, and sanitation, were performed exclusively or primarily by men. Trimming was more commonly performed by women. On average, workers reported having been in their current poultry processing job from 2 to 4 years. Sixty percent of workers reported working the first shift, 35.5% the second shift, and only 4.5% the third shift. This reflects the distribution of work shifts at the local poultry plants.

Forty-seven percent of workers rated their health as "fair" or "poor," compared to 53% who rated their health "excellent," "very good," or "good." In the 30 days prior to the interview, the most commonly reported symptoms were

TABLE I. Sample Demographic Characteristics

	Women (n = 99)	Men (n = 101)	Total sample (n = 200)
	n (%)	n (%)	n (%)
Age (years)			
≤24	12 (12.1)	21 (20.8)	33 (16.5)
25–29	24 (24.2)	22 (21.8)	46 (23.0)
30–34	25 (25.3)	21 (20.8)	46 (23.0)
35–44	28 (28.3)	21 (20.8)	49 (24.5)
≥45	10 (10.1)	16 (15.8)	26 (13.0)
Years in U.S. ^a			
≤4	14 (14.1)	17 (16.8)	31 (15.5)
5–9	42 (42.4)	44 (43.6)	86 (43.0)
10–14	30 (30.3)	21 (20.8)	51 (25.5)
≥15	12 (12.1)	18 (17.8)	30 (15.0)
Years in North Carolina ^b			
≤4	26 (26.3)	25 (24.8)	51 (25.5)
5–9	49 (49.5)	48 (47.5)	97 (48.5)
10–14	23 (23.2)	18 (17.8)	41 (20.5)
≥15	1 (1.0)	8 (7.9)	9 (4.5)
Country of Birth			
Mexico	48 (48.5)	47 (46.5)	95 (47.5)
Guatemala	27 (27.3)	39 (38.6)	66 (33.0)
El Salvador	13 (13.1)	12 (11.9)	25 (12.5)
Honduras	8 (8.1)	1 (1.0)	9 (4.5)
Other	3 (3.0)	2 (2.0)	5 (2.5)

Latino Poultry Workers, North Carolina, 2005.

^aMissing data on one male and one female respondent.

^bMissing data on two male respondents.

headache (48.0%), pain in arms or hands (46.0%), pain in neck or back (36.0%), and sore throat or difficulty swallowing (35.5%) (Table III). Eye pain, irritation, or discharge was reported by 28.5%. The only significant gender differences were for upset stomach, nausea, and vomiting (women reported more symptoms than men [30.3% vs. 19.8%]) and difficulty with balance, standing, and walking (men reported more symptoms than women [8.9% vs. 2.0%]).

Overall 119 workers (59.5%) reported experiencing one or more of the five symptoms of possible occupational injuries or illnesses that were probed in greater detail in the past 30 days (Fig. 1). Respiratory symptoms (coughing, wheezing, shortness of breath, or difficulty breathing) were reported by 29 (14.5%) workers. Eleven workers reported being totally unable to work due to these symptoms in the past year, and 12 sought medical treatment at least once. Skin problems were reported by 34 (21.5%) workers. Six workers reported being totally unable to work, and 14 sought medical care.

Musculoskeletal problems were the most commonly reported work-related injuries. Leg or foot problems were

TABLE II. Work Characteristics of Sample, by Gender

Job	Years in job	Women (n = 99)	Men (n = 101)	Total sample (n = 200)
	Mean(SD)	n (%)	n (%)	n (%)
Chicken catching**	2.11 (1.88)	0 (—)	6 (5.9)	6 (3.0)
Hanging**	2.43 (1.58)	0 (—)	6 (5.9)	6 (3.0)
Killing	8.47 (6.60)	0 (—)	3 (3.0)	3 (1.5)
Cutting	3.26 (2.08)	17 (17.2)	15 (14.9)	32 (16.0)
Evisceration*	2.98 (1.77)	19 (19.2)	10 (9.9)	29 (14.5)
Wash-up	2.29 (1.33)	5 (5.1)	4 (4.0)	9 (4.5)
Trimming**	3.87 (2.34)	25 (25.3)	14 (13.9)	39 (19.5)
Deboning	2.84 (2.05)	10 (10.1)	7 (6.9)	17 (8.5)
Chilling	3.86 (1.28)	2 (2.0)	1 (1.0)	3 (1.5)
Packing	3.57 (2.88)	19 (19.2)	23 (22.8)	42 (21.0)
Sanitation***	3.96 (2.32)	4 (4.0)	18 (17.8)	22 (11.0)
Other	4.34 (2.49)	7 (7.1)	9 (8.9)	16 (8.0)
Shift				
First		62 (62.6)	59 (58.4)	121 (60.5)
Second		35 (35.4)	32 (31.7)	67 (33.5)
Third		2 (2.0)	10 (9.9)	12 (6.0)

Latino poultry workers, North Carolina, 2005.

**P* < 0.10.

***P* < 0.05.

****P* < 0.10.

reported by 46 (23.0%) workers. Nine of these workers reported being totally unable to work at least 1 day, and 11 sought treatment. Neck and back problems were reported by 36% of workers (n = 72). Almost a third of workers affected reported more than 1 work day totally unable to work (n = 23) and having sought medical treatment (n = 29). The most common conditions were problems with the arm, wrist, or hand. Ninety-two (46.0%) workers reported such injuries. Seventeen reported being totally unable to work 1 or more days due to such injuries, and only 26 sought treatment.

The prevalence of work-related injuries and illnesses was not uniform across companies (Table IV). Over 70% of workers in Company 3 reported an illness or injury due to poultry work in the previous year, compared to less than 30% in Company 2, and less than 10% in Company 1. The same company differences are evident across all of the specific symptoms reported by the sample for the past month: workers at Company 3 had the highest prevalence and Company 1, the lowest. All differences across companies were statistically significant except for skin illnesses.

Table IV shows the frequency of agreement with statements concerning the safety climate in the processing plants. While overall safety climate appears quite favorable for these workers, examination of items by company shows differences among companies in workers' beliefs about

workplace safety. In general, workers from Company 3 consistently have the lowest perceptions of workplace safety, while workers in Company 1 have the highest perceptions of workplace safety. This is reflected in overall rating of safety climate through statements about supervisors. While responses from Company 1 were spread across the possible responses, including almost a third who thought supervisors do as much as possible to make the job safe, 98.0% of workers at Company 3 affirmed the statement that supervisors were only interested in workers doing the job fast and cheap. These between-company differences were reflected in the overall safety climate scores (mean ± SD) (Company 1: 20.42 ± 4.06; Company 2: 25.07 ± 3.21; Company 3: 30.46 ± 3.42) (*F* = 122.67; *P* < 0.001).

Company support for work safety is demonstrated in their provision of PPE. Ear protection and non-slip shoes are needed by virtually all employees. However, although the companies provide ear protection to almost all workers (98.5% across the total sample), only about half the workers reported that the company paid for their ear protection (Table IV). For non-slip shoes, 79.0% of workers across all companies reported their company provided this footwear, but only about 36.7% of workers reported that their employer pays the full cost. PPE for hand protection and protective clothing have similar patterns of company support. The differences across companies in their payment for PPE are significant. Comparatively few employees in Company 3 report that the employer pays all of the cost of these types of PPE.

DISCUSSION

These findings indicate that the prevalence of symptoms associated with occupational injuries and illnesses commonly reported in poultry processing is high among immigrant poultry workers in western North Carolina. Twenty-eight percent of workers reported at least one work-related injury or illness in the past 12 months, and nearly 60% reported symptoms in the past 30 days of common conditions found among workers in the poultry processing industry, including dermatological, respiratory, and musculoskeletal injuries. Workers were not asked to attribute their specific symptoms to poultry work. However, post hoc comparisons found reporting any illness or injury due to poultry in the past year was highly associated with reporting each of the five poultry work-related symptoms (data not shown), supporting the attribution of these symptoms to occupation.

The self-rated health of these workers reflects the high rates of injuries and illnesses. Fair/poor self-rated health is a consistently strong predictor of both morbidity and mortality [Idler and Benjamini, 1997]. Forty-seven percent of workers in this study rate their health as fair or poor, compared to 33%

TABLE III. Illness Symptoms Experienced in the Past 30 Days, by Gender

Symptom	Women (n = 99)	Men (n = 101)	Total (n = 200)
	n (%)	n (%)	n (%)
Headache	51 (51.5)	45 (44.6)	96 (48.0)
Pain, stiffness, cramps, weakness in arms or hands	48 (48.5)	44 (43.6)	92 (46.0)
Pain, stiffness, cramps, weakness in neck or back	40 (40.4)	32 (31.7)	72 (36.0)
Sore throat or difficulty swallowing	36 (36.4)	35 (34.7)	71 (35.5)
Eye pain, irritation, or discharge	28 (28.3)	29 (28.7)	57 (28.5)
Upset stomach, abdominal pain, nausea, vomiting*	30 (30.3)	20 (19.8)	50 (25.0)
Pain, stiffness, cramps, weakness in legs or feet	22 (22.2)	24 (23.8)	46 (23.0)
Swelling of ankles, hands, feet, or abdomen	21 (21.2)	23 (22.8)	44 (22.0)
Dry skin, rashes, or other skin problems	23 (23.2)	20 (19.8)	43 (21.5)
Stuffy or runny nose, bleeding	19 (19.2)	22 (21.8)	41 (20.5)
Dizziness, earache, or ringing in ears	17 (17.2)	20 (19.8)	37 (18.5)
Fever, chills, or sweats	15 (15.2)	18 (17.8)	33 (16.5)
Chest pain, pressure, or palpitations	9 (9.2)	15 (14.9)	24 (12.1)
Coughing or wheezing	12 (12.1)	10 (9.9)	22 (11.0)
Vision problems	11 (11.1)	10 (9.9)	21 (10.5)
Frequent night-time urination or difficulty urinating	9 (9.1)	7 (6.9)	16 (8.0)
Shortness of breath or difficulty breathing	6 (6.1)	8 (7.9)	14 (7.0)
Difficulty with balance, standing, or walking**	2 (2.0)	9 (8.9)	11 (5.5)
Pain, burning, or blood in urine	2 (2.0)	3 (3.0)	5 (2.5)

Latino poultry workers, North Carolina, 2005.

* $P < 0.10$.

** $P < 0.05$.

in a probability sample of over 3,000 adults of Mexican origin in California [Finch and Vega, 2003].

Comparative data on occupational health in this population are difficult to obtain. The Bureau of Labor Statistics compiles incidence rates from OSHA-reported injuries and illnesses. The most recent statistics indicate a

rate of 8.1 illnesses or injuries per 100 workers, only a third the number reported in this survey. Injuries and illnesses included in the Bureau of Labor Statistics' data are only those that result in lost work or seeking medical care. It is likely that such a limitation undercounts actual injuries in this population.

Immigrant poultry processing workers reported elevated levels of symptoms relative to other samples, although good comparative data are not available. Whereas 36% and 21.5% of the present sample reported back pain and skin-related problems in the past 30 days, approximately 10% of a non-Latino racially diverse clinical sample reported these symptoms in the past 30 days [Jackson et al., 2003]. Whereas nearly one-half of workers in the current sample reported headache in the past month, only 5% of Jackson and colleagues clinical sample reported headache. In contrast to previous results from a general community sample showing that cardiovascular symptoms like chest pain, palpitations, and dizziness are the most common symptoms [Escobar et al., 1987], these symptoms were among the least often reported by our sample of immigrant workers. In a more occupationally based context, Kroenke et al. [1998] found that 24% and 27% of soldiers returning from the Persian Gulf War reported the onset of headaches and muscle pain during deployment with comparable levels at 1 year post deployment. Three

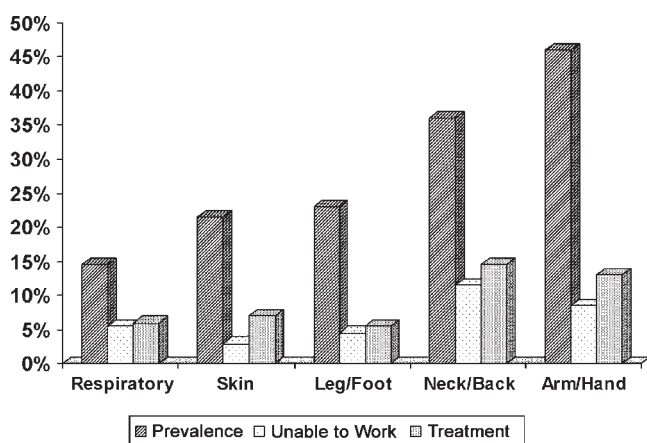


FIGURE 1. Occupational injuries and illnesses of immigrant Latinos in the poultry processing industry: prevalence, totally unable to work 1 or more days, and sought treatment, in the past 12 months, North Carolina, 2005.

TABLE IV. Work-Related Injuries and Illnesses, Safety Climate, and Company-Paid Personal Protective Equipment, by Company

	Total (%)	Company			χ^2	P
		1 (%)	2 (%)	3 (%)		
Any injury or illness due to poultry work (past year)	28.0	7.6	24.1	70.0	63.15	0.000
Respiratory symptoms (past month)	14.5	6.5	17.2	26.0	10.41	0.005
Skin symptoms (past month)	21.5	16.3	20.7	32.0	4.76	0.093
Leg/foot symptoms (past month)	23.0	8.7	15.5	58.0	47.05	0.000
Neck/back symptoms (past month)	36.0	16.3	29.3	80.0	58.63	0.000
Arm/hand symptoms (past month)	46.0	30.4	39.7	82.0	36.00	0.000
Safety climate*						
Workers' safety practices are very important to management.	68.8	96.7	69.0	18.0	93.19	0.000
Workers are regularly made aware of dangerous work practices or conditions	85.0	98.9	84.5	60.0	38.49	0.000
Workers are regularly praised for safe conduct	35.0	54.3	19.0	18.0	28.04	0.000
Workers receive instructions on safety when hired	80.0	98.9	82.8	42.0	65.97	0.000
Workers attend regular safety meetings	62.3	87.0	52.6	28.0	51.13	0.000
Proper safety equipment is always available	72.4	95.7	80.7	20.0	95.48	0.000
Workers have almost total control over personal safety	79.4	81.5	70.2	86.0	4.55	0.103
Taking risks is not a part of my job	41.0	43.5	25.9	54.0	9.22	0.010
The possibility of being injured at work in the next 12 months is very likely	89.3	88.8	80.7	100.0	10.42	0.005
Overall safety climate assessment					43.93	0.000
Supervisors do as much as possible to make my job safe	19.0	32.6	13.8	0.0		
Supervisors could do more to make my job safe	16.5	23.9	17.2	2.0		
Supervisors are only interested in doing the job fast and cheap	64.5	43.5	69.0	98.0		
Company pays full cost of PPE						
Ear protection	51.3	78.0	50.0	4.0	70.84	0.000
Hand protection	40.6	75.0	29.3	0.0	66.97	0.000
Non-slip shoes	36.7	67.1	26.3	2.0	55.60	0.000
Protective clothing	63.6	76.3	70.0	12.5	33.08	0.000

Latino poultry workers, North Carolina, 2005.

*Percentage who "strongly agree" or "agree."

years after deployment 20–25% of soldiers report headache, joint pain, and rash. Although symptom reporting is elevated among immigrant Latinos [Escobar et al., 1987], nevertheless, the higher rates of symptoms relative to clinical samples and the shift from cardiovascular to musculoskeletal and other symptoms common among poultry workers suggest that participants in the current study were reporting work-related health problems.

Estimates of undercounting of occupational injuries by others range up to 70% [Leigh et al., 2004], so this is not a unique finding. However, some worker populations are likely to be particularly at risk for under-reporting and hence, for exploitation by employers. These include the growing number of immigrant workers in the US. Immigrants tend to be healthier than the general population, as do workers, making the levels of symptoms and injuries reported all the more notable. Azaroff et al. [2002] point out that, in order for an injury to be counted, the worker must recognize the injury or illness, decide it is desirable to report it, attribute it to the job, and report it to the supervisor. The supervisor must

perceive that the worker has a legitimate work-related health problem, allow the worker to take off work or have restricted work, and must log the injury according to OSHA requirements—and then that particular log must be chosen as part of the Bureau of Labor Statistics' sample. For immigrant workers, a number of circumstances act as filters to reduce reporting, including language barriers, workers' fear of losing their jobs, workers' concerns about immigration status, incentive programs that reward low rates of absenteeism, and lack of access to health care. There are also disincentives for the companies to report injuries. Because injury statistics are the basis for regulations and resources for improving occupational safety [Leigh et al., 2004], it is essential that continued attention be paid to under-reporting.

One of the striking findings of these analyses is the between-company differences in injury and illness rates and symptom rates, and corresponding differences in perceived safety climate. While the poultry industry is often portrayed as a vertically integrated monolith, these data suggest that substantial differences exist in the safety climates and in

worker health. They also highlight the fact that management commitment to safety, as emphasized by the creation of a strong safety climate and the provision of company-paid PPE, can contribute to reductions in illness and injury in a dangerous industry. Further analyses are needed to examine this apparent link between safety climate and injuries, and to consider other potential factors such as between-company differences in the organization of work or supervisory staff.

This study has limitations that should be considered when interpreting its findings. First, the companies from which workers were recruited have different shift schedules, and the sampling design did not take account of these shifts. It is possible therefore that first shift is over-represented. The general shift-work literature shows that workers on later shifts experience more injuries [Strong and Zimmerman, 2005]. Therefore, the injury estimates from our sample should be viewed as conservative. The second limitation is the use of a nonrandom sample. In a population that is “hidden” and for which no listing of names can be easily obtained, more creative methods must be devised. Azaroff et al. [2003, 2004] used a method randomizing Southeast Asian names from a telephone book to obtain a sample; however, they were not able to validate the underlying assumption that all workers had listed telephone numbers. In the Latino population, no such listing exists because of the fluidity of the population; many immigrants lack telephones because of the documents required to obtain them. Therefore, the site-based sampling used here is a reasonable substitute, but one for which corroborating data would be useful. Fourth, the survey relied on retrospective self-reports of symptoms, rather than physical examinations or on-going surveillance that would have allowed clearer documentation of the relationship between injuries and work. Because retrospective data are subject to memory lapses, the reports of injuries presented here are likely underestimates. Fifth, the usual method for studying occupational injuries—sampling from the worksite—was not possible due to the closed nature of these poultry plants. It was also not possible to know how many workers are employed in the different jobs; this may vary across plants. This limits the generalizability of these findings. Finally, some of the symptoms reported may be due to conditions experienced by immigrant workers outside the workplace. For example, skin and respiratory symptoms may be due to overcrowded and substandard housing conditions.

Despite these limitations, this work presents a consistent picture of high rates of symptoms for occupational illnesses and injuries among Latino poultry workers in western North Carolina. Regardless of whether or not the symptoms are the direct result of work, they have implications for the ability of this population to work safely and for their long-term health and well-being. These rates and some of their potential predictors appear to vary from company to company. The data support the national data and claims of advocates that have identified the poultry processing industry as one in

which workers are at substantial risk of work-related morbidity and for which additional protections are needed.

CONCLUSIONS

These findings suggest several policy recommendations. First, these data strongly suggest that workplace commitment to safety makes a difference in worker occupational safety and health. Therefore, existing occupational safety regulations should be enforced across all poultry processing employers. Second, because of the high level of musculoskeletal complaints, an ergonomics program, such as that described in OSHA [2004] ergonomic guidelines, should be implemented and enforced at these poultry companies to reduce the incidence of musculoskeletal injuries. Finally, because these workers are vulnerable to intimidation, worker advocacy groups, and community agencies should work with poultry processing plants to improve worker safety and health.

Substantial needs for further research also exist. Systematic assessment of occupational injuries and illnesses with physical examinations should be conducted to confirm self-reported levels of such health indicators. Reasons for between-company differences in worker reported health and safety climate should be further investigated. Although others have described the under-reporting of occupational injuries, continued attention to this is necessary so that the resources to improve worker health and safety are appropriately allocated.

The policy changes and research efforts suggested here will help to identify ways to reduce the high rates of occupational illnesses and injuries in this vulnerable population.

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