

# The association of dermatologist-diagnosed and self-reported skin diseases with skin-related quality of life in Latino migrant farmworkers

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## Abstract

**Background** Skin diseases are known to affect the quality of life (QoL), but data to support this are based on clinical samples. Few data document the skin-related QoL in the general population, and whether its association differs with self-reported or dermatologist-diagnosed skin ailments. Farmworkers are at high risk for skin diseases, and are an appropriate population in which to explore these associations.

**Objectives** To compare the association between skin-related QoL and workers' self-reports of skin conditions or dermatologist-diagnosed skin diseases over the course of a work season.

**Methods** Three hundred and four Latino farmworkers were recruited from 45 randomly selected residential sites in North Carolina, USA, for longitudinal surveillance. The participants were interviewed up to five times at 3-week intervals and the reported skin problems and Dermatology Life Quality Index (DLQI) were recorded. Nine digital photographs were taken of each participant. A board-certified dermatologist rated each for the presence of specific skin diseases.

**Results** An impact of skin disease on QoL was reported in 16% of interviews. In multivariate analyses with self-reported skin problems, feet or skin fungus, rash, itching, and poison ivy were predictors of QoL. Dermatologist-diagnosed inflammatory diseases and pigmentary disorders were significant predictors of QoL. The association was stronger for self-reported skin problems than for dermatologist-diagnosed conditions.

**Conclusions** In a population of farmworkers, skin problems had a clinically significant impact on QoL. Itch-related conditions and cosmetic conditions, such as acne and melasma, were important determinants of QoL. Treatment for these conditions in this population may enhance QoL.

## Introduction

Skin diseases adversely affect multiple domains of the quality of life (QoL), including emotional, social, and economic aspects.<sup>1-3</sup> Because most research on skin-related QoL has been conducted on clinical samples,<sup>4,5</sup> there is little evidence available on how skin ailments affect QoL in the general, nonclinical population. In addition, it is difficult to ascertain whether skin-related QoL, a subjective evaluation, is more closely linked to a person's reported skin ailments and symptoms or to a dermatologist's diagnosis of that person's skin diseases. Because the characteristics of skin disease that are more readily perceived (e.g. itching, burning) may be more bothersome than those that may be noticed only by a dermatologist (e.g. changes in color or texture), it is probable that self-perceived skin problems will have a greater effect on skin-related QoL than will diagnosable skin diseases.

Recent research conducted on migrant farmworkers<sup>6-10</sup> presents a unique opportunity to investigate skin-related QoL in a general, nonclinical population, and to compare its association with self-reported and dermatologist-diagnosed skin conditions. Farmworkers are an occupational group with high rates of skin problems, as a result of the nature of their work and their limited access to healthcare.<sup>6,7</sup> They have a specific vocabulary,<sup>8</sup> certain conceptual models of the etiology of skin problems,<sup>9</sup> and certain self-treatment regimens for these conditions.<sup>10</sup>

The purpose of this article was to compare the association with skin-related QoL of: (i) workers' self-reports of skin ailments and symptoms over the course of a work season; and (ii) dermatologist-diagnosed skin diseases. Because the conditions with which workers are aware are likely to cause a response, it is hypothesized that QoL will be more closely related to workers' self-reports of their skin ailments than to dermatologist-diagnosed skin diseases.

## Methods

This study used a longitudinal surveillance design to collect information on skin disease risk factors, prevalence, and incidence. Data collection was scheduled at baseline and at four follow-up assessments at intervals of approximately 3 weeks beginning in May 2005 and ending in October 2005.

### Sampling

No census listing all farmworkers in North Carolina exists. Therefore, farmworkers were selected from 45 farmworker camps randomly selected from lists of residential sites, or from camps served the previous year by outreach staff from cooperating clinics and service agencies.

No African-American and very few female residents were identified at the participating sites. Therefore, the recruitment of participants was conducted without regard for ethnicity, and all female farmworker residents were invited to participate. The study design called for the recruitment of up to seven participants per residential site, and up to five interviews per participant. The sample after the baseline interview included 242 farmworkers from 42 sites. At the first to third follow-up interviews, new participants were recruited to replace workers who had left the camps. Replacement participants were recruited from the same camp when possible. The total sample included 304 Hispanic farmworkers from 45 camps, with a total of 1048 data points.

### Data collection

Data were collected by eight interviewers who were bilingual in Spanish and English. A questionnaire was administered at each interview. The questionnaire contained demographic and background questions, including age, marital status, history of work in agriculture, country of origin, education, and perceived health status. Questions related to work practices inquired about living conditions, crops worked, tasks completed, possible risk factors encountered, hygiene practices, and clothing or protective equipment worn on each of the previous 7 days. Participants were also asked to list skin and other health problems that they had experienced during the previous 7 days.

The Dermatology Life Quality Index (DLQI) was included on the questionnaire.<sup>11</sup> 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 School, 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 the vocabulary and idioms on the existing validated American

Spanish DLQI to the local Spanish-speaking population. This slightly revised version was then subjected to back and forward translation. It was submitted to Dr Finlay and approved for use. A description of the DLQI used in this article has been published previously.<sup>12</sup>

The questionnaire and consent form were translated into Spanish by a professional translator who was familiar with Mexican Spanish and with the farmworker population in North Carolina. The interviews were conducted in the participant's language of choice, which was Spanish in all cases.

Nine digital photographs were taken of each participant. These photographs included one frontal view of the face, two lateral views of the face, frontal and posterior views containing the torso and upper extremities, palmar and dorsal surfaces of the hands, and plantar and dorsal surfaces of the feet. The photographs were taken with an image size of 2592 × 1944 pixels and a FINE image quality setting (compression to one-quarter the size of the original). Images were stored as JPEG files on a secure HIPAA-compliant server housed at Wake Forest University Baptist Medical Center.

Data collection procedures were reviewed by the Wake Forest University School of Medicine's Institutional Review Board to ensure protection of the rights of the participants. All participants gave signed informed consent and were given a copy of the consent forms to keep. The participants received a cash incentive of \$10 at each interview and a hat with an occupational health message at the first interview.

## Measures

### Outcome

The outcome measures for these analyses were the total DLQI and the Work and School subscale. Only the Work and School subscale was selected because the remainder were thought to have too much overlap with the self-reported skin conditions (Symptoms and Feelings subscale) or showed little variability. The total DLQI and the subscale were computed as recommended.<sup>11</sup> The Work and School subscale scores ranged from zero to a maximum of three. The total scale score ranged from zero (no impairment of life quality) to 30 (maximum impairment of life quality). After examining the distribution of the total DLQI scores, these were collapsed into 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 of zero or unity vs. scores greater than unity. The Work and School subscale was split into scores of zero vs. unity and above.

### Predictors

The presence of self-reported skin problems was obtained from the list of skin problems included in the questionnaire. The participants indicated the presence/absence of each skin problem during the 7 days prior to the interview. Some of the items were grouped together for analysis purposes. The following conditions were used as outcomes: (i) fungus (includes the items "foot fungus"

and “fungus on the skin but not on the foot”); (ii) fungus on the nails; (iii) poison ivy; (iv) rash; (v) acne; (vi) superficial wounds (includes the items “sores or wounds,” “cuts,” and “scratches or abrasions”); (vii) insect bite; (viii) warts; (ix) calluses; and (x) sunburn. Several symptoms were included as outcomes: (i) blisters; (ii) spots or pigment change; and (iii) itching. Dichotomous measures of the presence/absence of each outcome were constructed for each participant at each interview and across the season.

Diagnosed skin diseases were obtained from the digital photographs. A single board-certified dermatologist (SRF) viewed and rated the photograph sets, recording diagnoses on a standardized form. The form listed the diagnoses which were grouped into the following categories: inflammatory disease, infection, pigmentary disorder, tumor, and trauma. This process is consistent with standard telemedicine diagnostic procedures.<sup>13,14</sup>

Dichotomous measures of each major category of diagnosed skin disease (inflammatory disease, infection, pigmentary disorder, tumor, and trauma), and each specific diagnosed skin disease or injury, were constructed for each participant over the entire data collection period and at each interview. Specific skin diseases included: the inflammatory diseases acne and folliculitis, contact dermatitis, and other inflammatory diseases; the infectious diseases tinea pedis, onychomycosis, warts, pitted keratolysis, and other infectious diseases; the pigmentary disorders postinflammatory changes, melasma, and other pigmentary disorders; tumors; and traumatic skin lesions, traumatic nail lesions, scars, bug bites, calluses, and other trauma. Two measures of the major category of trauma were constructed: the first measure, used only for descriptive analysis, included diagnoses of scars and calluses; the second, used in descriptive and multivariate analyses, excluded these diagnoses.

Other predictors evaluated included age (18–24, 25–30, 31–40, 41 years and older), region of birth (northern Mexico, central Mexico, and southern Mexico or Guatemala), languages spoken (English, Spanish, an indigenous language), education (0–6, 7–9, 10+ years), type of farmwork (planting, cultivating, harvesting, topping tobacco, burning tobacco), temperature ( $\leq 25$  °C,  $> 25$  °C and  $< 26.5$  °C,  $\geq 26.5$  °C), working with a temporary worker (H2A) visa (yes/no), self-reported health (poor/fair, good/very good/excellent), and years worked in agriculture in the USA (1, 2–3, 4–7, 8+ years). Most of the sample was born in Mexico. Northern Mexico was defined to include the states Baja California, Baja California Sur, Chihuahua, Coahuila, Nuevo Leon, Sonora, Tamaulipas, and Durango. Southern Mexico was defined to include Campeche, Chiapas, Quintana Roo, Tabasco, and Yucatan; participants from Guatemala were included in the southern Mexico group. The remaining states and the Federal District were defined as central Mexico.

### Data analysis

The distributions of the farmworker characteristics were described using counts, frequencies, means, and standard deviations. Dichotomous outcomes for total DLQI and the Work

and School subscale were first modeled as functions of the farmworker characteristics, type of farmwork, environmental temperature, self-reported skin conditions, and diagnosed skin disorders with bivariate logistic regression models. Next, in order to examine whether self-reported skin conditions or the diagnosed skin disorders were more strongly associated with skin-related QoL, two separate multivariate logistic regression models were created for total DLQI. One model included the self-reported skin conditions, farmworker characteristics, type of farmwork, and environmental temperature; the second model included the diagnosed skin disorders, farmworker characteristics, type of farmwork, and environmental temperature. Each model was reduced to a simpler, final model by step-by-step removal of the covariates from the model whose exclusion did not change the association between the total DLQI outcome and the strongest skin condition predictor in the model or the strongest skin disorder predictor in the model by more than 20%. The same multivariate logistic modeling strategy was employed for the Work and School subscale outcome.

The regression coefficients (and their standard errors) in both the bivariate and multivariate logistic regression models were determined using the alternating logistic regressions estimation procedure<sup>15</sup> to account for the typically correlated multiple observations from the same farmworker, as well as possibly correlated multiple observations from farmworkers employed at the same camp. Multivariate adjusted prevalence odds ratios (ORs) and their 95% confidence intervals (CIs) were determined in the usual way via exponentiation of the log ORs from the multivariate logistic regressions. The magnitude of the clustering of the skin disorder outcomes within farmworkers and between farmworkers within camps was estimated using the pairwise ORs.<sup>16</sup> The descriptive analyses used SPSS version 14.0 (SPSS Inc., Chicago, IL, USA), and the alternating logistic regressions used SAS version 9.1 (SAS Institute Inc., Cary, NC, USA).

### Results

The sample consisted of 300 male Hispanic farmworkers and four female Hispanic farmworkers (Table 1). The age (mean  $\pm$  standard deviation) was  $31.7 \pm 9.3$  years. Over 60% reported a primary education or no formal education. Almost three-quarters of the workers were from the central region of Mexico, and over 60% reported being in the USA on an H2A temporary visa. The average number of years spent doing farmwork in the USA was  $5.1 \pm 4.7$  years.

The mean total DLQI reported was  $0.80 \pm 1.59$ . DLQI scores of zero or unity were reported for 84.2% of observations. Scores of 2–5 were reported for 13.1%, scores of 6–10 for 2.2%, and scores above 10 for 0.4% of observations. Ten percent of observations showed effects (i.e. values above zero) on the Work and School subscale.

Foot or skin fungus and sunburn were the skin conditions most commonly reported by workers (Table 2) at one or more

**Table 1** Participant characteristics: farmworkers in eastern North Carolina, 2005 (*n* = 304)

	Frequency	Percentage	Mean	Standard deviation
Gender				
Male	300	98.7		
Female	4	1.3		
Age (years)			31.68	9.30
18–24	79	26.0		
25–30	69	22.7		
31–40	104	34.2		
≥ 41	52	17.1		
Education (grades)			6.72	2.84
0–6	184	60.5		
7–9	85	28.0		
≥ 10	35	11.5		
Region of birth				
Northern Mexico	42	13.8		
Central Mexico	222	73.0		
Southern Mexico and Guatemala	40	13.2		
Language spoken*				
English	13	4.3		
Spanish	302	99.3		
Indigenous language	39	12.8		
Self-rated health				
Fair/poor	130	42.8		
Good or better	174	57.2		
H2A visa				
Yes	191	62.8		
No	113	37.2		
Experience in US agriculture (years)†			5.09	4.68
1	69	22.7		
2–3	82	27.0		
4–7	77	25.3		
≥ 8	75	24.7		

\*A number of participants spoke more than one language, and so the totals exceed 304 and 100%.  
 †*n* = 303, because of missing data.

times during the summer (58.6% and 58.6%, respectively). Acne, calluses, itching, and rash were reported by over 40% of workers. The most common skin disorders diagnosed by dermatologists were tinea pedis (67.8%) and acne (47.7%).

In bivariate associations (adjusting for clustering by person and camp) between predictor variables and DLQI, all self-reported skin problems, except calluses, were positively associated with elevated total DLQI (Table 3). The associations were particularly strong for three symptoms queried: blisters (OR: 3.42; 95% CI: 1.67, 6.28), rash (OR: 4.86; 95% CI: 3.28, 7.20), and itching (OR: 11.22; 95% CI: 7.36, 17.11). Of the specific conditions queried, the association with total DLQI was highest for poison ivy (OR: 4.32; 95% CI: 2.28, 8.18). Similar results were found for the bivariate relationship between the Work and School subscale and self-reported skin conditions.

**Table 2** General prevalence of self-reported skin conditions and dermatologist-diagnosed skin disorders in eastern North Carolina; includes number of persons who reported the presence of the skin problem or symptom at least once (*n* = 304 farmworkers)

Skin problem or symptom	General prevalence ( <i>n</i> = 304)	
	<i>n</i>	%
Skin conditions (self-reported)		
Foot fungus or skin fungus	178	58.6
Nail fungus	110	36.2
Rash	130	42.8
Acne	147	48.4
Superficial wounds (includes cuts, sores, scratches)	83	27.3
Insect bite	116	38.2
Sunburn	178	58.6
Itching	140	46.1
Calluses	147	48.4
Warts	60	19.7
Blisters	42	13.8
Spots/pigment change	49	16.1
Poison ivy	32	10.5
Skin disorders (diagnosed)		
Inflammatory diseases	174	57.2
Acne and folliculitis	145	47.7
Contact dermatitis	37	12.2
Infectious diseases	238	78.3
Onychomycosis	140	46.1
Tinea pedis	206	67.8
Pigmentary disorders	58	19.1
Trauma	187	61.5
Trauma, excluding scars and callus	105	34.5

Dermatologist-diagnosed skin diseases were, in general, less strongly related to skin-related QoL than were the self-reported skin problems. Inflammatory diseases, as a general category, were positively related to total DLQI (OR: 1.38; 95% CI: 1.04, 1.82); however, the most common inflammatory conditions, acne and contact dermatitis, were not. Pigmentary disorders were positively related to DLQI (OR: 2.41; 95% CI: 1.50, 3.89). Neither infectious diseases nor trauma were related to the total DLQI. A similar pattern was found for the Work and School subscale.

Age and education were not related to either measure of skin-related QoL. The first year in agriculture was associated with effects on both measures of skin-related QoL (OR: 2.32; 95% CI: 1.21, 4.45).

Higher temperatures were associated with total DLQI (OR: 2.04; 95% CI: 1.02, 4.10). Working in planting and topping tobacco was positively associated with both measures of skin-related QoL, and burning tobacco was protective.

In multivariate analyses with self-reported skin problems, four variables (foot or skin fungus, rash, itching, and

**Table 3** Bivariate associations of the total Dermatology Life Quality Index (DLQI) and Work and School subscale with characteristics amongst farmworkers in eastern North Carolina ( $n = 1046$  interviews with 303 farmworkers, adjusted for clustering by person and camp)

Characteristic	Total DLQI		Work and School	
	OR	95% CI	OR	95% CI
Skin conditions (self-reported)				
Foot fungus or skin fungus	2.50	1.82, 3.45	2.98	2.19, 4.05
Nail fungus	3.08	2.02, 4.70	2.58	1.74, 3.82
Rash	4.86	3.28, 7.20	3.72	2.46, 5.62
Acne	1.61	1.06, 2.45	1.54	1.08, 2.18
Superficial wounds (includes cuts, sores, scratches)	2.76	1.70, 4.47	2.75	1.79, 4.21
Insect bites	1.67	1.16, 2.42	1.62	1.15, 2.28
Sunburn	1.74	1.20, 2.53	1.16	0.78, 1.71
Itching	11.22	7.36, 17.11	7.59	4.61, 12.48
Calluses	1.43	0.97, 2.12	1.46	0.97, 2.19
Warts	1.96	1.27, 3.01	1.91	1.25, 2.93
Blisters	3.42	1.67, 6.28	2.62	1.44, 4.79
Spots	2.87	1.53, 5.39	2.32	1.23, 4.36
Poison ivy	4.32	2.28, 8.18	3.76	1.91, 7.41
Skin disorders (diagnosed)				
Inflammatory disease	1.38	1.04, 1.82	1.36	1.00, 1.84
Acne	1.27	0.95, 1.69	1.18	0.88, 1.57
Contact dermatitis	0.67	0.21, 2.12	0.94	0.30, 2.93
Infectious disease	0.83	0.61, 1.13	0.90	0.68, 1.20
Onychomycosis	1.21	0.89, 1.64	1.30	0.99, 1.70
Tinea pedis	0.82	0.60, 1.11	0.80	0.58, 1.10
Pigmentary disorder	2.41	1.50, 3.89	1.68	1.04, 2.73
Trauma	0.75	0.58, 0.96	0.98	0.73, 1.31
Personal and environmental characteristics				
Age (years)				
18–24	1.51	0.81, 2.83	1.26	0.85, 1.87
25–30	1.02	0.58, 1.84	1.31	0.88, 1.95
31–40	1.41	0.79, 2.51	1.22	0.81, 1.85
≥ 41	1.00	–	1.00	–
Years in agriculture				
1	2.32	1.21, 4.45	1.35	0.83, 2.19
2–3	1.21	0.72, 2.04	1.27	0.98, 1.65
4–7	0.74	0.47, 1.16	0.98	0.78, 1.24
≥ 8	1.00	–	1.00	–
Years of education				
0–6	1.00	–	1.00	–
7–9	0.84	0.54, 1.32	0.92	0.66, 1.29
≥ 10	1.21	0.69, 2.12	1.40	0.77, 2.56
Average temperature (°C)				
≤ 25	1.00	–	1.00	–
> 25 and < 26.5	1.67	0.89, 3.15	2.22	1.08, 4.57
≥ 26.5	2.04	1.02, 4.10	1.76	0.75, 4.13
Work tasks				
Planting	2.11	1.33, 3.35	2.15	1.28, 3.59
Cultivating	1.35	0.73, 2.50	2.08	1.34, 3.25
Harvesting	1.33	0.93, 1.91	1.06	0.69, 1.62
Topping tobacco	1.83	1.25, 2.68	1.98	1.27, 3.08
Barning tobacco	0.56	0.40, 0.78	0.71	1.72, 5.08

CI, confidence interval; OR, odds ratio.

**Table 4** Multivariate adjusted association of the total Dermatology Life Quality Index (DLQI) and Work and School subscale with self-reported skin problems and type of work of farmworkers in eastern North Carolina (adjusting for clustering by worker and site;  $n = 1046$  interviews with 303 farmworkers)

Characteristic	Total DLQI		Work and School	
	OR	95% CI	OR	95% CI
Self-reported skin problems				
Foot fungus or skin fungus	2.36	1.60, 3.48	2.73	1.94, 3.84
Rash	2.54	1.61, 3.99	1.91	1.35, 2.71
Itching	8.71	5.63, 13.47	5.19	3.02, 8.92
Poison ivy	4.83	2.28, 10.24	3.89	1.72, 8.82
Type of work				
Planting	2.13	1.27, 3.59	1.92	1.25, 2.96
Barning tobacco	0.61	0.44, 0.85		

CI, confidence interval; OR, odds ratio.

poison ivy) remained strong positive predictors of both total DLQI and the Work and School subscale (Table 4). Planting was positively related and barning negatively related to skin-related QoL. In multivariate analyses with dermatologist-diagnosed skin diseases (Table 5), inflammatory diseases and pigmentary disorders remained significant predictors of skin-related QoL. The types of work were also predictors, and were stronger predictors than the diagnosed skin diseases.

## Discussion

Most of the existing studies of the QoL impacts of skin diseases have been conducted in clinic populations.<sup>4</sup> As these persons have sought care for their skin disease, it is not surprising that the impact on QoL of skin diseases amongst patient populations is considerable. Such studies, however, shed little light on the deficits of QoL experienced as a result of skin disease in the general population.

In this study, we examined a population of migrant farmworkers at relatively high risk for a variety of skin conditions.<sup>6–8,17,18</sup> Overall, the impact of skin conditions on QoL was small; however, approximately 15% of our sample reported a clinically meaningful impact on QoL.

Itching appeared to be a significant skin problem in this population. Although a high correlation with the total DLQI might be expected, because itching is one of the questions in the DLQI, itching also remained important in the Work and School subscale, which does not include the itching question. Cosmetic conditions, such as nail fungus, acne, and spots, were also associated with a significant impact on QoL. It might have been predicted that such conditions, which have a significant cosmetic component, would not have affected QoL in this population. This population is predominantly

**Table 5** Multivariate adjusted association of the total Dermatology Life Quality Index (DLQI) and Work and School subscale with diagnosed skin diseases and type of work of farmworkers in eastern North Carolina (adjusting for clustering by worker and site;  $n = 1046$  interviews with 303 farmworkers)

Characteristic	Total DLQI		Work and School	
	OR	95% CI	OR	95% CI
Diagnosed skin diseases				
Inflammatory disease	1.46	1.10, 1.93	1.42	1.02, 1.98
Pigmentary disorder	2.28	1.39, 3.73	1.68	1.00, 2.84
Type of work				
Planting	3.35	2.19, 5.13	3.83	2.46, 5.98
Cultivating			3.29	1.98, 5.49
Harvesting	2.19	1.58, 3.06	2.45	1.54, 3.90
Topping tobacco	2.52	1.64, 3.87	3.37	2.03, 5.61
Barning tobacco			1.84	1.09, 3.12

CI, confidence interval; OR, odds ratio.

male and is in the USA to work. It has limited opportunities to socialize with women or with nonfarmworkers.

Amongst the dermatologist-diagnosed skin diseases, pigmentary disorders had the strongest association with QoL. Melasma was the most commonly diagnosed condition. This association requires further study to determine whether such conditions, usually considered as benign, are as stigmatizing in this population as in others.<sup>19,20</sup>

The analyses in this article have established that skin diseases are important in the QoL of the overall farmworker population, not simply in those who present with skin complaints in clinical settings. Itching is a major contributor to poor skin-related QoL. Treatment for this, or protective measures, should be made available to farmworkers. Such measures will be most needed early in the season during planting.

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