

# Self-Reported Skin Symptoms and Skin-Related Quality of Life Among Latino Immigrant Poultry Processing and Other Manual Workers

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**Background** *Manual labor employment occurs in environments with exposures likely to impact skin-related quality of life (SRQOL).*

**Objectives** *The objectives of this paper are to (1) document the dimensions of SRQOL, (2) examine its association with skin symptoms, and (3) identify the predictors of SRQOL in Latino manual workers.*

**Methods** *A population-based survey of 733 Latino manual workers obtained Dermatology Life Quality Index (DLQI) and skin symptoms in the prior year.*

**Results** *Two-thirds of workers were employed in production. Skin symptoms in prior year were reported by 23%. Impaired SRQOL was reported by 23%. In multivariate analyses, reduced SRQOL was associated with age, occupation, childhood indigenous language use, and experience of skin symptoms in the prior year.*

**Conclusions** *Despite overall high SRQOL exposures in some immigrant occupational groups produce reduce SRQOL. This rural, immigrant population faces significant obstacles to obtaining dermatological care; efforts are needed to improve their SRQOL.*  
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**KEY WORDS:** *poultry processing workers; manual workers; occupational health; survey; immigrant health*

## INTRODUCTION

Manual work in many industries occurs in environments that produce exposures likely to cause cutaneous injuries and illnesses. Such exposures can include chemicals, metals, vegetation, wet work, and animal products. In addition, work often takes place in temperature, humidity, and sunlight extremes than can adversely affect skin and exacerbate existing skin conditions. Tools in the workplace can also traumatize skin with resultant scarring.

The incidence of job-related skin disease resulting in lost work time was 3.3 illnesses per 10,000 workers in 2011; rates were considerably higher in some industry sectors, such as manufacturing at 4.6/10,000 [Bureau of Labor Statistics, 2012]. Because occupational skin disease is frequently underreported, the true incidence of job-related skin disease is likely higher than the Bureau of Labor Statistics estimate. Underreporting occurs, in part, because

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workers risk negative consequences for reporting workplace injury or illness to the sources (e.g., workers' compensation claims) used for compiling such statistics [Azaroff et al., 2002].

Contact dermatitis accounts for most occupational skin disease [Diepgen and Coenraads, 1999; Cherry et al., 2000]. Epidemiologic studies report occupational skin disease among manual workers employed in a range of industries including construction [Block et al., 2003; Stocks et al., 2011], food manufacturing and processing [Viinanan et al., 2011; Pichardo-Geisinger et al., 2013], food preparation [Vester et al., 2012], cleaning [Meding and Swanbeck, 1990; Nielsen, 1996; Mirabelli et al., 2012], healthcare [Machovcová et al., 2012], and farm work [Arcury et al., 2007; Irby et al., 2009].

Although skin disease itself has been documented, evidence for its impact on skin-related quality of life (SRQOL) among manual workers is sparse. Most analyses are restricted to clinical samples. For example, all studies found by a recent review of the impact of occupational contact dermatitis on SRQOL [Lau et al., 2011a] were recruited either from clinics or from work injury claims listings. However, many skin diseases are not treated clinically, particularly in low socioeconomic status worker populations. Such workers may not recognize a skin disease if symptoms are mild [Quandt et al., 2005, 2008a], may lack access to specialty care [Feldman et al., 2009] or rely on self-treatment [Arcury et al., 2006; Cathcart et al., 2008], and may not be able to take time from work to obtain medical evaluation. The few published studies of SRQOL conducted in the general population include a longitudinal study of Latino migrant farmworkers in the southeastern United States (304 workers with a total of 1,048 observations), which found that effects of skin disease on SRQOL were reported in about one in six observations [Quandt et al., 2008b]. A small study of 25 poultry processing workers from a non-clinical population found a broad range of effects of skin conditions on SRQOL, with one in two reporting some effect [Quandt et al., 2005].

Examination of SRQOL among a broader worker population is necessary to understand the magnitude of the impact skin disease has on different components of SRQOL. Such studies can heighten recognition of skin disease in these populations, encourage greater awareness of skin disease in primary care, and lead to expansion of access to specialty care. Understanding SRQOL effects also may enhance strategies for reducing the impact of skin disease on workers' lives, if the underlying skin disease cannot be avoided or controlled.

The Latino or Hispanic population in the US grew dramatically in the first decade of the twenty-first century, by 43%, compared to a growth rate of 10% for the total US population [Ennis et al., 2011]. This coincided with dispersal, first noted in the 1990s, of Hispanic residence across the US,

from a concentration in long-established settlements, largely in the western US, to "new settlement" areas in parts of the Southeast and Midwest that previously had few Hispanic residents [Kandel and Cromartie, 2004; Fry, 2008]. These immigrants were rapidly incorporated into the workforce, many in manual occupations that placed them at high risk for occupational injuries and illnesses [Orrenius and Zadvoyny, 2009].

This paper draws on a site-based sample of Latino manual workers recruited from the general population in western North Carolina, USA. As this study sample comes from a rural area with limited specialty care available and is in a new settlement area for Latinos in the US, their access to dermatological care is limited, making them an important population in which to measure the impact of skin disease on SRQOL in workers employed among a wide variety of industries. The objectives of this paper are to (1) identify the dimensions of SRQOL most affected in Latino manual laborers, (2) examine the association of SRQOL and skin symptoms, and (3) identify the predictors of SRQOL in this population.

## METHODS

### Sampling and Recruitment

Data were collected as part of a larger study of occupational health among Latino manual laborers. The study used a cross-sectional design to collect information on SRQOL and skin ailments from Latino poultry processing and other manual laborers. Workers were recruited from March 2009 to August 2010.

Procedures for sampling and recruitment have been reported previously [Arcury et al., 2013; Pichardo-Geisinger et al., 2013]. In brief, a site-based sampling method was used to recruit a representative sample [Arcury and Quandt, 1999; Parrado et al., 2004]. A sample frame was developed of dwellings where Latinos lived in the study area. The list contained 4,376 possible Latino dwellings.

Recruiters visited randomly selected dwellings in order. Residents were screened for inclusion criteria: self-identified as being Latino or Hispanic, worked 35 hr or more per week in a manual labor job, and 18 years of age or older. Manual labor jobs were defined as employment in non-managerial jobs in industries such as landscaping, construction, restaurant work, hotel work, child care, or manufacturing. Because the aim of the larger study was to compare poultry and non-poultry workers, non-poultry manual workers with previous work in poultry only qualified if lifetime employment in poultry production or processing was 6 months or less, and not within the past 2 years. Work in poultry processing was defined as any type of non-supervisory work in a poultry processing plant with job categories from receiving through

sanitation. Employees of poultry production farms were excluded. More than one resident per dwelling could be recruited, if eligible. Of 1,681 dwellings selected, residents were screened in 965, for a dwelling screening rate of 57%. Of the 716 dwellings where residents were not screened, 114 appeared to be vacant, no one answered the door at 362, residents refused to be screened at 123, 97 addresses could not be found by the recruiters, dog and other safety concerns prevented screening at 11, and 9 structures were not residences. In the 965 dwellings where residents were screened, a total of 1,526 adult residents were screened. Of those eligible, 742 (78%) were interviewed and 215 refused to be interviewed. One participant was recruited in 318 dwellings, 2 in 156, 3 in 36, and 4 in 1 dwelling.

## Data Collection

Data collection procedures were approved by the Wake Forest School of Medicine's Institutional Review Board. Data were collected in face-to-face interviews by Spanish speaking interviewers. All interviewers attended a series of training sessions, which included procedures for obtaining informed consent, interviewing techniques, and maintaining confidentiality. Informed consent was obtained from all participants. Consent was obtained after dwelling residents were screened for eligibility.

The survey instrument included demographic and background questions: age, occupation, education, language most often spoken in the childhood home (indigenous or non-indigenous [Spanish or English]), and self-rated health. Skin symptoms were queried by asking if each of a list of 12 skin symptoms (taken from the Nordic Occupational Skin Questionnaire [Flyvholm et al., 2002]) had been experienced for hands, wrist, or forearms in the past 12 months. The symptoms were: redness, dry skin with scaling/flaking, fissures or cracks, weeping or crusts, tiny water blisters (vesicles), papules, rapidly appearing itchy wheals/welts (urticarial), itching, burning/prickling/stinging, tenderness, aching or pain, or other. The Spanish translations for these symptoms were derived from our previous research with immigrant Latino workers [Vallejos et al., 2005]. A skin-specific health-related QOL instrument, the Dermatologic Life Quality Index (DLQI) [Finlay, 1998], was administered. The DLQI is designed to be completed quickly by persons 16 years and older. It consists of 10 items in which the respondent rates the effect of any skin condition on different aspects of life over the previous week (e.g., "Over the last week, how itchy, sore, painful or stinging has your skin been?"). Responses include: not at all (0), a little (1), a lot (2), and very much (3). The DLQI was originally developed in English and has been translated and validated in multiple languages. The questions form six subscales for different areas of life (Symptoms and Feelings, Daily Activities,

Leisure, Personal Relationships, Work, and Treatment) and a total score. In order to ensure fidelity to the original DLQI, we received permission from Dr. Andrew Y. Finlay, its developer, to create a validated version using the technique he requires for all new versions (see website for further details: <http://www.dermatology.org.uk/index.asp?portal/quality/dlqiinstruc.html>). Briefly, we undertook a series of interviews with persons in the target population to adjust vocabulary and idioms on the existing validated American Spanish DLQI to the local Spanish-speaking population. This slightly revised version then was subjected to back and forward translation. It was submitted to Dr. Finlay and approved for use.

## Measures

A measure of skin symptoms was created by summing the number of individual symptoms reported as present during the past 12 months. Possible values ranged from 0 to 12.

The Dermatological Life Quality Index subscales and total were computed as recommended [Finlay, 1998]. Each question was scored from 0 to 3. The scores were summed to produce subscale scores that ranged from 0 to a maximum of 6 (with the exception of the Work subscale and the Treatment subscale, which each had a maximum of 3). Scores were calculated only for participants who had answered at least 8 of the 10 questions. This criterion excluded nine participants from the original sample. The total scale score ranged from 0 (no impairment of life quality) to 30 (maximum impairment of life quality). These were first classified according to Hongbo et al. [2005] into categories of "no effect on life quality" (scores 0–1), "small effect..." (scores 2–5), "moderate effect..." (scores 6–10), "very large effect..." (scores 11–20), and "extremely large effect..." (scores 21–30).

As would be expected in a non-clinical population, the total DLQI scores and the subscores had a positive skew. Scores therefore were collapsed to three dichotomous outcome variables in order to explore which work tasks and demographic variables were most strongly associated with elevated DLQI scores. First, the total DLQI scores were split into scores 0 or 1 versus scores greater than 1. The two subscale scores (for the Symptoms and Feelings and the Work subscales) were split into scores of 0 versus 1 and above.

Occupation was obtained by categorizing workers into major Standard Occupation Classification (SOC) groups based on the primary job reported by the worker. Because of small numbers in several of the major SOCs, the occupational groups were collapsed into four broad groups for analysis, based on likely similarity of skin exposures: Production ( $n = 481$ ); Construction and Extraction, plus Installation, Maintenance, and Repair, plus Transportation and Material

Moving ( $n = 100$ ); Food Preparation and Serving Related, plus Personal Care and Service, plus Other ( $n = 101$ ); and Building and Grounds Cleaning and Maintenance, plus Farming/Fishing/Forestry ( $n = 51$ ).

## Analysis

Descriptive statistics of the sample were calculated as frequencies and percentages of discrete measures. Bivariate associations between dichotomized outcomes and demographic characteristics were examined using Chi Square tests of association. Multivariate logistic regression modeling accounting for clustering by dwelling and site strata was used to assess the relationship between DLQI outcomes and sample characteristics. Predictors in the generalized mixed effects modeling included age categorized as 18–24, 25–30, 31–40, 41+ years, gender, occupation as outlined above, education (0–6, 7–9, and 10+ years), language (indigenous versus non-indigenous), self-rated health (fair/poor vs. good or better), and self-reported skin symptoms. Adjusted odds ratios and 95% confidence intervals were estimated. Significance was accepted at  $P < 0.05$  with all analyses being generated using SAS version 9.2 (Cary, NC).

## RESULTS

The average ( $\pm$ SD) age of workers was 33.8 ( $\pm$ 10.2) years, with the largest proportion in their 30s (Table I). Over half (57%) were male. Over half of the workers (66%) had production occupations; most of these were employed in poultry processing. Educational status was generally low, with over half (57%) reporting six or fewer years of formal education completed. Almost a quarter (24%) reported having spoken an indigenous language in childhood. Over half (56%) rated their general health as fair or poor.

The number of different skin symptoms reported ranged from 0 to 12, and averaged 0.79 ( $\pm$ 1.81). No symptoms were reported by 566 workers (77.2%), 1 symptom by 32 (4.4%), 2–3 symptoms by 77 (10.1%), 4–6 symptoms by 5.6%, and 7 or more by 17 (2.3%). The most frequently reported symptoms were itching (14.9%), redness (10.3%), tenderness (8.7%), welts or wheals (8.1%), and burning/prickling/stinging (7.7%).

Mean total score reported for the DLQI was low: 0.65 ( $\pm$ 1.55). However, DLQI scores of 1 or higher were reported for 22.5% of observations. A “small effect” of skin disease on quality of life was reported for 14.4%, “moderate effect” for 2.3%, and a “large effect” for 0.1%. “No effect” was reported for 83.1% of observations.

The strongest association of reported skin symptoms with SRQOL was seen in the Symptoms and Feelings subscale (Table II), for which 19.9% of observations showed some effects, evidenced by a score of 1 or greater. On the

**TABLE I.** Sample Personal and Work Characteristics of 733 Immigrant Manual Workers Who Participated in Survey Interviews

	n <sup>a</sup>	%
Age		
18–24 years	133	18.2
25–30 years	193	26.4
31–40 years	239	32.6
41+ years	167	22.8
Sex		
Female	315	43.0
Male	418	57.0
Occupation		
Production	481	65.5
Construction/Installation and Repair/Transportation	100	13.6
Food Prep/Personal Care and Service/Other	101	13.8
Building and Grounds/Farming	51	7.0
Education		
0–6 years	420	57.4
7–9 years	170	23.2
10+ years	142	19.4
Language of childhood		
Indigenous	171	23.5
Non-indigenous	556	76.5
Self-rated health		
Fair/poor	407	56.2
Good or better	317	43.8
Skin symptoms		
No 12 month symptoms	563	77.1
12 month symptoms	167	22.9

<sup>a</sup>Varying n-values in the subsamples are attributable to missing data.

Work subscale, 15.0% of observations showed effects. The Leisure, Daily Activities, and Personal Relationship subscales showed relatively low association (6.0%, 4.4%, and 4.0%, respectively). The Treatment subscale showed almost no association (1.0%).

In bivariate analyses of personal and work characteristics and DLQI total and subscale scores (Table III), younger age was associated with poorer SRQOL. Males reported significantly poorer scores on the work subscale than did females, with a similar trend noted for total DLQI scores. Both total DLQI and the subscales differed by occupation, with employment in Production/Building and Grounds/Farming having worse SRQOL compared to the other occupations. Indigenous language was associated with poorer SRQOL in both the total and subscale scores. Poorer self-rated health was associated with poorer SRQOL for symptoms and feelings. Reporting skin symptoms in the previous year was associated with poorer scores on both total and subscale DLQI.

**TABLE II.** Frequency and Percent of Sample Reporting Dermatological Life Quality Index (DLQI) Subscale Scores From 0–3 or 5, With Higher Numbers Indicating Greater Impact of Skin Conditions on DLQI Domains

Score	Symptoms and feelings		Daily activities		Leisure		Work <sup>a</sup>		Personal relationships		Treatment <sup>a</sup>	
	n	%	n	%	n	%	n	%	n	%	n	%
0	587	80.1	701	95.6	690	94.0	622	85.0	704	96.1	726	99.1
1	91	12.4	27	3.7	29	4.0	101	13.8	28	3.8	6	0.8
2	46	6.3	4	0.6	13	1.8	5	0.7	1	0.1	1	0.1
3	5	0.7	1	0.1	2	0.3	4	0.6	0	0	0	0
4	3	0.4	0	0	0	0	—	—	0	—	—	—
5	1	0.1	0	0	0	0	—	—	0	—	—	—

<sup>a</sup>Range of possible scores, 0–3.

In multivariate analyses (Table IV), the effect of a single age group, 25–30 years, remained strongly associated with poorer SRQOL for the total DLQI score and the Work subscale. Workers 25–30 years of age had greater odds of reporting total DLQI score (adjusted odds ratio 3.05; 1.28, 7.03 95% confidence interval), and Work (AOR 2.76; 1.19, 6.40 CI) than workers 41 years and older. Occupation remained associated with DLQI only for the Work subscale. Compared to Production workers, those in Construction and related occupations had lower odds of reduced Work DLQI (OR 0.24; 0.07, 0.79 CI), suggesting better SRQOL among Construction workers than Production workers. In contrast, those in Building and Grounds Maintenance and related occupations had greater odds of increased Work subscale (OR 4.79; 1.62, 13.69 CI), suggesting that Building and Grounds Maintenance workers have poorer SRQOL than Production workers. The odds of DLQI scores suggesting impaired SRQOL were greater for indigenous language speakers for total DLQI (AOR 2.94; 1.51, 5.70 CI) and both subscales: Symptoms and Feelings (AOR 2.06; 1.15, 3.71 CI) and Work (AOR 2.48; 1.26, 4.89 CI).

Self-reported skin symptoms were associated with poorer SRQOL for the total score (OR 52.20; 27.7, 98.4 CI), Work subscale (OR 42.13; 24.7, 72.0 CI), and the Symptoms and Feelings subscale (OR 63.96; 31.4, 129.1 CI). Sex, education, and self-rated health were not associated with SRQOL in the multivariate analyses.

**DISCUSSION**

This study indicates that approximately one in five Latino manual laborers at the selected sites in western North Carolina reports an effect of skin conditions on their quality of life. As would be expected in a general worker population, this frequency is far lower than that seen in studies of clinical populations. A previous review of studies using the DLQI where a general population sample was contrasted with a

clinical sample found that mean DLQI scores from the general population samples ranged from 0 to only 0.05 [Lewis and Finlay, 2004]. By comparison, our sample of Latino manual workers averages 0.65, substantially higher than the previous general population samples reviewed. This average is substantially lower than studies of patients with occupation-linked skin diseases such as latex allergy [Nienhaus et al., 2008], hand eczema [Boehm et al., 2012; Diepgen et al., 2013], contact dermatitis [Hutchings et al., 2001; Lau et al., 2011b], and atopic dermatitis [Yano et al., 2013], where mean DLQI scores range from 4.5 to 11.1.

In other studies reporting DLQI subscale scores, the Symptoms and Feelings and the Work subscales generally show the largest impacts [Hutchings et al., 2001; Lau et al., 2011a; Boehm et al., 2012]. In this study population, most of the adverse effects were related to interference with work and problems caused by the experience of symptoms or feelings about one’s skin disease with about 20% and 15%, respectively, of respondents self-reporting one or more skin symptoms. This is similar to findings among Latino migrant farmworkers in North Carolina [Quandt et al., 2008a]. As both studies focused on migrant or immigrant workers who come to the US for economic reasons and often are responsible for supporting extended families in the US or in their country of origin, skin conditions that impair the ability to work may be particularly bothersome. However, unlike migrant farmworkers, the workers in the present study are, for the most part, residing in the US with kin and living in less isolated surroundings so that it is somewhat surprising that there was no greater reporting of skin conditions affecting leisure activities or personal relationships. The work/school and symptoms/feelings subscales may be linked, as our previous work has shown that symptoms that disturb sleep—symptoms like “itchy, sore, painful, or stinging” that are covered in the symptoms/feelings subscale—are particularly worrisome to workers who feel economic pressure to work [Rao et al., 2002].

This sample of workers has relatively good skin health: 77.1% reported no symptoms in the 12 months prior to

**TABLE III.** Bivariate Associations Between Dermatological Life Quality Index (DLQI) Measures and Personal and Work Characteristics, n (col %)

Characteristic	DLQI total score <sup>a</sup> (n = 733)		Symptoms and Feelings subscale <sup>b</sup> (n = 733)		Work subscale <sup>b</sup> (n = 732)		P-value <sup>c</sup>
	Not affected at all	Affected in varying degrees	Not affected at all	Affected in varying degrees	Not affected at all	Affected in varying degrees	
Age							
18–24 years	113 (18.6)	20 (16.1)	110 (18.8)	23 (15.7)	114 (18.4)	19 (17.3)	0.0003
25–30 years	138 (22.7)	55 (44.4)	133 (22.7)	60 (41.1)	147 (23.7)	46 (41.8)	
31–40 years	206 (33.9)	33 (26.6)	198 (33.8)	41 (28.1)	206 (33.2)	32 (29.1)	
41+ years	151 (24.8)	16 (12.9)	145 (24.7)	22 (15.1)	154 (24.8)	13 (11.8)	
Sex							
Male	339 (55.7)	79 (63.7)	328 (55.9)	90 (61.6)	344 (55.3)	73 (66.4)	0.0309
Female	270 (44.3)	45 (36.3)	259 (44.1)	56 (38.4)	278 (44.7)	37 (33.6)	
Occupation <sup>d</sup>							
Group 1	393 (64.5)	88 (71.0)	384 (65.4)	97 (66.4)	405 (65.1)	75 (68.2)	<0.0001
Group 2	93 (15.3)	7 (5.7)	86 (14.6)	14 (9.6)	95 (15.3)	5 (4.6)	
Group 3	90 (14.8)	11 (8.9)	83 (14.1)	18 (12.3)	89 (14.3)	12 (10.9)	
Group 4	33 (5.4)	18 (14.5)	34 (5.8)	17 (11.6)	33 (5.3)	18 (16.4)	
Education							
0–6 years	348 (57.2)	72 (58.1)	335 (57.2)	85 (58.2)	353 (56.8)	66 (60.0)	0.2306
7–9 years	139 (22.9)	31 (25.0)	136 (23.2)	34 (23.3)	141 (22.7)	29 (26.4)	
10+ years	121 (19.9)	21 (16.9)	115 (19.6)	27 (18.5)	127 (20.5)	15 (13.6)	
Language							
Indigenous	117 (19.4)	54 (43.9)	115 (19.8)	56 (38.6)	121 (19.6)	50 (45.9)	<0.0001
Non-indigenous	487 (80.6)	69 (56.1)	467 (80.2)	89 (61.4)	496 (80.4)	59 (54.1)	
Self-rated health							
Fair/poor	329 (54.5)	78 (63.9)	313 (54.0)	94 (65.3)	338 (55.0)	68 (63.0)	0.1221
Good or better	273 (45.5)	44 (36.1)	267 (46.0)	50 (34.7)	277 (45.0)	40 (37.0)	
Skin symptoms							
No 12 month symptoms	545 (89.9)	18 (14.52)	534 (91.4)	29 (19.9)	548 (88.5)	14 (12.7)	<0.0001
12 month symptoms	61 (10.2)	106 (85.5)	50 (8.6)	117 (80.1)	71 (11.5)	96 (87.3)	

<sup>a</sup>Total score: 0 or 1, not affected at all or affected a little; > 1, affected a lot or very much.<sup>b</sup>Subscales: 0, not affected at all; > 0, affected in varying degrees.<sup>c</sup>P-value from Chi-square tests of association.<sup>d</sup>Group 1: Production; Group 2: Building and Grounds, Farming, Outdoor; Group 3: Construction, Installation, Transportation; Group 4: Food Preparation, Personal Care, Service, Other.

**TABLE IV.** Multivariate Logistic Regression Analyses to Examine the Association of Total Dermatological Life Quality Index (DLQI) Score, Symptoms and Feelings Subscale, and Work Subscale With Selected Personal and Occupational Characteristics

Characteristic	Total DLQI (n = 716)		Symptoms and Feelings subscale (n = 716)		Work subscale (n = 715)	
	AOR <sup>a</sup>	95% CI	AOR	95% CI	AOR	95% CI
Age						
18–24 years	1.59	(0.59, 4.27)	1.08	(0.44, 2.65)	1.85	(0.62, 5.53)
25–30 years	3.05	(1.28, 7.30)	2.15	(0.97, 4.76)	2.76	(1.19, 6.40)
31–40 years	1.30	(0.52, 3.21)	1.08	(0.47, 2.48)	1.88	(0.76, 4.68)
41+ years	— <sup>b</sup>	—	—	—	—	—
Sex						
Male	1.02	(0.54, 1.92)	1.00	(0.57, 1.76)	1.63	(0.85, 3.12)
Female	—	—	—	—	—	—
Occupation <sup>c</sup>						
Group 1	—	—	—	—	—	—
Group 2	0.33	(0.10, 1.04)	0.90	(0.30, 2.68)	0.24	(0.07, 0.79)
Group 3	0.79	(0.29, 2.13)	1.64	(0.79, 3.37)	2.03	(0.75, 5.53)
Group 4	2.26	(0.79, 6.46)	1.38	(0.44, 4.37)	4.75	(1.65, 13.69)
Education						
0–6 years	—	—	—	—	—	—
7–9 years	1.40	(0.73, 2.70)	1.03	(0.52, 1.90)	1.40	(0.72, 2.74)
10+ years	1.49	(0.62, 3.57)	1.46	(0.61, 3.03)	0.71	(0.27, 1.85)
Language						
Indigenous	2.94	(1.51, 5.70)	2.06	(1.15, 3.71)	2.48	(1.26, 4.89)
Non-indigenous	—	—	—	—	—	—
Self-reported health						
Fair/poor	1.13	(0.64, 1.99)	1.49	(0.87, 2.56)	0.95	(0.52, 1.74)
Good or better	—	—	—	—	—	—
Skin symptoms						
No symptoms	—	—	—	—	—	—
12 month symptoms	52.20	(27.7, 98.4)	42.13	(24.7, 72.0)	63.69	(31.4, 129.1)

<sup>a</sup>Adjusted odds ratios and 95% CI from clustered, stratified multivariate logistic regression modeling comparing participants who reported skin-related quality of life being affected in varying degree due to skin problems versus those who reported little effect or none at all.

<sup>b</sup>Reference category.

<sup>c</sup>Group 1: Production; Group 2: Building and Grounds, Farming, Outdoor; Group 3: Construction, Installation, Transportation; Group 4: Food Preparation, Personal Care, Service, Other.

interview. However, those most commonly experienced include itching, which is a highly prevalent skin symptom and source of considerable morbidity [Weisshaar and Dalgard, 2009], and wheals, which are a known symptom of urticaria and linked to handling poultry products [Fisher, 1982], poison ivy, and various chemicals [Adisesh et al., 2013], occupational risks for manual workers across all the industry sectors represented in this sample.

The factors associated with poor SRQOL were age, speaking an indigenous language, occupation, and self-reported skin symptoms. Skin ailments may be more common in this 25–30 year age group because they have had sufficient exposures to reduce SRQOL; affected workers may eventually drop out of the work force or change jobs to reduce exposures, producing the “healthy worker effect.”

That is, those with severe enough skin conditions due to work will tend to drop out of the labor force or at least change jobs to one with fewer adverse health effects. The explanation for indigenous language associated with poor SRQOL is less easy to construct. Most of the indigenous workers are originally from Guatemala or southern Mexico, and have significant American Indian ancestry. This may be reflected in genetic differences, which result in greater exacerbation of skin conditions. In a subsample of this study sample who received a clinical skin evaluation, indigenous language was associated with a greater overall level of skin disease, including both infectious and inflammatory conditions [Pichardo-Geisinger et al., 2013]. Alternatively, indigenous language speakers are generally less acculturated in their countries of origin and may have had less access to medical

care or have lived in poorer quality housing, factors that can also result in greater prevalence and impact of skin disease.

SRQOL was associated with occupation, although the association remained significant only for the Work subscale in the multivariate analysis. Production work, which consisted largely of poultry processing workers, was associated with worse SRQOL than that of workers in construction, transportation, and similar occupations, but better SRQOL than that of workers doing building and grounds maintenance and farm work. Poultry processing workers, depending upon their job in the plants, are continuously exposed to water, animal protein, chicken feathers, chicken excrement, or cleaning and cooling chemicals, and often wear occlusive gloves. Although workers in the construction category are at risk for skin disorders, continuous exposure may be restricted to a small proportion of workers, such as those in construction who do cement or tile work or those in transportation who work with petroleum products. Both building and grounds maintenance workers and farmworkers can be exposed to chemicals, different types of plants, and weather extremes. A longitudinal surveillance study of Latino farmworkers found high rates of infectious and inflammatory skin disease, as well as skin trauma [Arcury et al., 2007]. A large study of professional cleaners found higher rates of hand dermatitis than in a comparison population. Hand dermatitis was associated with cleaning outdoor areas and schools and using particular chemicals and cleaning products [Mirabelli et al., 2012]. This study suggests that these different levels of exposures common to different industries are reflected in differences by industry in SRQOL.

The experience of any skin symptoms during the previous 12 months was associated with increased odds of reporting poorer total and subscale SRQOL. The large odds ratios reflect the overwhelming number of those who reported symptoms also reporting poor SRQOL. This is somewhat surprising considering that the symptom data were for the previous year and the SRQOL was reported for only the previous week. This suggests that the skin conditions underlying these workers' symptoms are likely to be chronic and cause chronically low SRQOL. It is notable that clinical data for a subset of these workers collected on a non-work day showed infectious skin diseases of the feet (tinea pedis and onychomycosis) to be the most commonly diagnosed skin diseases. Skin symptom data in the current analysis were focused on hands, wrists and forearms, suggesting that inflammatory diseases may be the source of substantial morbidity. Such conditions may be more likely to be revealed in survey data than clinical data, as their visible signs may be more transient and not present on a non-work day.

These findings should be interpreted in light of their limitations. The study is cross-sectional, so the duration of reduced SRQOL cannot be assessed. Workers were recruited

from only one area of the US. Because no census of Latino residents exists and this population is relatively hidden, a true population-based random sample was not possible. A site-based sampling strategy with assistance from community leaders was used instead. The true number of eligible individuals in the sampled dwellings is unknown, as some individuals may have absented themselves when the recruiter visited; and it is not possible to know how many there were and how many would have been eligible. The occupational categories used required combining categories because of small cell sizes. The study is cross-sectional, so causation or time-relationships among work, symptoms, and SRQOL cannot be determined. Atopic status was not assessed; it might have varied among subgroups and its inclusion in multivariable analyses might have altered the results. Nevertheless, the study has significant strengths. First, inclusion of workers from the multiple industries employing members of this ethnic population presents a broad picture of SRQOL. Second, the industries represented (e.g., poultry processing, construction, food service, farm work) are those in which, nationally, a large proportion of Latino immigrants are employed and which have a high proportion of Latino employees.

This paper adds to the sparse literature on the effect of skin illness on manual workers. It indicates that a small, but significant, number of Latino manual workers suffer from reduced quality of life due to skin ailments. Several barriers stand in the way of improving this situation. First, specialty healthcare such as dermatology is relatively scarce in rural communities, and wait times are often long [Uhlenhake et al., 2009]. Second, these workers are largely non-English speaking, which can present barriers in obtaining care in the US. Finally, many manual workers lack health insurance and may not perceive skin conditions as serious enough to warrant the out of pocket expenses resulting from seeking treatment. This suggests that policy changes to increase access to care are needed, as well as greater patient education for self-care of skin ailments.

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