

## Skin-Related Quality of Life among Migrant Farmworkers

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### **Abstract:**

**Background:** Farmworkers in North America work in an environment likely to produce skin injuries and illnesses that affect quality of life (QOL).

**Objective:** We identified the dimensions of skin-related QOL that were most impaired and examined predictors in a cohort of North Carolina farmworkers.

**Methods:** We conducted a longitudinal survey of 304 Latino farmworkers across a work season (1,048 interviews). We assessed skin-related QOL using the Dermatology Life Quality Index.

**Results:** Effects on QOL were reported in 38.7% of observations. The greatest impacts of skin impairments were seen in the Symptoms and Feelings and Work and School Subscales. In multivariate analysis, specific work tasks and high temperatures were associated with greater decrements in QOL.

**Conclusions:** Skin disease among farmworkers is sufficiently severe to affect QOL. Future research should test the effectiveness of interventions on modifiable factors such as facilities for personal hygiene and field sanitation on skin-related QOL.

**Antecedents:** Les ouvriers agricoles en Amerique du Nord travaillent dans des conditions favorisant les lesions cutanees qui affectent leur qualite de vie (QV).

**Objectif:** Identifier les dimensions des lesions qui affectent le plus la QV est la plus et examiner les signes predictifs dans une cohorte d'ouvrier agricole en Caroline du Nord.

**Methodes:** Nous avons merle une enquete longitudinale sur 304 ouvriers sud-americains au tours d'une saison de travail. Nous avons effectue 1 048 entrevues au total. Nous avons evalue la QV relative a la condition de la peau au moyen de (Indite dermatologue de la qualite de vie.

**Resultats:** Des effets sur la qualite de vie ont ete rapportes dans 38,7 % des observations. L'effet le plus marque des atteintes cutanees se trouvait dans les categories «Symptomes et sensations» et caravan et ecole». Dans les analyses multivariees, des taches precises et les temperatures elevees etaient associees a une baisse plus importante de la QV.

**Conclusions:** Les maladies de la peau parmi les ouvriers agricoles sont assez graves et affectent la QV. Des recherches futures devront porter sur l'efficacite a ce niveau des interventions visant les facteurs modifiables, tels que des installations pour [hygiene personnelle et les techniques sanitaires sur le terrain.

### **Article:**

Farmworkers work and live in environments likely to produce skin injuries and illnesses. They are exposed to pesticides, fertilizers, and fuels, as well as both cultivated and wild plants. Their work conditions also expose them to sun, heat, humidity, and insects, which can affect skin and exacerbate skin ailments.<sup>1</sup> Tools and plants in the work environment can produce a variety of wounds. In the United States, farmworkers have the highest incidence of skin disorders of all industrial sectors. For 2003, the annual incidence rate was 18.5 in 10,000 workers for all agricultural production and 31.0 in 10,000 for crop production. This compares with only 4.9 in 10,000 for all private industry.<sup>2</sup>

The number of farmworkers in North America is not known. In Canada, over 15,000 foreign workers come from Mexico and the Caribbean to Ontario alone, through the Seasonal Agricultural Workers Program.<sup>3,4</sup> In the United States, farmworkers (plus dependents) number approximately 4.2 million.<sup>5</sup> They are largely from Mexico, male, and poor.<sup>6</sup> Farmworkers frequently live in crowded and unsanitary conditions,<sup>7,8</sup> conducive to the spread of infectious skin disease. Several studies have documented the prevalence of skin problems in the farmworker population. Forty-six percent of grape and tomato workers in California reported a rash lasting 2 or more days in the past 3 months, and a waist-up examination detected current irritant or contact dermatitis in 2% of workers.<sup>9</sup> In another study of grape, citrus, and tomato workers in California, 12% reported a rash lasting more than 2 days in the previous 12 months. Examination revealed 2% with contact dermatitis and 13% with lichenified hand dermatitis.<sup>10</sup> In a survey of North Carolina farmworkers, 24% of workers in early season and 37% in late season reported skin itch, burning, or rash in the previous 2 months.<sup>11</sup> A skin assessment conducted with workers at two farmworker camps in North Carolina diagnosed at least one skin disease in 77.7% of the 54 men examined and all of the 5 women examined. Nail and foot fungi were the most common conditions, with contact dermatitis diagnosed in 6% of the sample.<sup>12</sup>

Although many skin ailments are transient and likely have a minor effect on the overall health of workers, they can have a substantial effect on worker quality of life (QOL) by causing discomfort or impairing the ability to work, sleep, or engage in leisure activities. However, the impact on QOL is unknown because there has been no attempt to measure skin-related QOL among farmworkers. This article reports skin-related QOL in a cohort of farmworkers over the course of a work season in eastern North Carolina. Its goals are to (1) to describe skin-related QOL among farmworkers, (2) identify those dimensions of skin-related QOL most affected in farmworkers, and (3) examine predictors of skin-related QOL.

## **Methods**

### ***Sampling***

The data reported here were collected as part of a larger study of occupational skin disease among farmworkers. The study used a longitudinal surveillance design to collect information on skin-related QOL and skin ailments from Latino farmworkers across a work season. Data were collected at baseline and at four follow-up assessments, each approximately 3 weeks apart. Workers were recruited beginning in May 2005, in areas with the earliest growing season. The last data were collected in October 2005.

Because no census listing farmworkers exists, a site-based sampling method was used to recruit a representative sample.<sup>13,14</sup> A similar method has been used in previous farmworker health research.<sup>15,16</sup> Fifteen residential sites were randomly selected from those served by each of two migrant clinics and one farmworker service agency, for a total of 45 sites. Camps were located in nine counties across eastern North Carolina (Sampson, Johnston, Harnett, Wilson, Nash, Edgecombe, Greene, Pitt, and Lenoir counties), selected because they are the locations of producers of the state's major hand-harvested crops: tobacco, sweet potatoes, and cucumbers. Other hand-harvested crops produced include bell peppers, tomatoes, watermelons, and squash. These counties employed an estimated 28% of the state's farmworkers in 2000.<sup>17</sup>

Preliminary visits to residential sites showed that all residents were Latino and that almost all were male. Up to 7 farmworkers were selected randomly without regard to gender from each site. In camps with less than 7 residents, all were recruited. The total sample included 304 farm-workers from 45 camps, with a total of 1,048 interviews. The resulting sample included 141 participants who completed 5 interviews, 23 who completed 4 interviews, 39 who completed 3 interviews, 33 who completed 2 interviews, and 68 who completed 1 interview. Missing data reduced the sample for multivariate analysis to 1,046 interviews.

### ***Data Collection***

Data collection procedures were approved by the Wake Forest University 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.

The baseline survey instrument included demographic and background questions: age, marital status, history of work in agriculture, country of origin, education, and perceived health status. At both baseline and follow-up, a skin-specific health-related QOL instrument, the Dermatology Life Quality Index (DLQI),<sup>18</sup> 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 (eg, "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 School, and Treatment) and a total score. 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 this Web site 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 was then subjected to back and forward translation. It was submitted to Dr. Finlay and approved for use.

### *Measures*

The DLQI subscales and total were computed as recommended.<sup>18</sup> 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 and School subscale and the Treatment subscale, which had a maximum of 3). The total scale score ranged from 0 (no impairment of life quality) to 30 (maximum impairment of life quality). These were classified according to Hongbo and colleagues<sup>19</sup> into categories of "no effect on life quality" (scores 0-1), "small effect" (2-5), "moderate effect" (6-10), "very large effect" (11-20), and "extremely large effect" (21-30).

After examining the distribution of scores, these were collapsed to three dichotomous outcome variables 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 were split into scores of 0 versus 1 and above.

Predictors evaluated included age (18-24, 25-30, 31-40, and 41 years and older), highest level of education completed (grades 0-6, 7-9, 10, or higher), region of birth (Northern Mexico, Central Mexico, Southern Mexico, and Guatemala), 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 United States. 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 Southern Mexico. The remaining states and the Federal District were defined as Central Mexico.

Five work task variables and one environmental variable were also evaluated as predictors of the DLQI. Work task variables were planting, cultivating, topping, harvesting, and banning, with topping and banning being specific to work in tobacco. In each case, the variable indicates whether the farmworker performed the task in the past 7 days. Average temperature in degrees Celsius for the previous 7 days ( $\leq 23.9^{\circ}\text{C}$ ,  $> 23.9^{\circ}\text{C}$  and  $\leq 26.7^{\circ}\text{C}$ , and  $> 26.7^{\circ}\text{C}$ ) was the environmental variable. These data were obtained from regional weather stations.

### *Analysis*

The frequency and severity of the impact on QOL from skin impairments were described with counts and frequencies for the total DLQI and its subscales. Each of the dichotomous outcomes for total DLQI, Work and School subscale, and Symptoms and Feelings subscale was modeled as a function of independent variables for demographic, work task, and environmental variables with a logistic regression. The regression coefficients (and their standard errors) in these multivariate logistic regression models were determined with the alternating logistic regressions estimation procedure<sup>20</sup> to account for the typically correlated multiple observations from the same farmworker and possibly correlated multiple observations from farmworkers employed at the same camp.

Multivariate adjusted prevalence odds ratios and their 95% confidence intervals were determined in the usual way, via exponentiation of the log odds ratios from the multivariate logistic regressions. The magnitude of the clustering of the DLQI outcome and its subscales within farmworkers and between farmworkers within camps was estimated with pairwise odds ratios (PORs).<sup>21</sup> The descriptive analyses used *SPSS*, version 14.0 (SPSS Inc, Chicago, IL), and the alternating logistic regressions used *SAS*, version 9.1 (SAS Institute Inc., Cary, NC).

## Results

Three hundred of the 304 participating farmworkers were male. Participants ranged in age from 18 to 70 years (mean  $\pm$  SD 31.68  $\pm$  9.30 years) (Table 1). Most (88.5%) reported a ninth grade education or less. Over 40% rated their health as poor or fair. Over half of the workers were in the United States on the H2A temporary visa program. The sample included workers with experience in US agriculture ranging from this being the first year to more than 20 years.

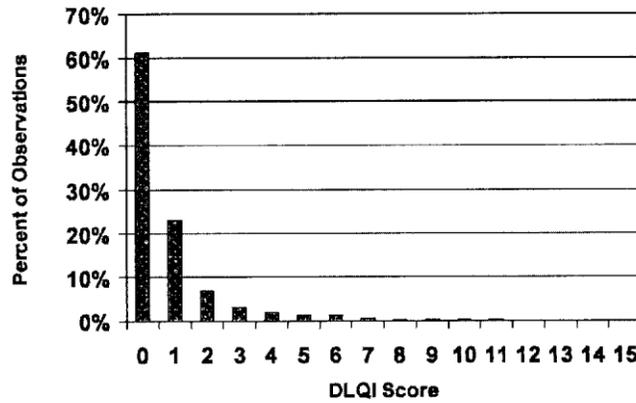
**Table 1.** Participant Characteristics: Farmworkers in Eastern North Carolina, 2005 ( $N = 304$ ).

<i>Characteristic</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Mean</i>	<i>SD</i>
Gender				
Male	300	98.7		
Female	4	1.3		
Age (yr)			31.68	9.298
18–24	79	26.0		
25–30	69	22.7		
31–40	104	34.2		
$\geq 41$	52	17.1		
Education (grades)			6.72	2.844
0–6	184	60.5		
7–9	85	28.0		
$\geq 10$	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 (yr) <sup>†</sup>			5.09	4.680
1	69	22.7		
2–3	82	27.0		
4–7	77	25.3		
$\geq 8$	75	24.7		

\*A number of participants spoke more than one language, so totals exceed 304 and 100%.

<sup>†</sup> $N = 303$ , owing to missing data.

The mean DLQI reported was 0.80  $\pm$  1.59. DLQI scores of 1 or higher were reported for 38.7% of observations (Figure 1). A "small effect" was reported for 13.1%, "moderate effect" for 2.2%, and a "very large effect" for 0.4% of observations. "No effect" was reported for 84.2% of observations.



**Figure 1.** Percentage of observations for total scores on the Dermatology Life Quality Index (DLQI); 1,048 observations with 304 farmworkers across one work season in North Carolina.

**Table 2.** Frequencies for Dermatology Life Quality Index Subscale Scores (*n* = 1,046 interviews)

Score	<i>Dermatology Life Quality Index Subscales</i>											
	<i>Symptoms and Feelings</i>		<i>Daily Activities</i>		<i>Leisure</i>		<i>Work and School*</i>		<i>Personal Relationships</i>		<i>Treatment*</i>	
	n	%	n	%	n	%	n	%	n	%	n	%
0	650	62.1	997	95.3	994	95.0	942	90.1	1,037	99.1	1,041	99.5
1	296	28.3	35	3.3	20	1.9	86	8.2	7	0.7	5	0.5
2	68	6.5	10	1.0	28	2.7	10	1.0	2	0.2	0	0
3	28	2.7	2	0.2	1	0.1	8	0.8	0	0	0	0
4	2	0.2	1	0.1	3	0.3			0	0		
5	2	0.2	1	0.1	0	0			0	0		

\*Range of possible scores, 0–3.

The greatest impact of skin impairments was seen in the Symptoms and Feelings subscale (Table 2), for which 37.9% of observations showed some effects. Ten percent of observations showed effects on the Work and School subscale. There was relatively little impact of skin impairment reported for the other subscales.

Multivariate analyses found that DLQI scores were not related to worker age, education, region of birth, visa status, or years of experience in US agriculture. Workers engaged in planting, cultivating, topping, and harvesting tobacco had 4.16, 2.39, 2.44, and 2.20 greater odds, respectively, of elevated DLQI scores, compared with those not engaged in those tasks (Table 3). Compared with temperatures  $\leq 23.9^{\circ}\text{C}$ , those working in temperatures  $> 23.9^{\circ}\text{C}$  and  $\leq 26.7^{\circ}\text{C}$  had 2.29 greater odds of elevated DLQI and those in temperatures  $> 26.7^{\circ}\text{C}$  had 3.33 greater odds of elevated DLQI scores.

For the Symptoms and Feelings subscale, those reporting fair or poor health had 1.56 greater odds of elevated subscale scores. Workers had greater odds (1.96, 1.91, 1.48, and 1.50, respectively) of reporting elevated subscale scores when cultivating, topping, harvesting, and burning tobacco than those not doing those tasks. Workers in temperatures of  $> 23.9^{\circ}\text{C}$  and  $\leq 26.7^{\circ}\text{C}$  had 2.11 greater odds of elevated subscale scores, and those in temperatures  $> 26.7^{\circ}\text{C}$  had 2.09 greater odds compared with those in temperatures  $< 23.9^{\circ}\text{C}$ .

For the Work and School subscale, workers engaged in planting had 4.63 greater odds of elevated subscale scores compared with those not planting. Other tasks associated with greater odds of elevated subscale scores were cultivating (3.71), topping (3.04), harvesting (2.05), and burning (2.03) tobacco. Working while temperatures were  $> 23.9^{\circ}\text{C}$  and  $\leq 26.7^{\circ}\text{C}$  and  $> 26.7^{\circ}\text{C}$  was associated with 3.02 and 4.67 greater odds of elevated subscale scores, respectively, than working while temperatures were  $\leq 23.9^{\circ}\text{C}$ .

Without adjustment for covariates in the logistic prevalence model, there was moderate to moderately strong clustering of total DLQI, the Symptoms and Feelings subscale, and the Work and School subscale both within farmworkers (PORs of 2.25, 1.47, and 2.61, respectively) and small to moderately large clustering between farmworkers within camps (PORs of 1.35, 1.15, and 3.23, respectively). The addition of the demographic and task variables to the prevalence model reduced the within-camp POR for total DLQI and for the Work and School subscale to a greater degree than the within farmworker POR.

**Table 3.** Multivariate Analysis: Association of Total Dermatology Life Quality Index, Symptoms and Feeling Subscale, and Work and School Subscale with Selected Demographic and Occupational Characteristics among Farmworkers in Eastern North Carolina ( $N = 1,046$  interviews with 303 farmworkers)

Characteristic	Total DLQI		Symptoms and Feelings		Work and School	
	OR	95% CI	OR	95% CI	OR	95% CI
Prevalence model*						
Self-rated health						
Fair/poor	1.45	0.93–2.25	1.56	1.19–2.05	1.47	0.92–2.36
Good or better	1.00		1.00		1.00	
Planting						
Yes	4.16	2.53–6.84	1.77	1.00–3.13	4.63	2.56–8.38
No	1.00		1.00		1.00	
Cultivating						
Yes	2.39	1.17–4.86	1.96	1.13–3.39	3.71	1.91–7.24
No	1.00		1.00		1.00	
Topping tobacco						
Yes	2.44	1.44–4.13	1.91	1.35–2.71	3.04	1.66–5.56
No	1.00		1.00		1.00	
Harvesting						
Yes	2.20	1.46–3.31	1.48	1.07–2.05	2.05	1.28–3.27
No	1.00		1.00		1.00	
Barning tobacco						
Yes	1.31	0.82–2.09	1.50	1.06–2.11	2.03	1.08–3.82
No	1.00		1.00		1.00	
Average temperature						
≤ 23.9°C	1.00		1.00		1.00	
> 23.9–≤ 26.7°C	2.29	1.21–4.36	2.11	1.36–3.26	3.02	1.38–6.61
> 26.7°C	3.33	1.37–8.12	2.09	1.17–3.74	4.67	1.54–14.21
Clustering model						
Within-farmworker POR <sup>†</sup>						
Unadjusted	2.25	1.44–3.51	1.47	1.09–1.99	2.61	1.43–4.75
Adjusted	2.24	1.34–3.75	1.40	1.02–1.93	2.38	1.28–4.42
Within-camp POR <sup>2</sup>						
Unadjusted	1.35	1.06–1.71	1.15	0.97–1.37	3.23	1.87–5.58
Adjusted	1.18	0.96–1.44	1.14	0.96–1.36	2.58	1.45–4.61

CI = confidence interval; DLQI = Dermatology Life Quality Index; OR = odds ratio; POR = pairwise odds ratio.

\*Predictors age, education, region of birth, H2A visa status, and years of experience in US agriculture were not significant and are not shown.

<sup>†</sup>The unadjusted POR is not adjusted for covariates in the logistic model for prevalence. The adjusted POR is based on covariates in the prevalence model.

## Discussion

Farmworkers are known to have a high prevalence of skin ailments.<sup>2</sup> This research demonstrates that skin conditions decrease skin-related QOL overall, and on specific dimensions. Previous research on skin-related QOL has been limited largely to clinical samples, with no focus on occupational groups. A review of DLQI studies found only seven that had reported a "normal" population, each as a comparison group with a clinical sample.<sup>22</sup> The mean DLQI scores in those seven studies ranged from 0 to 0.5, with a median of 0.35. These are less than the 0.8 observed in the study. Workers noted little or no impact of skin conditions on the dimensions of Daily Activities (eg, shopping and housekeeping), Leisure, Personal Relationships, and Skin Treatment. This is not surprising, considering the lifestyle of farmworkers. Most live in crowded temporary housing,<sup>23</sup> have little time for leisure activities, and are separated from families.<sup>24</sup> Nonetheless, qualitative research has indicated that workers attend to symptoms of skin disorders and practice a variety of self-care behaviors to treat them.<sup>25,26</sup>

Previous research in this population has shown that symptoms that disrupt sleep are particularly worrisome to workers as the lack of rest impairs the ability to work.<sup>27</sup> Thus, it is consistent that the Symptoms and Feelings and the Work and School dimensions were the ones for which farmworkers reported reduced QOL.

The level of QOL effects and the very limited reduction in within-farmworker clustering when the 12 predictor variables are included in the model are also consistent with simply tolerating skin disorders and not seeking medical care for conditions that present low-level annoyance. Although migrant health clinics exist in the study area, their hours are limited, and many workers lack transportation to seek care.

These analyses indicate that the primary predictors of poorer skin-related QOL are occupational and environmental. Work tasks associated with direct contact with plants are the strongest predictors of QOL. The plants themselves or chemicals associated with the plants (eg, pesticides, growth regulators) may be responsible. Protection from these factors may lie in personal protective equipment or in improved field sanitation. Workers report fewer facilities for hand washing than are required, and some rewear dirty clothes because they lack sufficient clothing and laundry facilities:<sup>28</sup>

This study's findings should be interpreted in light of its limitations. The survey included workers in only one area of the United States. Because of the substantial mobility of farmworkers,<sup>29</sup> it was not possible to select a probability sample. Instead, the site-based sampling approach was employed. Nonetheless, the study has some substantial strengths. First, its longitudinal nature made it possible to document skin-related QOL through the entire growing season. Second, it included a large number of farmworkers. Third, although the respondents worked in a variety of crops, almost all worked in tobacco at some time during the study. Tobacco is a crop cultivated in a large number of places around the world, including Canada, so the findings of its effects on skin-related QOL are important in a wide variety of populations. Many of the migrant workers brought from Mexico and the Caribbean to Ontario work in tobacco.

Following on this research, a more thorough investigation of the origin of skin ailments in this worker population is needed. In particular, the role of modifiable factors, such as facilities for personal hygiene and reentry into the fields following chemical application, should be explored as possible interventions to improve skin-related QOL.

## References

1. Villarejo D, Baron SL. The occupational health status of hired farm workers. *Occup Med* 1999;14:613-35.
2. Bureau of Labor Statistics. 2005. Bureau of Labor Statistics Data, Occupational Injuries and Illnesses: industry data for 2003, US Department of Labor. Available at: <http://www.bls.gov/iif/home.htm#data> (accessed August 17, 2005).
3. Preisbisch K. Canada's seasonal agricultural workers program as a model of best practices in migrant worker participation in the Benefits of Economic Globalization Project: social relations practices between seasonal agricultural workers, their employers, and the residents of rural Ontario. Ottawa: North-South Institute; 2003.
4. Gibb H. Farmworkers from afar: results from an international study of seasonal farmworkers from Mexico and the Caribbean working on Ontario farms. Ottawa: North-South Institute; 2006.
5. Health Resources & Services Administration. An atlas of state profiles which estimates the number of migrant and seasonal workers and members of their families. Washington (DC): Health Resources & Services Administration; 1990.
6. Carroll D, Samardick RM, Bernard S, et al. Findings from the National Agricultural Workers Survey (NAWS) 2001-2002: a demographic and employment profile of United States farm workers. Washington DC: US Department of Labor; 2005. Research Report No.: 9.
7. Bradman A, Chevrier J, Tager I, et al. Association of housing disrepair indicators with cockroach and rodent infestations in a cohort of pregnant Latino women and their children. *Environ Health Perspect* 2005;113:1795-801.

8. Early J, Davis SW, Quandt SA, et al. Housing characteristics of farmworker families in North Carolina. *J Immigrant Health* 2006; 8:173-84.
9. McCurdy SA, Wiggins P, Schenker MB, et al. Assessing dermatitis in epidemiologic studies: occupational skin disease among California grape and tomato harvesters. *Am J Ind Med* 1989;16:147-57.
10. Gamsky TE, McCurdy SA, Wiggins P, et al. Epidemiology of dermatitis among California farm workers. *J Occup Med* 1992;34: 304-10.
11. Arcury TA, Quandt SA, Mellen BG. An exploratory analysis of occupational skin disease among Latino migrant and seasonal farmworkers in North Carolina. *J Agric Saf Health* 2003;9:221-32.
12. Krejci-Manwaring J, Schulz MR, Feldman SR, et al. Skin disease among Latino farmworkers in North Carolina. *J Agric Saf Health* 2006;12:155-63.
13. Arcury TA, Quandt SA. Participant recruitment for qualitative research: a site-based approach to community research in complex societies. *Hum Organ* 1999;58:128-33.
14. Parrado EA, Flippen CA, McQuiston C. Use of commercial sex workers among Hispanic migrants in North Carolina: implications for the spread of HIV. *Perspect Sex Reprod Health* 2004;36:150-6.
15. Arcury TA, Quandt SA, Austin CK, et al. Implementation of EPA's Worker Protection Standard training for agricultural laborers: an evaluation using North Carolina data. *Public Health Rep* 1999;114: 459-68.
16. Quandt SA, Hiott AE, Grzywacz JG, et al. Oral health and quality of life of migrant and seasonal farmworkers in North Carolina. *J Agric Saf Health* 2007;13:45-55.
17. Larson AC. Migrant and Seasonal Farmworker Enumeration Profiles Study North Carolina. Report prepared for the Migrant Health Program, Bureau of Primary Health Care, HRSA. 2000. Available at: <http://bphc.hrsa.gov/migrant/Enumeration/final-nc.pdf> (accessed November 18, 2005).
18. Finlay AY. The Dermatology Life Quality Index. Initial experience of a simple practical measure., In: Rajagopalan R, Sheretz EF, Anderson RT, editors. *Care management of skin diseases: life quality and economic impact*. New York: Marcel Dekker; 1998. p. 85-94.
19. Hongbo Y, Thomas CL, Harrison MA, et al. Translating the science of quality of life into practice: what do Dermatology Life Quality Index scores mean? *J Invest Dermatol* 2005;125:659-64.
20. Carey VJ, Zeger SL, Diggle P. Modeling multivariate binary data with alternating logistic regressions. *Biometrika* 1993;80:517-26.
21. Preisser IS, Arcury TA, Quandt SA. Detecting patterns of occupational illness clustering with alternating logistic regressions applied to longitudinal data. *Am J Epidemiol* 2003;158:495-501.
22. Lewis V, Finlay AY. 10 years experience of the Dermatology Life Quality Index (DLQI). *J Invest Dermatol Symp Proc* 2004;9:169-80.
23. Housing Assistance Council. *No refuge from the fields: findings from a survey of farmworker housing conditions in the United States*. Washington (DC): Housing Assistance Council; 2001.
24. Grzywacz JG, Quandt SA, Early J, et al. Leaving family for work: ambivalence and mental health among migrant Latinos. *J Immigr Minor Health* 2006;8:85-97.
25. Arcury TA, Vallejos QM, Marin AJ, et al. Latino farmworker perceptions of the risk factors for occupational skin disease. *Am J Ind Med* 2006;49:434-42.
26. Arcury TA, Vallejos QM, Feldman SR, et al. Treating skin disease: self-management behaviors of Latino farmworkers. *J Agromed* 2006;27-35.
27. Rao P, Quandt SA, Arcury TA. Hispanic farmworker interpretations of green tobacco sickness. *J Rural Health* 2002;18:503-11.
28. Arcury TA, Quandt SA, Cravey AJ, et al. Farmworker reports of pesticide safety and sanitation in the work environment. *Am J Ind Med* 2001;39:487-98.
29. Quandt SA, Preisser IS, Arcury TA. Mobility patterns of migrant farmworkers in North Carolina: implications for occupational health research and policy. *Hum Organ* 2002;61:21-9.