One-year Incidence of Carpal Tunnel Syndrome in Latino Poultry Processing Workers and Other Latino Manual Workers

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This is the accepted version of the following article:

Cartwright, M. S., Walker, F. O., Blocker, J. N., Schulz, M. R., Arcury, T. A., Grzywacz J. G., Mora D., Chen H., Eaton B., Quandt S. A. (2014). One-year Incidence of Carpal Tunnel Syndrome in Latino Poultry Processing Workers and Other Latino Manual Workers. *American Journal of Industrial Medicine, 57(3)*, 362-369.doi: 10.1002/ajim.22250,

which has been published in final form at http://dx.doi.org/10.1002/ajim.22250.

Abstract:

Objective:

To determine the incidence of carpal tunnel syndrome (CTS) over 1 year in Latino poultry processing workers.

Methods:

Symptoms and nerve conduction studies were used to identify Latino poultry processing workers (106 wrists) and Latinos in other manual labor occupations (257 wrists) that did not have CTS at baseline, and these individuals were then evaluated in the same manner 1 year later.

Results:

Based on wrists, the 1-year incidence of CTS was higher in poultry processing workers than non-poultry manual workers (19.8% vs. 11.7%, $P = 0.022$). Poultry workers had a higher odds (1.89; $P = 0.089$) of developing CTS over 1 year compared to non-poultry manual workers.

Discussion:

Latino poultry processing workers have an incidence of CTS that is possibly higher than Latinos in other manual labor positions. Latino poultry workers' high absolute and relative risk of CTS likely results from the repetitive and strenuous nature of poultry processing work.

Keywords: occupational health | vulnerable populations | manufacturing | immigrant workers | carpal tunnel syndrome

Article:

INTRODUCTION

Carpal tunnel syndrome (CTS) is a condition that typically results in some combination of numbness, tingling, pain, and weakness in the affected hand. It occurs secondary to damage or irritation of the median nerve at the wrist [Gelberman et al., 1981], and therefore is a common work-related condition in manual labor occupations requiring repetitive use of the hands [Frost et al., 1998]. It is estimated to affect 2.7% of the general population, results in $500 million in healthcare costs in the United States yearly, and is a leading cause of workers' compensation claims [Stevens et al., 1988; Atroshi et al., 1999; Herbert et al., 1999]. The Bureau of Labor statistics reports that the incidence of CTS among workers in the manufacturing industry is 2.4/10,000 [BLS,]. Although significant, the incidence rate may be underestimated by 40% or more [Leigh, 2012]. Workers often do not report musculoskeletal disorders, and physicians are often not trained to identify musculoskeletal disorders as occupational disorders, therefore contributing to underreporting of these conditions [Azaroff et al., 2002].

Poultry processing, one segment of the manufacturing industry, typically requires repetitive hand movements to hang, kill, pluck, clean, eviscerate, cut, package, and box poultry at a rapid pace. Workers also frequently clean and repair equipment, assemble boxes, and move heavy pallets [Fink, 1998; U.S. Department of Labor, 2001]. Throughout the United States many poultry processing workers are now immigrant Latinos [Fink, 1998], and this group of workers faces unique challenges because of language and cultural barriers and reluctance to complain about work conditions [Marin et al., 2009a, 2009b]. It has recently been demonstrated that Latino poultry processing workers have a high prevalence of CTS, which exceeds the prevalence of CTS in other manual laborers and affects between 6.5% and 59.2% of poultry processing workers, depending on the methods used to define CTS [Cartwright et al., 2012b]. However, there are no data on incidence of CTS in this population.

Latino workers represent 15% of the United States workforce [Toossi, 2012] yet they have higher than average injury and fatality rates [Smith, 2012]. Latino workers, especially those who are foreign born, are concentrated in occupations such as manufacturing with the highest prevalence of labor law violations [Pinedo et al., 2011]. While it is widely agreed in the literature that reported injury rates do not reflect real injury rates due to underreporting [Smith, 2012], underreporting is especially problematic among Latino workers. These workers belong to a vulnerable population, which is often hidden and afraid to report their injuries because they fear retaliation [Smith,2012]. Furthermore, many of the new settlement areas where Latinos have migrated in the past two decades and where the majority of poultry production takes place are located in the southern United States [National Chicken Council, 2010; Passel et al., 2011]. Most southern states have statutes that are unfavorable to collective bargaining and unions do not have a strong presence, further contributing to the underreporting of injuries. Because these workers are hard to reach, and there is often no access for outside groups to conduct occupational health research at these worksites, the literature addressing prevalence and incidence of injuries among Latino workers is limited.

As Latino workers are projected to become one of the fastest growing groups in the US workforce [Toossi, 2012], it is important to have better data regarding the incidence of injury rates among this group of workers. The purpose of this study is to assess the incidence of CTS development over 1 year in Latino poultry processing workers, and to identify factors associated with incident CTS.

METHODS

Participants

Prior to the initiation of data collection, this study was approved by the Institutional Review Board at Wake Forest School of Medicine. All participants signed informed consent, and they were paid $40 for each data collection clinic they attended. This study was part of a larger project to evaluate multiple health issues facing Latino poultry processing workers, and the data collection methods below have also been described elsewhere [Cartwright et al., 2012b].

Starting in June 2009, Latinos in poultry and non-poultry manual labor occupations were recruited from four counties in western North Carolina to participate in a study of neurologic, musculoskeletal, dermatologic, and pulmonary conditions related to work. Community-based sampling of dwelling units was performed with a focus on areas with a high proportion of Latinos, and those that self-identified as Latino or Hispanic, were 18 or older, and worked in manual labor occupations were recruited. More than one resident per dwelling could be recruited, if eligible. Work in poultry processing was defined as having a non-supervisory position in a poultry plant, which included jobs from receiving through sanitation. Non-poultry manual labor positions included landscaping, construction, restaurant work, hotel work, child care, and manufacturing. If non-poultry workers had previously worked more than 6 months in poultry processing, or had worked in poultry processing in the past 2 years, they were excluded from the study. Those that enrolled in the study underwent an hour-long interview, which focused on many aspects of their health and occupation. They then attended a data collection clinic and all participants, including those without symptoms, underwent testing, including a questionnaire, a hand diagram, and nerve conduction studies related to CTS. Based on the case definition of CTS described below, those without CTS at the baseline data collection clinic were then invited to attend a second data collection 1 year later. The final follow-up data collection clinic occurred in November 2011, and in total there were 12 data collection clinics, which occurred on Sundays evenly distributed throughout the study period. Since a small number of participants were expected to change jobs between baseline and follow-up, the final analyses were calculated using two different methods; one based on the initial classification of the participants into poultry or non-poultry groups (even if they changed jobs) and the second excluding all participants that had a change in job status during follow-up. It was found that excluding those with a job change did not alter the data substantially, so the reported results are based on the first method, in which participants were categorized based on their initial classification of poultry or non-poultry groups.

Over the first 2 years of the study 1,526 individuals were screened, 957 were eligible for enrollment, 742 underwent interviews, 518 attended baseline data collection clinic, and 513 had nerve conduction studies and filled out hand diagrams at the baseline data collection clinic (1,026 wrists). Two hundred sixty-four participants were identified as not having CTS at baseline and were invited to return to a second data collection clinic 1 year later. Of those, 173 (65.5%) returned for 1 year follow-up. This group included 50 poultry workers and 123 non-poultry workers without CTS in either wrist. In addition, there were 6 poultry workers and 11 non-poultry workers that were invited back for the dermatologic portion of the study that had no CTS in one of their wrists, and they were included when the data was analyzed on a wrist, rather than an individual, basis. This resulted in 106 total wrists without CTS in the poultry group and 257 total wrists without CTS in the non-poultry group. Of note, at follow-up five poultry and six non-poultry had changed jobs and two poultry and nine non-poultry were unemployed, but these participants were all analyzed based upon the group in which they were initially classified.

Clinical Evaluations

Each participant's baseline height, weight, and body mass index (BMI) were obtained. Participants were asked if they had numbness, pain, or weakness in their hands for 2 or more days in the previous month, and if they answered affirmatively, they completed the Katz hand diagram to describe the distribution of symptoms. The hand diagrams were scored “unlikely” (0), “possible” (1), “probable” (2), or “classic” (3) for CTS based upon previously published methods for scoring of the diagram, and each diagram was scored by two clinicians (M.S.C. and F.O.W.) blinded to the participant's occupation and nerve conduction results [Katz and Stirrat, 1990]. The hand diagrams were performed at both the baseline and 1 year follow-up visits. No disagreements in hand diagram scoring occurred.

Nerve Conduction Studies

Study participants underwent bilateral nerve conduction studies using a Teca TD10 Electromyograph (Teca Corporation, Pleasantville, NY) at baseline and follow-up. Studies were performed by experienced technicians blinded to the participant's occupation and clinical evaluations. If necessary, hands were warmed to 32 degrees Celsius, and median and ulnar antidromic sensory studies were performed, stimulating the wrist and recording with ring electrodes 140 mm distally on the 2nd and 5th fingers. The onset and peak latencies were recorded, and those with non-recordable median sensory potentials underwent orthodromic median motor studies stimulating at the wrist and recording from the abductor pollicis brevis muscle.

Measures

CTS was defined using a combination of symptoms, as reported through the Katz hand diagram, and nerve conduction study abnormalities. If the hand diagram was scored a 1, 2, or 3, then the participant was assigned a score of "1" for symptoms; if not, the participant was assigned a "0." Peak median and ulnar sensory latencies were compared. If the median was less than 0.49 ms longer than the ulnar, it was scored a "0;" if it was 0.50 to 0.79 ms longer, it was scored a "1;" and if it was >0.80 ms longer, it was scored a "2." The symptom score and nerve conduction score were then added, and a total score of 0 was defined as "no CTS," 1–2 as "possible CTS," and 3 as "CTS." Similar CTS case definitions, with 0.50 and 0.80 ms cut-offs for peak latency difference, have been used in previous studies [Werner et al., 2001]. This scoring system was applied to each wrist that was studied, and those that scored a 0 bilaterally during the initial visit were invited to return 1 year later. In addition, others invited back for the dermatologic portion of the study with a 0 in just one wrist were also invited to participate. In addition to defining CTS at the wrist level, individuals were defined as having "no CTS" if both wrists were scored as "0," "possible CTS" if one or both wrists was scored a "1 or 2," and "CTS" if either wrist was scored a "3." Statistical analyses were performed considering both the wrist level and individual level for defining CTS.

In order to potentially identify factors that may increase the risk of CTS, poultry workers underwent standardized interviews regarding their work schedule and environment. They were asked to identify which of the following tasks they performed: cutting, eviscerating, washing, trimming, deboning, receiving, hanging, killing, plucking, packing, sanitation, chilling, and other. Those who performed a single task >50% of the time were categorized into that task for statistical analyses. If they performed multiple duties and no single task occupied more than 50% of their time, they were categorized into "multiple tasks." Many of the tasks require similar movements; four groups were created. The groups include: packing, sanitation, chilling, and other (category 1); cutting, eviscerating, wash-up, trimming, and deboning (category 2); receiving, hanging, killing, and plucking (category 3); and multiple jobs (category 4).

Statistical Analyses

In general, descriptive statistics were calculated as means and standard deviations for continuous variables, and percentages and frequencies for discrete variables. Baseline personal characteristics were compared between the poultry and non-poultry groups using Student's *t*-tests for continuous variables and χ^2 tests of association for categorical variables. To calculate CTS incidence, the percentage of wrists that went from a baseline CTS score of 0 to possible (score of 1–2) and definite (score of 3) CTS at 1 year were calculated for both groups and compared using Fisher's exact test. In addition, the percentage of individuals was calculated that went from no

CTS (bilateral score of 0) at baseline to unilateral or bilateral CTS at 1 year, as defined by both the strict (only definite CTS) and less strict (possible or definite CTS) definitions of CTS. The incidence of CTS at the individual level was also compared between the poultry and non-poultry groups using χ^2 tests of association or Fisher's exact test when the expected value for any cell was 5 or fewer observations.

At the wrist level, adjusted odds ratios and 95% confidence intervals were calculated using multivariate logistic regression to determine predictors of CTS incidence. The model included poultry work, age, BMI, and gender and controlled for dwelling clustering, correlation between wrists in an individual, and data collection site strata. In only poultry workers, CTS incidence was described by age, BMI, gender, and job task as means and standard deviations or percentages and frequencies Bivariate analyses comparing 1-year incident CTS and risk factors were assessed using logistic regression and controlling also for dwelling clustering, correlation between wrists in an individual, and site strata. All wrist-level analyses were performed on two distinct groups; one group with all wrists included (363 wrists) and the other group with only those wrists from individuals with bilateral CTS (346 wrists). Since no meaningful differences were detected using these two populations, all wrist-level results reported in this manuscript include all wrists free of CTS at baseline. All *P* values were considered significant at the 0.05 level and statistical calculations were performed using SAS Version 9.2 (SAS, Cary, NC).

RESULTS

The baseline personal characteristics for the poultry processing workers and non-poultry workers are described in Table I, and there were no statistically significant differences between the poultry and non-poultry workers in regards to age, BMI, gender, spoken language, and level of education. The 1-year incidence of CTS, in all participants, poultry processing workers, and non-poultry workers is described in Table II. At the wrist level, 19.8% of poultry workers developed possible or definite CTS at 1 year compared to 11.7% of non-poultry workers ($P = 0.022$). At the individual level, the increased incidence of CTS in the poultry workers compared to the non-poultry workers did not reach statistical significance. However, statistical significance was approached when evaluating the development of bilateral CTS using the less strict definition (12.0% vs. 4.9%, $P = 0.095$) and when evaluating the development of unilateral CTS using the strict definition (4.0% vs. 0.0%, $P = 0.082$).

Table I. Baseline Personal Characteristics in the Poultry (N = 56) and Non-Poultry (N = 134) Laborers

Characteristic	**All laborers, mean [SD] or N (column %)**	**Poultry, mean [SD] or N (column %)**	**Non-poultry, mean [SD] or N (column %)**	***P*-Value**
Age	30.6 [8.3]	30.8 [9.3]	30.5 [7.9]	0.862

BMI	28.1 [4.6]	27.8 [4.8]	28.1 [4.5]	0.681
Gender				
Male	102 (53.7)	29 (51.8)	73 (54.5)	0.734
Female	88 (46.3)	27 (48.2)	61 (45.5)	
Spoken language				0.270
Indigenous[a]	41 (21.7)	15 (26.8)	26 (19.6)	
Non-indigenous	148 (78.3)	41 (73.2)	107 (80.4)	
Education				0.590
0–6 years	97 (51.1)	31 (55.4)	59 (48.0)	
7–9 years	54 (28.4)	16 (28.6)	35 (28.5)	
10+ years	39 (20.5)	9 (16.1)	29 (23.6)	

a Indigenous refers to individuals in whose childhood homes a Native American language, rather than Spanish, was spoken.

Table II. The 1-Year Incidence of Carpal Tunnel Syndrome in Poultry and Non-Poultry Workers

	All workers, N (column %)	**Poultry, N (column %)**	**Non-poultry, N (column %)**	***P*-Value**
By wrists ($N = 363$)[a]				0.022
Developed possible CTS	49 (13.5)	19 (17.9)	30 (11.7)	
Developed definite CTS	2 (0.6)	2 (1.9)	0 (0.0)	
By individuals (N = 173); possible or definite CTS[b]				
Developed unilateral CTS	24 (13.9)	8 (16.0)	16 (13.0)	0.606
Developed bilateral CTS	12 (6.9)	6 (12.0)	6 (4.9)	0.095
Developed unilateral or	36 (20.8)	14 (28.0)	22 (17.9)	0.137

bilateral CTS				
By individuals (N = 173); only definite CTS[a]				
Developed unilateral CTS	2 (1.2)	2 (4.0)	0 (0)	0.082
Developed bilateral CTS	0 (0)	0 (0)	0 (0)	—
Developed unilateral or bilateral CTS	2 (1.2)	2 (4.0)	0 (0)	0.082

The data in this table are reported based on both the wrist and individual level; therefore, the number of wrists affected when totaled by column will not be equal for each separate section.
a Fisher's exact test.
b Chi-squared test.

Table IIIa includes the adjusted odds ratios for the development of CTS at the wrist level when controlling for type of work, age, BMI, and gender. Of these variables, only poultry work was associated with an increased odds ratio that approached statistical significance at 1.89 ($P = 0.089$). Table IIIb is similar, but includes the adjusted odds ratios for the development of CTS at the participant level. Similar to the wrist level results, the highest odds ratio is for poultry work (1.81), but it does not reach statistical significance ($P = 0.139$). Finally, when only those in poultry work were assessed to determine factors that may increase the incidence of CTS, none of the assessed variables (age, BMI, gender, poultry task) approached statistical significance (Table IV).

Table IIIa. Adjusted Odds Ratios for the Incidence of Carpal Tunnel Syndrome at the Wrist Level (N = 363 Wrists)

Characteristic	**AOR**	**95% CI**	***P*-Value**
Type of work			0.089
Poultry	1.89	0.91, 3.96	
Non-poultry[a]	—	—	
Age[b]	1.01	0.96, 1.06	0.708
BMI[b]	1.02	0.95, 1.09	0.597
Gender			0.558
Male	1.23	0.61, 2.49	

Female[a]	—	—	

AOR, adjusted odds ratio.
a Reference category.
b Treated as continuous variables, adjusted odds ratios reported for a one point increase in the variable of interest.

Table IIIb. Adjusted Odds Ratios for the Incidence of Carpal Tunnel Syndrome at the Individual Level (N = 173 Individuals)

Characteristic	**AOR**	**95% CI**	***P*-Value**
Type of work			0.139
Poultry	1.81	0.83, 3.98	
Non-poultry[a]	—	—	
Age[b]	1.00	0.95, 1.05	0.969
BMI[b]	1.02	0.94, 1.10	0.713
Gender			0.583
Female	—	—	
Male[a]	1.24	0.58, 2.67	

AOR, adjusted odds ratio.
a Reference category.
b Treated as continuous variables, adjusted odds ratios reported for a one point increase in the variable of interest.

Table IV. Characteristics Potentially Associated With the Incidence of Carpal Tunnel Syndrome in Poultry Workers (N = 106 Wrists)

Characteristic	**No CTS, mean [SD] or N (row %)**	**Possible CTS, mean [SD] or N (row %)**	**CTS, mean [SD] or N (row %)**	**Bivariate analysis**	
				OR	***P*-Value**
Age[a]	29.9 [8.0]	34.5 [14.1]	28.0 [1.4]	1.04	0.185
BMI[a]	27.7 [4.9]	27.9 [3.4]	30.0 [3.3]	1.02	0.723

Gender					
Female	43 (82.7%)	8 (15.4%)	1 (1.9%)	0.73	0.601
Male[b]	42 (77.8%)	11 (20.4%)	1 (1.9%)	—	
Poultry Job Task[c]					
Category 1[b]	32 (76.2%)	9 (21.4%)	1 (2.4%)	—	
Category 2	35 (83.3%)	6 (14.3%)	1 (2.4%)	0.64	0.515
Category 3	10 (90.9%)	1 (9.1%)	0 (0)	0.32	0.307
Category 4	8 (72.7%)	3 (27.3%)	0 (0)	1.20	0.851

a Treated as continuous variables, odds ratios reported for a one point increase in the variable of interest.
b Reference category.
c Category 1: Packing, Sanitation, Chilling, Other; Category 2: Cutting, Eviscerating, Wash-up, Trimming, Deboning; Category 3: Receiving, Hanging, Killing, Plucking; Category 4: Multiple job tasks.

DISCUSSION

One of the challenges of CTS, from both a clinical and research standpoint, is defining the presence of the condition. The diagnosis can be based on symptoms, examination findings, nerve conduction studies, neuromuscular ultrasound, response to surgery, or a combination of these parameters [Stevens, 1997; Rempel et al., 1998; Keith et al., 2009; Cartwright et al., 2012a]. In research settings, in particular, defining the presence of CTS may be limited by time and financial constraints. In addition, CTS can also be described on either a wrist or individual level, and different cut-offs can be applied to alter the accuracy of each diagnostic test. Given these diagnostic challenges, the incidence data in this study are presented in a variety of manners to increase clinical relevance and allow for comparison to previous studies. Using a strict definition of CTS, in which both clinical and electrodiagnostic abnormalities must be present, two wrists on two separate poultry workers went from no evidence of CTS at baseline to definite CTS at 1 year, and none of the non-poultry manual workers developed definite CTS. This resulted in 1.9% of wrists and 4.0% of individuals developing CTS after 1 year in poultry processing. When a less strict definition of CTS was applied, 19.8% of wrists and 28.0% of poultry workers developed CTS over 1 year, compared to 11.7% of wrists and 17.9% of individuals in non-poultry manual laborers, with the data based on the wrist level reaching statistical significance ($P = 0.022$). Based on these findings, it is possible that Latinos employed in poultry processing have a higher 1-year incidence of CTS than Latinos employed in other manual labor positions.

There are only a few prospective studies of CTS incidence in the literature. Silverstein et al. [2010] examined workers in manufacturing at baseline and 1 year, using symptoms and nerve conduction studies to define CTS, and found that at 1 year 1.05% of 479 wrists developed CTS. This is slightly less than the 1.9% (strict definition) and certainly less than then 19.8% (less strict definition) of wrists in poultry workers that developed CTS at 1 year. On an individual rather than wrist level, Werner et al. [2005] found that 4.5% of auto assembly workers developed CTS over 1 year, using clinical symptoms and nerve conduction studies (latency 0.5 ms or greater in the median compared to ulnar sensory response) to define CTS. Using similar criteria, Gell et al. [2005] found a 7% incidence of CTS over an average of 5.4 years in industrial and clerical workers, or 1.2% per year. Direct comparison of the incidence in auto assembly, industrial, and clerical workers to poultry workers is challenging because the case definitions of CTS differ in these studies, but on an individual level our study found between 4.0% (strict definition) and 28% (less strict definition and similar to the definition used by Werner and Gell) of poultry workers developed CTS over 1 year. Other studies, using only clinical symptoms to define CTS, have detected higher incidence rates at 1 year, but not as high as the 19.8% of wrists and 28.0% of individuals detected amongst poultry workers in this study. For example, Andersen and coworkers used symptoms obtained through surveys to determine that 5.5% of 5,658 computer users in Denmark developed CTS at 1 year. Of interest, Nathan et al. [2005] examined 148 industrial workers at baseline and again 17 years later, using symptoms and nerve conduction studies to define CTS, and found that 28% of workers developed CTS over this extended follow up.

Another finding of note in this study is that traditional risk factors for CTS, such as higher age, higher BMI, and female gender did not predict the development of CTS over 1 year in this population of manual workers. Our previous examination of the prevalence of CTS in Latino manual workers did show a modest association between CTS and higher age and BMI, but not female gender [Cartwright et al.,2012b]. The reason these traditional risk factors do not appear to carry as much importance for the incidence of CTS in this population is not known, but it is possible that the manual labor performed by this group is a greater risk factor than higher age and BMI and female gender, as has been suggested in other studies of CTS incidence in occupations requiring forceful exertion [Burt et al., 2013].

While this study is one of the few prospective investigations of CTS, and it provided significant insight into this condition in poultry processing workers, it did have some limitations. First, although the study initially started with a large number of participants, the final analyses included just 56 poultry workers and 134 non-poultry workers with no CTS at baseline and full 1-year follow up data. A larger study population would have increased the power to detected statistically significant differences at the individual level. Second, there are certain types of nerve conduction studies, such as palmar mixed comparison studies, that are more sensitive for the diagnosis of CTS than the antidromic sensory responses used in this study. We did not use the more sensitive studies because they are more technically challenging, especially in the field setting. Using these more sensitive nerve conduction studies might have increased the incidence of CTS in both groups slightly. Third, the comparison group in this study also had a relatively high 1-year incidence of CTS, which likely occurred because some were involved in occupations requiring repetitive wrist movements, such as landscaping, construction, restaurant work, and manufacturing. While this is an appropriate comparison group, the high incidence of CTS in this group made it more challenging to document statistically significant increases in the poultry workers. Fourth, the length of time each worker was employed in their current position was not included in the analyses. It is difficult to speculate how this may have affected the results, since it is possible that a longer employment might lead to more cumulative trauma and a higher likelihood of CTS, or conversely a worker that is intrinsically more resistant to the development of CTS might stay in the same job longer, so they are less prone to develop CTS over the length of the study. Either way, this is a limitation of the current study. Finally, we used a hand diagram, rather than a detailed history and physical examination, to diagnose CTS. This accepted approach was used because a detailed clinical evaluation would not have been feasible with the number of participants in this study, but a detailed history and examination might have slightly increased our diagnostic accuracy for CTS [Rempel et al., 1998].

Given the high 1-year incidence of CTS amongst poultry workers, the increased incidence compared to other manual laborers, and our previous finding of an increased prevalence of CTS in poultry workers compared to non-poultry manual laborers [Cartwright et al., 2012b], it is possible that poultry processing predisposes workers to the development of CTS. The current study did not identify any specific job tasks that significantly increased the risk of CTS, but the study of CTS prevalence in poultry workers did identify an association with performing multiple jobs (odds ratio = 2.66, $P = 0.0035$) and a trend towards a positive association in those that were involved in cutting, eviscerating, wash-up, trimming, and deboning (odds ratio = 1.57, $P = 0.0661$).

The increased risk of CTS in the current group of poultry workers, with at least 4.0% of workers developing CTS over 1 year, likely results from the strenuous and repetitive nature of poultry processing. Employers and regulators should consider this risk in an effort to improve the overall health of this vulnerable population. While the benefit of specific interventions to decrease the incidence of CTS has not been proven, policies to provide more rest from repetitive hand movements, improve ergonomics, and increase screening for CTS should be considered to help decrease the high incidence of CTS in this group of workers [Dick et al., 2011].

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