



Published in final edited form as:

Int J Dermatol. 2014 September ; 53(9): 1091–1097. doi:10.1111/j.1365-4632.2012.05833.x.

The Association of Skin Conditions with Housing Conditions Among North Carolina Latino Migrant Farmworkers

Cheryl J. Gustafson, MD^{1,2}, Steven R. Feldman, MD, PhD^{1,2,3,4}, Sara A. Quandt, PhD^{5,6}, Scott Isom, MS⁷, Haiying Chen, MD, PhD^{7,6}, Chaya R. Spears, PhD^{8,6}, and Thomas A. Arcury, PhD^{8,6}

¹Center for Dermatology Research, Wake Forest School of Medicine, Winston-Salem, North Carolina

²Department of Dermatology, Wake Forest School of Medicine, Winston-Salem, North Carolina

³Department of Pathology, Wake Forest School of Medicine, Winston-Salem, North Carolina

⁴Department of Social Science and Health Policy, Division of Public Health Sciences, Wake Forest School of Medicine, Winston-Salem, North Carolina

⁵Department of Epidemiology and Prevention, Division of Public Health Sciences, Wake Forest School of Medicine, Winston-Salem, North Carolina

⁶Center for Worker Health, Wake Forest School of Medicine, Winston-Salem, North Carolina

⁷Department of Biostatistical Sciences, Wake Forest School of Medicine, Winston-Salem, North Carolina

⁸Department of Family and Community Medicine, Wake Forest School of Medicine, Winston-Salem, North Carolina

Abstract

Background—Skin conditions are common among Latino migrant farmworkers. Although many skin conditions are related to occupational exposures, poor housing conditions may also contribute to skin ailments in migrant farmworkers.

Objectives—To evaluate the association between housing conditions and skin conditions among Latino migrant farmworkers.

Methods—A cross-sectional study design using interview questionnaires, home inspections, and environmental sampling was implemented to document housing quality of farmworker camps/homes, and the prevalence of self-reported skin conditions in Latino migrant farmworkers.

Correspondence: Thomas A. Arcury, PhD, Department of Family and Community Medicine, Wake Forest School of Medicine, Medical Center Boulevard, Winston-Salem, NC 27157, Phone: 336-716-9438, Fax: 336-716-3206, tarcury@wakehealth.edu.

Conflict of Interest: Drs. Gustafson and Feldman are affiliated with the Center for Dermatology Research. This Center is supported by an unrestricted educational grant from Galderma Laboratories, L.P. Dr. Feldman is a consultant and speaker for Galderma, Connetics, Abbott Labs, Warner Chilcott, Centocor, Amgen, Photomedex, Genentech, BiogenIdec, and Bristol Myers Squibb. Dr. Feldman has received grants from Galderma, Connetics, Astellas, Abbott Labs, Warner Chilcott, Centocor, Amgen, Photomedex, Genentech, BiogenIdec, Coria, Pharmaderm, Ortho Pharmaceuticals, Aventis Pharmaceuticals, Roche Dermatology, 3M, Bristol Myers Squibb, Stiefel, GlaxoSmithKline, and Novartis and has received stock options from Photomedex. All other authors have no conflicts to disclose.

Interviews were completed with 371 farmworkers residing in 186 of the 226 camps (camp response rate 82.3%).

Results—Self-reported pruritus (31%), rash (25%), scaling (12%), blisters (11%), and ingrown nails (10%) were commonly among the participants. Pruritus was more likely to be reported by farmworkers living in dwellings without air conditioning ($p<0.05$). Rash was associated with dwellings reported to have a low humidity ($p<0.05$). Scaling was more likely to be reported by farmworkers living in dwellings with indoor temperatures in the thermal discomfort range ($p<0.05$). No statistically significant associations were detected for indoor allergens and self-reported skin ailments among migrant farmworkers.

Conclusions—Skin conditions are common among migrant farmworkers in North Carolina. The quality of housing conditions, particularly hot, dry indoor thermal environment, demonstrated significant associations with pruritus, rash, and scaling. The impact of housing characteristics on pruritus and blisters was greatest in new migrant farmworkers. Further research is needed to delineate additional housing factors that could cause or exacerbate skin diseases in farmworkers.

Introduction

Skin diseases are common among migrant farmworkers due to the nature of their work and living conditions, as well as their limited access to healthcare.^{1, 2} Suspected etiologies of skin diseases include exposure to pesticides, fertilizers, and other chemicals; working long hours in hot climates; sensitivity to plants and animals; working with dangerous machinery; and contact with infectious agents.^{3–5} Skin conditions common among farmworkers include contact dermatitis, infectious skin diseases (e.g., tinea pedis, onychomycosis, warts), inflammatory skin diseases (e.g., acne, folliculitis), and pigmentary disorders (e.g., melasma).⁶

Many agricultural employers provide housing to migrant farmworkers in the form of labor camps. While housing quality affects environmental health, there is minimal published data on the quality of migrant farmworker housing.^{7–11} Housing facilities are frequently substandard.^{12, 13} Housing is often crowded, in disrepair, and deficient in basic facilities (e.g., air conditioning and indoor plumbing). According to a recent study of migrant farmworkers' housing conditions in North Carolina, 67% of housing units were moderately substandard and 22% were severely substandard.¹¹

Poor farmworker housing conditions are associated with an increased prevalence of diverse health problems, such as lead poisoning, respiratory illness, and diarrheal diseases.⁶ However, there is a paucity of medical literature regarding the association between poor housing and the incidence of skin disease in migrant farmworkers. The purpose of this analysis is to assess the relationship between self-reported skin disease and the quality of housing among migrant farmworkers. This analysis uses data collected in migrant farmworker houses through interviews, housing inspections, and environmental sampling from housing units.

Materials and Methods

Sample

Participants were recruited from 16 counties in eastern North Carolina for a larger study of the quality of housing of farmworkers and the impact of that housing on health. Lists of camps were obtained from community partners serving farmworkers in these counties, including the North Carolina Farmworkers Project, Carolina Family Health Center, Kinston Community Health Center, and Piedmont Health Services. If new camps were encountered during the study period, they were added to the lists. All identified migrant farmworker camps were approached to participate in the study. All camp housing was employer provided and included barracks and other communal residences or clusters of residences where workers shared housing facilities. The project was explained in detail to camp residents. If they agreed to participate, three farmworkers were selected to participate in the study. Two farmworkers were recruited to complete detailed interviewer-administered questionnaires, and a third farmworker was recruited to assist with the completion of a housing inspection. Each farmworker received a \$30 incentive for participation; participating camps received a volley ball. To be enrolled in the study, participants had to meet several inclusion criteria: male gender, age 18 or older, currently employed in farm work, and a current resident of the camp being inspected. The study protocol was approved by the Wake Forest School of Medicine Institutional Review Board, and all participants gave signed informed consent.

Data Collection

Interviews were conducted in Spanish, and all interviewers were fluent Spanish speakers. Interviewers underwent a 3-day data collection training program conducted by the investigators and project manager. During the training course, protocols for housing inspections were thoroughly reviewed.

Self-reported skin disease data were collected through the interviewer-administered questionnaire. The questionnaire was developed in English and translated into Spanish by a professional translator who is a native Spanish speaker familiar with Mexican Spanish. Farmworkers were asked if they had been affected by rash, pruritus, scaling, blisters, and ingrown nails during the last week.

Housing condition data were also collected through the interviewer-administered questionnaires, as well housing inspections. Items included in the questionnaire assessed the presence of air conditioning, smell of must or mildew, perception of dampness. Inspections of farmworker housing units were based on the housing quality standards promulgated by the North Carolina Department of Labor (NCDOL) using the NCDOL Migrant Housing Inspection Checklist.¹⁴ Camps were inspected and housing conditions were documented with digital images. Temperature and relative humidity were consecutively measured three times using a hygrometer in both participants' sleeping rooms, as well as a common room. Smell of must or mildew and dampness in sleeping rooms was assessed subjectively by participants.

Measures

The outcome measures for this analysis were dichotomous indicators for presence of pruritus (itching), rash, scaling, blisters, and ingrown nails in the previous week. Independent measures included housing conditions and participant personal characteristics. Housing condition measures included the presence of air conditioning, the presence of a must or mildew smell, and the presence of dampness or humidity. Sleeping room thermal comfort and heat index was calculated for each participant. Thermal discomfort was based on room temperature and humidity and dichotomized into the values (1) thermal comfort, if room temperature was < 80 and humidity ≤ 60 , and (2) thermal discomfort. Heat index was based on room temperature and characterized by 4 values: (1) no danger, heat index < 80 ; (2) caution, heat index ≥ 80 and < 90 ; (3) extreme caution, heat index ≥ 90 and < 105 ; and (4) danger, heat index ≥ 105 and < 130 . Common room thermal comfort and heat index was calculated each camp and had the same values as used for the sleeping room. Photographs of camp conditions were also obtained (Figure 1).

Participant personal characteristics included having an H2-A visa. Currently, the H-2A program is the only agricultural guest-worker program in the US allowing individuals' employment in specific agricultural areas for a pre-determined time period. While the number of H-2A visa holders varies by state, North Carolina has a relatively large group of farmworkers working under this visa program. Other participant characteristics included language, with two dichotomous measures of farmworkers' use of Spanish or an indigenous language. Age was divided into the categories 18 to 29 years, 30 to 39 years, and 40 years or older. Educational attainment was described as less than primary school (grades 0–5), primary school (grade 6), secondary school (grade 9), and preparatory school' (grade 12) or greater. Farmworkers were organized into three categories based on their years worked in US agriculture: 1 to 5 years, 6 to 10 years, and 11 or more years. Farmworkers' time spent in their current dwelling was categorized as 0 to less than 4 weeks, 4 to less than 8 weeks, 8 to less than 12 weeks, 12 to less than 16 weeks, and 16 or more weeks.

Statistical Analysis

Descriptive statistics were used to describe participant characteristics, housing conditions, and skin problems of participating migrant farmworkers. Associations of housing conditions and participant characteristics with skin conditions were calculated using Fisher's exact tests. All data analyses were performed using SAS 9.2 (SAS Institute, Cary, NC) and p-values of less than 0.05 were considered statistically significant.

Results

Data collection was completed in 186 camps. Residents in an additional 36 camps declined to participate, and the grower refused to permit participation by workers in another four camps. The resulting camp participation rate was 82.3% (186/226). Reasons given by farmworkers for non-participation included being too tired (5/36), uninterested (3/36), and being occupied by cooking/eating/drinking (9/36). Some workers offered no reason for their refusal to participate (19/36). The final sample included 371 men who completed interviews and 182 men who assisted in the camp assessments; 231 men refused to participate when asked. The participation rate was 70.5% (553/784); however, the rate could be lower as

individuals who did not want to participate could have avoided the recruiters. Housing inspections were completed for 183 of the 186 camps with three camps' inspections being incomplete due to intervention by the grower.

Over half of the participants were in the United States on the H-2A temporary visa program (Table 1). About one-in-five participants spoke an indigenous language. Nearly half of the participants (44.5%) were 18 to 29 years of age. Most (87.1%) reported a ninth grade education or less. Over half of the participants had worked in US agriculture for 1 to 5 years. Approximately one-fourth of the participants (23.8%) resided in the housing units for 16 or more weeks prior to being enrolled in the study.

Air conditioning was absent for 56.6% of the residences (Table 2). Thermal comfort had the value of discomfort in 86.7% of the sleeping rooms, and the heat index was at extreme caution in 33.8% of the sleeping rooms and at the danger level in 5.3% of the sleeping rooms. Ten percent of the participants reported a smell of must or mildew in their sleeping rooms, and dampness was present in 5.7% of the sleeping rooms. Thermal comfort had the value of discomfort in 94.0% of the common rooms, and the heat index was at extreme caution in 44.0% of the sleeping rooms and at the danger level in 8.2% of the common rooms.

Pruritus was the most common skin disease assessed, as it was reported by 31% of the farmworkers. Prevalence of the other skin ailments among the farmworkers was: rash (25%), scaling (12%), blisters (11%), and ingrown nails (10%). Farmworkers who had spent 1 to 5 years working in US agriculture were more likely to report blisters (29, 15.1%) than those with 6 to 10 years (6, 5.6%) and 11 or more years (6, 8.5%) experience ($p < 0.05$). Farmworkers who had spent 1 to 5 years (68, 35.41%) and 6 to 10 years (34, 31.5%) working in US agriculture were more likely to report pruritus than those working 11 or more years (13, 18.3%) ($p < 0.05$).

Air conditioning was the only housing condition that had a statistically significant association with pruritus. Pruritus was reported by 24.2% (39) farmworkers living in air conditioned dwellings, compared to 36.2% (76) of the farmworkers living in dwellings without air conditioning ($p < 0.05$). Scaling of the skin was more predominant in farmworkers who had a sleeping room in the thermal discomfort range (41, 13.1%), compared to those who had a sleeping room in the thermal comfort range (1, 2.1%) ($p < 0.05$). Rash was significantly associated with humid dwelling environments such that 47.6% (10) of those who lived in damp or humid houses reported rash compared to 24.1% (84) who did not live in damp or humid houses ($p < 0.05$). Of the 91 participants reporting rash, the relationship with heat index ranges of the common room of the housing units was: 14.3% (13), no danger, 24.2% (22), caution; 54.9% (50), extreme caution; and 6.6% (6), danger. No significant association was detected in regard to the housing conditions assessed and the incidence of blisters and ingrown nails (Table 3).

Discussion

The skin functions as a critical barrier between the individual and the surrounding environment. Migrant farmworkers are exposed to diverse environmental challenges and poor living conditions in their work setting that may precipitate or aggravate skin disease. Self-reported skin conditions were common among North Carolina migrant farmworkers participating in this study. The most common skin condition was pruritus, which was reported by nearly one-third of the participants, confirming other reports that pruritus, rash and blisters are common in this population.^{2, 15-18} Vallejos et al.¹⁶ reported pruritus in 46.1% of the participating farmworkers across the 5-month season, rash in 42.8%, and blisters in 13.8%. In the current study, participants reported pruritus, rash, and blisters at a slightly higher frequency compared to the farmworkers surveyed by Vallejos and colleagues. The seasonal period during which farmworkers were surveyed is one factor that may account for these differences.

Pruritus and blisters were more likely to be reported by workers who were relatively new to agricultural work compared to individuals who had spent 6 or more years in agricultural work. One possible explanation for this finding is that new workers are not used to the conditions associated with agricultural work, such as pesticides and other chemicals, dust, and plant or animal allergens, as well as not taking adequate precautionary measures, such as wearing gloves. Healthy worker effect could contribute to these findings since new farmworkers with sensitive skin could have stopped working in agriculture and pursued a different field of work, subsequently resulting in a larger number of agricultural workers with less sensitive skin remaining in farmwork after 6 years.

Prior to the current study, the only published data regarding the association of housing conditions and skin disease in migrant farmworkers was by Arcury et al.⁶ In their study, two environmental factors were found to increase the risk of inflammatory disease in migrant farmworkers: (1) working in or near fields where pesticides have been used; and (2) poor housing conditions. In the present study, a significant association was identified between poor housing conditions, particularly indoor temperature and humidity, and certain skin diseases. Elevated room temperature in farmworker homes likely precipitated or exacerbated itching as hot environmental conditions are a common cause of pruritus. Likewise, other skin conditions, particularly scaling and rash, were associated with substandard indoor temperature/humidity.

Employers of migrant farmworkers should strive to provide better quality housing, as poor housing conditions are associated with common skin ailments. By taking measures to improve housing conditions, the frequency of such skin ailments could potentially be reduced, thereby helping to improve the physical health of farmworkers. The effect of air conditioning identified in this study could be direct or it may be a general indicator of better housing or more concern for worker well-being. Failing to provide decent housing to farmworkers may jeopardize the relationship between the employer and employees as farmworkers may feel underappreciated and disrespected when housing camps are in disrepair, lack adequate ventilation, or lack basic utilities. Unfortunately, providing decent quality housing for residents with low incomes is an ongoing unmet challenge in the United

States. Moreover, providing decent quality housing to migrant farmworkers is an even greater challenge, which involves the worker, employer, and the state. Previous attempts to enforce housing standards resulted in a trend toward employers discontinuing the provision of housing to farmworkers.¹⁹

This study should be evaluated in light of its limitations. Prevalence of skin ailments was based on self-report of participating farmworkers rather than objective measures, such as direct physical examinations. This may have led to some subject bias. This study was limited to male, Latino, migrant farmworkers in North Carolina. The prevalence of skin ailments in this population of agricultural workers may differ from those found in workers living in other locations or in single family housing settings. The etiology of skin disease is often multi-factorial as a variety of factors affect the skin, such as genetics, environmental conditions, occupational factors, recreational activities, and personal hygiene. This study did not take into account other environmental factors, such as occupational variables, that may be associated with the five self-reported skin ailments assessed in this study. The observed high incidence of blisters and ingrown nails was not related to the housing variables we studied and may be related to other aspects of participants' challenging work environments.

Additional studies are needed to document housing quality and its impact on the health and quality of life of migrant farmworkers. Comparison across studies will be improved if consistent categories and terminology are implemented when reporting skin disease.

Acknowledgments

This research was supported by grant R01-ES012358 from the National Institute of Environmental Health Sciences.

References

1. Krejci-Manwaring J, Schulz MR, Feldman SR, et al. Skin disease among Latino farmworkers in North Carolina. *J Agric Saf Health*. 2006; 12:155–163. [PubMed: 16724791]
2. 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; 9:221–232. [PubMed: 12970952]
3. Hogan DJ, Lane P. Dermatologic disorders in agriculture. *Occup Med*. 1986; 1(2):285–300. [PubMed: 2956710]
4. Villarejo D, Baron SL. The occupational health status of hired farm workers. *Occup Med*. 1999; 14:613–635.5. [PubMed: 10378979]
5. Irby CE, Yentzer BA, Vallejos QM, Arcury TA, Quandt SA, Feldman SR. The prevalence and possible causes of contact dermatitis in farmworkers. *Int J Dermatol*. 2009; 48:1166–1170. [PubMed: 20064167]
6. Arcury TA, Feldman SR, Schulz MR, et al. Diagnosed skin diseases among migrant farmworkers in North Carolina: prevalence and risk factors. *J Agric Saf Health*. 2007; 13:407–418. [PubMed: 18075016]
7. Harrison P. Safe, clean, and affordable: California farmworker housing needs. *J Archit Plan Res*. 1995; 12:19–34.
8. Holden, C. Bitter harvest: Housing Conditions of migrant and seasonal farmworkers. In: Thompson, CD.; Wiggins, MF., editors. *The Human Cost of Food Farmworkers' Lives, Labor, and Advocacy*. Austin, TX: University Texas Press; 2002. p. 169-193.
9. Housing Assistance Council. *No Refuge from the Fields: Findings from a Survey of Farmworker Housing Conditions in the United States*. Housing Assistance Council; 2001.

10. Peck, S. Many harvests of shame: Housing for farmworkers. In: Belden, JN.; Wiener, RJ., editors. *Housing in Rural America: Building Affordable and Inclusive Communities*. Thousand Oaks, CA: Sage Publications; 1999. p. 83-90.
11. Vallejos QM, Quandt SA, Grzywacz JG, et al. Migrant farmworkers' housing conditions across an agricultural season in North Carolina. *Am J Ind Med*. 2011; 54:533–544. [PubMed: 21360725]
12. Villarejo D, McCurdy SA, Bade B, Samuels S, Lighthall D, Williams D III. The health of California's immigrant hired farmworkers. *Am J Ind Med*. 2010; 53:387–397. [PubMed: 20191600]
13. Arcury TA, Weir M, Chen H, et al. Migrant farmworker housing regulation violations in North Carolina. *Am J Ind Med*. 2012; 55:191–204. [PubMed: 22237961]
14. Migrant Housing Inspection Checklist. North Carolina Department of Labor; 2011. <http://www.nclabor.com/ash/echklist.pdf> [Accessed February 28, 2012]
15. Quandt SA, Schulz MR, Vallejos QM, et al. The association of dermatologist-diagnosed and self-reported skin diseases with skin-related quality of life in Latino migrant farmworkers. *Int J Dermatol*. 2008; 47:236–241. [PubMed: 18289322]
16. Vallejos QM, Schulz MR, Quandt SA, et al. Self report of skin problems among farmworkers in North Carolina. *Am J Ind Med*. 2008; 51:204–212. [PubMed: 18181182]
17. 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; 16:147–157. [PubMed: 2528291]
18. Gamsky TE, McCurdy SA, Wiggins P, Samuels SJ, Berman B, Shenker MB. Epidemiology of dermatitis among California farm workers. *J Occup Med*. 1992; 34:304–310. [PubMed: 1532030]
19. About America's Farmworkers. National Center for Farmworker Health, Inc; 2011. <http://www.ncfh.org/?pid=4> [Accessed February 28, 2012]



Figure 1a.



Figure 1b.

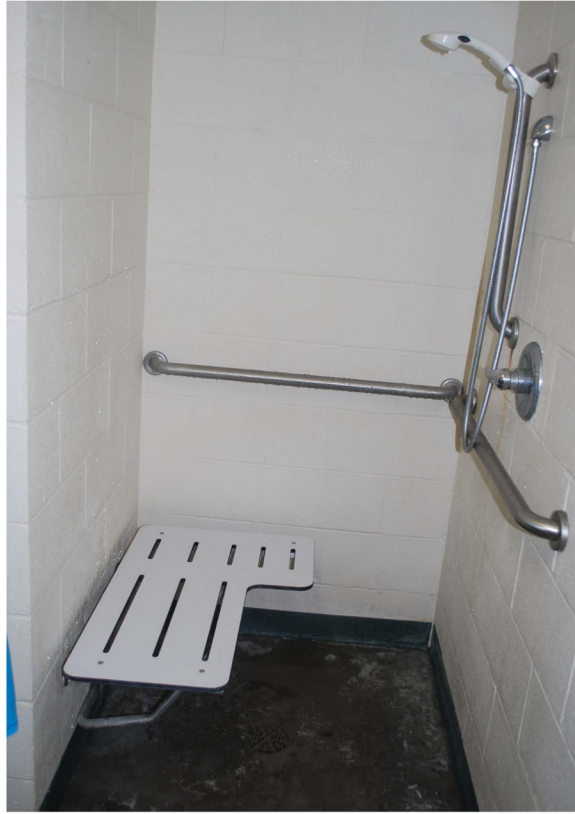


Figure 1c.



Figure 1d.



Figure 1e.



Figure 1f.

Figure 1.
Examples from Two Migrant Farmworker Camps Indicating Variation in Housing Conditions: Bedrooms (a & b), Showers (c & d), and Kitchens (e & f) in Good Versus Poor Condition.

Table 1

Participant Characteristics, Migrant Farmworkers, Eastern North Carolina, 2010 (N=371)

Participant Characteristics	N	%
H2A status		
H2A	242	65.2
Non-H2A	129	34.8
Languages spoken		
Spanish	370	99.7
Indigenous	68	18.3
Age of participants		
18 to 29 years	165	44.5
30 to 39 years	107	28.8
40 years or older	99	26.7
Educational attainment		
Less than primary school (grades 0–5)	83	22.4
Primary school (grade 6)	123	33.2
Secondary school (grade 9)	117	31.5
Preparatory school (grade 12) or greater	48	12.9
Years worked in agriculture in U.S.		
1 to 5 years	192	51.8
6 to 10 years	108	29.1
11 or more years	71	19.1
Time spent in current dwelling		
0 to less than 4 weeks	56	15.1
4 to less than 8 weeks	54	14.6
8 to less than 12 weeks	85	23.0
12 to less than 16 weeks	87	23.5
16 or more weeks	88	23.8

Table 2

Housing Characteristics, Migrant Farmworkers, Eastern North Carolina, 2010

Participant Level Housing Characteristics (N=371)	n	%
Air Conditioning		
No	210	56.6
Yes	161	43.4
Sleeping Room Thermal Comfort*		
Comfort	47	13.1
Discomfort	313	86.9
Sleeping Room Heat Index*		
No danger	74	20.7
Caution	144	40.2
Extreme caution	121	33.8
Danger	19	5.3
Musty or Mildew Smell in Sleeping Room		
No	333	90.0
Yes	37	10.0
Presence of Dampness/Humidity in Sleeping Room		
No	348	94.3
Yes	21	5.7
Camp Level Housing Characteristics (N=186 camps)		
Common Room Thermal Comfort		
Comfort	11	6.0
Discomfort	172	94.0
Common Room Heat Index		
No danger	22	12.1
Caution	65	35.7
Extreme caution	80	44.0
Danger	15	8.2

Table 3

Housing Characteristics and Self-Reported Skin Conditions, Migrant Farmworkers, Eastern North Carolina, 2010 (Total N = 371).

Housing Characteristics	Rash		Scaling		Blisters		Pruritus		Ingrown nails	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Air Conditioning										
No	60 (28.6)	29 (13.8)	25 (11.9)	76 (36.2)*	24 (11.4)					
Yes	34 (21.1)	17 (10.6)	16 (9.9)	39 (24.2)	12 (7.5)					
Dampness/humidity										
No	84 (24.1)*	41 (11.8)	39 (11.2)	106 (30.5)	35 (10.1)					
Yes	10 (47.6)	5 (23.8)	2 (9.5)	9 (42.9)	1 (4.8)					
Musty/mildew smell										
No	82 (24.6)	40 (12.0)	38 (11.4)	101 (30.3)	33 (9.9)					
Yes	12 (32.4)	6 (16.2)	3 (8.1)	14 (37.8)	3 (8.1)					
Heat Index Danger Common Room										
No Danger	13 (29.5)*	5 (11.4)	4 (9.1)	17 (38.6)	7 (15.9)					
Caution	22 (17.1)	11 (8.5)	18 (14.0)	30 (23.3)	13 (10.1)					
Extreme Caution	50 (31.3)	25 (15.6)	15 (9.4)	53 (33.1)	13 (8.1)					
Danger	6 (20.0)	3 (10.0)	4 (13.3)	9 (30.0)	1 (3.3)					
Heat Index Danger Sleeping Room										
No Danger	21 (28.4)	7 (9.5)	11 (14.9)	23 (31.1)	10 (13.5)					
Caution	27 (18.8)	14 (9.7)	12 (8.3)	37 (25.7)	15 (10.4)					
Extreme Caution	38 (31.4)	20 (16.5)	12 (9.9)	41 (33.9)	7 (5.8)					
Danger	5 (26.3)	1 (5.3)	3 (15.8)	7 (36.8)	2 (10.5)					
Thermal Comfort Common Room										
Thermal comfort	3 (13.6)	0 (0.0)	3 (13.6)	7 (31.8)	3 (13.6)					
Thermal discomfort	88 (25.7)	44 (12.8)	38 (11.1)	103 (30.0)	32 (9.3)					
Thermal Comfort Sleeping Room										
Thermal comfort	12 (25.5)	1 (2.1)*	9 (19.1)	12 (25.5)	7 (14.9)					
Thermal discomfort	79 (25.2)	41 (13.1)	29 (9.3)	97 (31.0)	28 (8.9)					

p-values are from Fisher's Exact test

* p value < 0.05

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript