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## Migrant farmworkers' housing conditions across an agricultural season in North Carolina

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### Abstract

**Background**—Several studies have documented poor housing conditions for farmworkers but none has focused on migrant farmworker housing, which is often provided as a condition of employment. Farmworker housing quality is regulated, but little documentation exists of compliance with regulations.

**Methods**—A 2007 survey of 43 randomly selected farmworker camps and a 2008 survey of 27 camps randomly selected from the 2007 sample documented housing conditions via interviewer administered questionnaire and housing checklist.

**Results**—Substandard conditions are common in migrant housing. All camps had at least one exterior housing problem; 93% had at least one interior problem. Housing conditions worsen across the agricultural season. Characteristics including no residents with H2A visa and 11 or more residents are associated with poorer conditions.

**Conclusions**—Housing standards are not adequately enforced. An increase in post-occupancy inspections and targeting camps with characteristics that place them at increased risk for substandard conditions are recommended.

### Keywords

Migrant farmworker; housing conditions; substandard housing; housing standards; enforcement

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## Introduction

Poor housing quality has a negative impact on health [Jacobs et al. 2009; Rauh et al. 2008]. Social characteristics, such as crowding and noise, have been associated with depression, anxiety and social withdrawal [Evans and Lepore 1993; Evans et al. 2000; Guite et al. 2006; Magaña and Hovey 2003]. Physical characteristics like mold, insect or rodent infestation, structural damage, and unsanitary facilities have been associated with respiratory disease, skin disease, infectious diseases, and injuries [Frisvold et al. 1988; Gergen et al. 1999; Howard 1993; Bashir 2002; Krieger and Higgins 2002; Chew et al. 2006; Sahakian et al. 2008; Salo et al. 2008; Bryant-Stephens 2009].

Migrant farmworkers are among those few occupational groups whose housing is directly linked to their employment, often as part of their compensation. Many agricultural employers who need temporary labor provide housing to migrant farmworkers. Few studies have documented housing conditions among farmworkers, but all report that substandard housing conditions are common [Holden 2000; Housing Assistance Council 2001; Holden 2002; Bradman et al. 2005; Early et al. 2006; Gentry et al. 2007]. Studies of farmworker housing have focused primarily on family housing for seasonal farmworkers who do not move to work in agriculture [Bradman et al. 2005; Early et al. 2006; Gentry et al. 2007; Quandt et al. 2004 a, 2004b]. Housing quality for migrant farmworkers, who make up about 38% of farmworkers, has received little consideration in the research literature [USDA Economic Research Service 2008].

Housing conditions to which migrant farmworkers are exposed and the possible health effects of such conditions are relatively unknown. The Housing Assistance Council (HAC) conducted a survey of farmworker housing, some of which was migrant housing [HAC 2001]. The HAC survey provides the most comprehensive overview of farmworker housing to date; however, the results of this survey have not been peer reviewed and should be interpreted with caution. Although it does not distinguish between conditions in seasonal and migrant housing, the HAC report shows that over half of farmworker housing is crowded; 22% of housing units had a broken toilet, bathtub, stove, or refrigerator; 22% had serious structural damage; 36% had broken windows or torn screens; 29% had evidence of water leakage; and signs of rodent or insect infestation were evident in 19% of housing units. One time survey data may be inadequate to describe the conditions of migrant farmworker housing because housing conditions likely vary across the agricultural season with fluctuations in worker numbers and with the potential for facilities to break. Due to this fluctuation in housing conditions, it is likely that the timing of data collection for a cross-sectional study will influence the results.

This study was designed to address the gaps in the evidence resulting from a lack of focus on the housing of migrant farmworkers and the failure to document conditions throughout the agricultural season. The purpose of this analysis is to describe housing conditions in migrant farmworker camps in eastern North Carolina by (1) describing the housing conditions in migrant farmworker camps across the agricultural season and (2) identifying the characteristics of the camps and camp residents associated with poor housing conditions.

## Materials and Methods

We collected data in 2007 and 2008 as part of PACE3, a community-based participatory research project conducted in eastern North Carolina. Partners in this project included Wake Forest University School of Medicine, the North Carolina Farmworkers Project (NCFP) (Benson, NC), Greene County Health Care, Inc. (Snow Hill, NC), and Columbus County Community Health Center (Whiteville, NC).

## Locale

PACE3 focused on farmworkers living in 11 eastern North Carolina counties: Bladen, Columbus, Edgecombe, Greene, Harnett, Johnston, Lenoir, Pitt, Sampson, Wayne, and Wilson. Study investigators selected these counties because they are among those with the largest number of agricultural workers in the state and because our community partners, who assisted with creating the sampling frame, serve these counties. In 2007, conservative estimates by the North Carolina Employment Security Commission put the number of migrant farmworkers without H2A visas in the study counties at 13,675 (36.2% of the 37,610 in North Carolina), and the number of migrant farmworkers with H2A visas at 2,995 (34.3% of the 8,730 in North Carolina).

## Sample

In 2007, a two-stage procedure was used to select farmworkers. First, each of the partnering agencies prepared a list of farmworker camps in the counties they serve and camps were randomly recruited from each agency's list. The comprehensive list of camps included 168 camps; a total of 44 migrant and seasonal camps were recruited in random order from the list. Second, participants in each of the camps were recruited to participate. In camps with 7 or fewer residents, all were invited to participate. In camps with 8 or more residents, 8 to 10 farmworkers were invited to participate. The sample included 287 total participants. For 2008 we created a randomized list of the camps that participated in the 2007 data collection. Interviewers returned to the camps in random order and invited all 2007 study participants whom they could find to participate until 120 participants were recruited. There were two camps from 2007 at which participants were located in 2008 but refused to participate. Ten of the camps from 2007 that were randomly selected for the 2008 data collection had no study participants residing in them at the time of the 2008 recruitment. To reach the goal of 120 participants in 2008, 26 of the 2007 camps were recruited; in addition, two new camps were added to the study in 2008 as 2007 participants had moved to these camps.

This analysis focused on the housing in migrant farmworker camps. With the exclusion of the single seasonal farmworker residence in the sample, the final sample used in this analysis includes 43 migrant farmworker camps with 280 participants in 2007, and 27 migrant farmworker camps with 116 participants in 2008.

## Data Collection

Data were collected via interviewer administered questionnaires from May through September 2007, and June through September of 2008, by eight fluent Spanish-speaking, trained, and supervised interviewers. Participants completed questionnaires at one month intervals up to four times in 2007 and up to three times in 2008. In both 2007 and 2008, the interview took about 45 minutes to complete for the initial contact, and about 25 minutes to complete in the subsequent contacts. Participants received an incentive valued at \$20 when they completed data collection for each round completed in 2007, \$25 for the three rounds in 2008. In 2008, interviewers completed a housing checklist at each camp based on a combination of observation and information elicited from camp residents to document exterior and interior housing conditions based on North Carolina temporary labor camp standards [NC DOL 2008]. The housing checklist was completed at only one of the three monthly visits in 2008. The Institutional Review Board of Wake Forest University School of Medicine, which follows ethical guidelines of the Helsinki Declaration, approved all data collection methods. All participants signed approved informed consent documents.

The questionnaire and housing checklist were developed in English. An experienced translator who is a native Spanish speaker familiar with vernacular Spanish terms used in Mexico did the translation. Fluent Spanish speakers familiar with farm work then reviewed

the translated instruments. The instruments were then pre-tested with Spanish-speaking farmworkers and revised as needed. The questionnaire included items on living conditions, household behaviors, and housing environment, as well as participant personal characteristics. The housing checklist included items on housing type, number of residents, and exterior and interior housing problems

## Measures

The 2007 data are divided into four periods: May 1 to June 8, June 9 to July 7, July 8 to August 5, and August 6 to September 4. The 2008 data are divided into three periods: June 13 to July 11, July 12 to August 10, and August 11 to September 9. These periods roughly approximate major activities in the North Carolina agricultural season while also preventing data for multiple visits to any camp from appearing in a single period. Other measures include characteristics of individual camp residents, characteristics of camps that are stable across an agricultural season, and characteristics of camps that are likely to vary across the season.

### Measures of Resident Characteristics

Measures of resident characteristics included: mean age (18-29, 30-39, 40 or more years), female adult residents present (yes, no), indigenous language spoken by at least one resident (yes, no), at least one resident had an H2A visa (yes, no), and mean years working in US agriculture (0-7, more than 7).

### Stable Camp Characteristics

Measures of stable camp characteristics are: trailers present in camp (yes, no), barracks present in camp (yes, no), house present in camp (yes, no), housing tenure (employer provided, rental), and number of residents in camp at baseline (1 to 10, 11 or more). Measures of camp characteristics that were available only for 2008 are: camp adjacent to agricultural fields (yes, no), livestock housed or fed near camp (yes, no), and child residents present (yes, no).

### Variable Camp Characteristics

Measures of camp characteristics that may vary across the season include: modal number of residents (1-10, 11 or more), modal number of people per sleeping room (1-2, 3 or more), at least one resident stated sleeping room felt crowded (yes, no), all residents had a place to store personal belongings (yes, no), modal number of people per working showerhead (1-8, 9 or more, 11 or more), and number of people per laundry facility (1-16, 16.1-30, 30.1 or more/none in camp). The measure "camp has inadequate facilities" (yes/no) was based on whether the camp had at least one of three characteristics: 11 or more people per working showerhead, 30.1 or more people per laundry facility or camp lacked laundry facilities, or not all residents had a place to store their personal belongings. The measures that were available only for 2008 were: number of people per working toilet (1-15, 15.1 or more) and mean square feet per person in sleeping rooms (less than 50, 50 or more).

Based on the camp inspection and interview data collected in 2008, we calculated four measures of housing quality problems. Total number of exterior housing problems (1,2,3) was based on the sum of overflowing trash containers, uncovered trash cans, trash or litter in yard, and signs of rodents. Total number of general interior housing problems (0, 1-5, 6 or more) was based on the sum of signs of pests, no fire extinguisher, no smoke detector/fire alarm, no first aid supplies available, no resident trained to administer first aid, dirty mattresses or no mattresses, holes in walls, floors or ceilings, and less than 50 square feet per person in sleeping rooms. The total number of problems in the bathroom (0, 1-2, 3 to 6)

was based on the sum of having a bathroom that must be entered by passing through a sleeping area, no drains in shower, mold or mildew present, hot and cold running water not available, 15.1 or more people per working toilet, 11 or more people per working showerhead, and a bathroom that was not clean. Total number of problems in kitchen (0, 1-2, 3-5) was based on the sum of having more than 5 people per burner, the kitchen was unclean, kitchen had no sink with hot and cold running water, and cloths, utensils, pots and pans were not clean and usable.

Finally, a measure of camp housing standards status was calculated for 2008 based on the camp inspection and interview with the values meets standards, moderately substandard, and severely substandard.

For a camp to be judged to have severely substandard housing it had to meet one of three characteristics: (1) had a major plumbing problem (no working toilet, no working showerhead, or no drinking water available), or (2) had electrical and structural hazards (exposed electrical wires and holes in floor, wall or ceiling), or (3) had 8 or more interior or exterior problems. The interior or exterior problems included all of those included in calculating the exterior housing problems, general interior housing problems, bathroom problems, and kitchen problems measures.

For a camp to be categorized as having moderately substandard housing it had to meet one of four characteristics: (1) 1 or more minor plumbing problem (raw sewage in yard, no drains in shower, no hot and cold running water in bathroom or no sink with hot and cold running water in kitchen); or (2) had exposed electrical cables (interior or exterior) or had holes in floor, walls or ceiling; or (3) lacked adequate facilities (had any of the following conditions): more than 5 people per working stove burner, more than 10 people per working showerhead, more than 15 people per working toilet, no fire extinguisher, no smoke detector, no mattresses); or (4) had 2 to 7 of the following interior or exterior problems: overflowing garbage or trash or litter in the yard or uncovered trash cans outside; signs of pests; dirty mattresses; bathroom must be entered by passing through a sleeping area; mold or mildew in bathroom; unclean bathroom; kitchen unclean or cloths, utensils, pots and pans were not clean and usable.

For a camp to be categorized as meeting housing standards, it must have had no more than 1 of the interior or exterior problems listed above under item 4 of the moderately substandard category.

## Statistical Analysis

All measures used in these analyses are calculated at the camp level. For measures that were collected from multiple residents from the same camp, the mode of all residents' responses was calculated and used as the measure for the camp. Descriptive statistics were calculated to describe the baseline characteristics of the camps for each year. Descriptive statistics were also presented for variables that were measured at multiple time points during the season. Bivariate analysis was done using generalized estimating equations (GEE) to model the probability of housing conditions and account for the multiple observations of a camp throughout the two years. These housing conditions included having three or more people per sleeping room, nine or more people per shower, 30.1 or more people per laundry facility, inadequate facilities, and less than 50 square feet per person in sleeping room. Housing standards (severely substandard versus moderately substandard or housing meets standards) were evaluated using a Fisher's Exact test due to the small number of camps included in the severely substandard category. Multivariate analysis was also done using GEE models to account for the repeated camp observations. Included in these models for each of the housing issues was a categorical time variable, migrant status, having a house present in the

camp, and camp size. Odds ratios and 95% confidence intervals are presented for both the bivariate and multivariate models. All statistics were performed using SAS 9.2 (SAS Institute, Cary, NC).

## Results

### Characteristics of Camp Residents

The 2008 residents compared to the 2007 residents were older, less likely to speak an indigenous language, more likely to have H2A visas, and more likely to have more than 7 years of work experience in US agriculture (Table I). About one quarter of camps in both years had female residents. About 15% of camps in 2008 had child residents. Houses were less common in camps in 2008 than 2007. Housing in both years was generally provided by the employer, and about two thirds of camps had 10 or fewer residents. Most of the camps in 2008 were located adjacent to agricultural fields, while about 11% had livestock housed or fed in close proximity.

The average number of residents per camp was lower in 2008 than in 2007. This is due, in large part, to our methods for recruiting participants in 2008. Camps that were included in the 2007 data collection were approached in random order and all participants from 2007 who could be located were invited to participate in the 2008 data collection. There were many camps at which one or more participants from 2007 did not return to the same camp. We did not recruit new participants to replace those we could not locate because the study design intended to expand upon data that had already been collected. This resulted in fewer residents per camp in the 2008 sample.

### Variable Camp Characteristics

Camp characteristics varied across the agricultural season due to frequent turnover in workers. The modal number of residents per camp was 10 or fewer for about two thirds of camps across the agricultural season for both 2007 and 2008 (Table II). However, the number of residents in the camps fluctuated across the agricultural season within most camps. Though few camps moved from the 10 or fewer category to the 11 or more category or vice versa, the number of residents in most camps varied at each visit, with some increasing and others decreasing. The proportion of camps with a mode of 1 to 2 farmworkers per sleeping room varied from 59% to 70% of camps across the two agricultural seasons.

There was little fluctuation in the proportion of camps (70% to 74%) in 2008 that had 50 or more square feet of space per person in their sleeping rooms. However, the proportion of camps with 1 or more residents who stated that their sleeping room felt crowded did vary across the two seasons with a range from 60% to 78%.

The number of camps in which farmworkers had a place to store their personal belongings increased across each agricultural season, from 67% to 93% in 2007, and from 85% to 96% in 2008. Few (2%-5%) camps in 2007 had 11 or more residents per working showerhead but camps with crowded showers were more common in 2008 (10% to 15%). There were 9 or more residents per working showerhead in 10% to 20% of camps in 2007 and in about a third of camps across 2008.

Less than 4% of camps had more than 15 people per working toilet in 2008 with very little fluctuation. The proportion of camps that had 30.1 or more farmworkers per laundry facility ranged from 18% to 28% in 2007 and from 4% to 8% in 2008. The percentage of camps that had inadequate facilities varied across 2007 from 24% to 44% and across 2008 from 11% to 27%.



## Prevalence of Housing Problems

All camps had at least one exterior housing problem such as overflowing or uncovered trash cans, litter in the yard, and signs of rodents (Table III). Two thirds had 1 exterior problem, a quarter had 2, and 7% had 3 problems. Seven percent of camps did not have any general interior housing problems. Most (82%) had 1 to 5 interior problems and 11% had 6 or more. The most common interior housing problems were safety hazards such as lack of a fire extinguisher (63%), lack of a smoke detector or fire alarm (59%), lack of first aid supplies (67%), and no resident trained to administer first aid (85%). Over a quarter (26%) of camps did not have any problems documented in the bathroom; over half had 1 or 2 problems, and 19% had 3 to 6. The most common bathroom problem was the presence of mold or mildew (63%). One third of camps did not have drains in the showers, and in one third the bathroom was unclean. Most camps (70%) did not have any problems in the kitchen; a quarter of camps had 1 or 2 kitchen problems, and less than 4% had 3 to 5 kitchen problems. The most common kitchen problem was that it was unclean (22%); 19% of camps had cloths, utensils, pots and pans that were not clean or were unusable. The combination of problems found in the exterior, the general interior, in the bathrooms, and in the kitchens of migrant farmworker camps resulted in 11% of the 2008 migrant farmworker camps having housing that met standards, while 67% were moderately substandard, and 22% were severely substandard.

## Predictors of Housing Characteristics

Camps that had 1 or more residents who spoke an indigenous language were about twice as likely to have 3 or more people sharing sleeping rooms and 3 times as likely to have inadequate facilities as were camps with no residents who speak an indigenous language (Table IV). Camps that did not have any residents with an H2A visa had over 2 times greater odds of having inadequate facilities compared to camps with residents who have H2A visas. Camps with residents who had a mean of 0 to 7 years of experience working in US agriculture had 2.5 times greater odds of having 3 or more people per sleeping room, 2.5 times greater odds of having 9 or more people per working shower, and were 2.9 times as likely to have inadequate facilities as those camps with residents who had more than 7 years of work experience.

Camps that had female residents were 3 times as likely as those with no female residents to have inadequate facilities. Camps that included trailers were about half as likely to have 3 or more people per sleeping room as were those that had no trailers present. Camps that included a house were more likely to have 3 or more people per sleeping room than camps with no houses. Camps with 11 or more residents had 2.5 times greater odds of having 3 or more people per sleeping room, 4.5 times great odds of having 9 or more people per showerhead, and were over 7 times more likely to have inadequate facilities compared to camps with 10 or fewer residents.

Camps with residents who spoke an indigenous language were more likely to be severely substandard than those that did not have any indigenous language speakers (Table V). Camps with residents with a mean of 0 to 7 years of experience working in US agriculture were more likely to be severely substandard than camps with residents who had more than 7 years of experience. Camps with female residents and with child residents were also more likely to be severely substandard than those that did not have any female or child residents.

A multivariate model shows that camps with no residents who had an H2A visa were over 3 times more likely to have inadequate facilities than camps that included residents with an H2A visa (Table VI). Camps that included a house had twice the odds of having 3 or more people per sleeping room compared to camps that did not include a house. Camps with 11 or

more residents were nearly 3 times more likely than those with 10 or fewer residents to have 3 or more people per sleeping room, were nearly 5 times as likely to have 9 or more people per showerhead, and were nearly 9 times as likely to have inadequate facilities.

## Discussion

This study adds valuable information about housing characteristics in migrant farmworker camps and how those characteristics vary across an agricultural season. The housing quality measures used in this study are based on standards in the Migrant Housing Act (MHA) of North Carolina, which establishes minimum safety and quality standards for housing provided to migrant workers. The MHA is enforced by the North Carolina Department of Labor [NCDOL 2008; Buhler et al. 2007]. Previous studies have used measures of crowding and housing quality that are used by the Department of Housing and Urban Development. Though using such measures provides a good comparison of conditions in farmworker camps to conditions in housing in the general population of the United States, they do not allow for evaluating whether farmworker housing meets housing quality standards that apply to temporary housing for farmworkers. The measures in this study allow evaluation of the extent to which migrant farmworker housing complies with applicable housing quality standards.

Substandard conditions are common in North Carolina migrant farmworker camps. At any point in the 2007 agricultural season, between 11% and 44% of camps had inadequate bathing, laundry, or storage facilities. When a more comprehensive set of housing standards was assessed in 2008, 89% of camps had more than 1 condition that violated the MHA. Two thirds of camps were moderately substandard and more than 20% were severely substandard.

Few of the measures used in this study are directly comparable to measures used in previous studies. The Housing Assistance Council (HAC) uses measures of moderately and severely substandard that are similar to measures in this study. The definitions of moderately and severely substandard used in this report are based on HAC's. In their 2001 survey of farmworker housing in the United States, HAC found that 20% of employer owned housing units were moderately substandard, and 18% were severely substandard. In the present study, most camps were employer owned and 67% were moderately substandard and 22% severely substandard. In a 2000 HAC survey of farmworker housing in the eastern migrant stream, 80% of dwellings had at least 1 exterior housing problem [Holden, 2000]. All camps in the present study had 1 or more exterior housing problems. However, 29% of the dwellings in the 2000 HAC survey had 4 or more exterior problems, whereas no camps in the present study had more than three exterior housing problems. The present study found that 22% of camps had severely substandard conditions compared to 38% of dwellings in the 2000 HAC survey. A 2004 survey of farmworker family housing in North Carolina has one measure that is comparable with those used in this study [Gentry et al. 2007]. In the present study, a maximum of 42% of camps had 3 or more people per bedroom compared to 44% in the family housing study.

This study expands upon the documentation of housing characteristics in farmworker housing by describing the variability of these conditions across the agricultural season. Conditions tend to be worse mid-season or late in the season than they are at the beginning. This is true for people per sleeping room, people per showerhead, and people per laundry facility.

This study also reports differences in the prevalence of housing conditions between 2007 and 2008. For the most part, conditions were similar or better in 2008 than they were in



2007, with the exception of people per showerhead. Several explanations for the differences observed are possible. Because all camps are required to be inspected before they are occupied each year, conditions may have improved in some of these camps between 2007 and 2008 because of repairs made so they would pass inspection. All but three of the camps were registered with NCDOL in 2008 and, therefore, should have been inspected before they were occupied. It is unlikely that the three unregistered camps were inspected. The improved conditions in 2008 may also be attributable, in part, to differing resident characteristics. The improvements are consistent with the associations we identified between inadequate facilities and camps with no residents with H2A visas and with camps with residents with 0 to 7 years of experience given the fact that a greater percentage of the 2008 camps had residents with H2A visas and with 7 or more years of experience. The camps with worse conditions in 2008 may have been less likely to be included in the 2008 sample than were those with better conditions. As it is likely that the quality of the housing provided plays a role in a worker's decision to return to work for the same grower the following year, the ten camps that were randomly selected to be recruited for the 2008 data collection but were not included because none of the study participants returned to those camps may have had worse conditions and that is, in part, why the workers did not return. The randomization of camps should have limited this effect. In addition, we ran analyses comparing camps that were excluded in 2008 to those that were included in the sample and identified no significant differences. However, the small sample size limited our ability to detect differences between the two groups, so this possibility cannot be completely discounted.

The results of these analyses also identify specific camp characteristics that are associated with substandard conditions. The findings that larger camps (those with 11 or more residents), camps with no workers who have H2A visas, camps with residents who speak indigenous languages, those with residents with a mean of less than 7 years experience working in US agriculture, and camps that include female and child residents are more likely to have inadequate facilities show that exposure to substandard conditions is not equally distributed among migrant farmworkers.

The prevalence of substandard conditions, how those conditions vary across the agricultural season, and the factors that are associated with poorer housing conditions all have important policy implications. These results suggest that migrant housing standards are not being adequately enforced. These housing standards exist because compliance with them is important for the protection of the health of residents.

Standards require that farmworker camps have a minimum of 50 square feet per person in sleeping rooms; our results show that between 26% and 31% of camps had fewer than 50 square feet per person. The Department of Housing and Urban Development (HUD) defines housing as crowded if it has more than 1 person per room, excluding kitchen and bathrooms. Most camps that meet the 50 square feet per person standard would be considered by HUD to be crowded. That up to 78% of camps have 1 or more residents who report that their sleeping room feels crowded shows that the workers feel that they live in crowded conditions regardless of whether the space provided complies with housing standards. Living in crowded conditions has been shown to be associated with increased rates of depression, anxiety and social withdrawal [Evans & Lepore 1993; Evans et al. 2000] and also can increase the spread of infectious diseases such as tuberculosis [Baker et al. 2008; Canadian Tuberculosis Committee 2007]. Living in such crowded conditions may have a negative impact on farmworkers' mental and physical well being.

North Carolina migrant housing standards mandate that there be a maximum of 10 people per working showerhead. There were 11 or more people per working showerhead in 3% to 15% of camps. The number of showerheads per person is particularly important for

agricultural workers because they are exposed to pesticides in the fields and should bathe as quickly as possible after leaving work to remove pesticides from their bodies to prevent their absorption. The fewer showers available, the longer workers must wait to shower, potentially resulting in higher doses of pesticides entering the body.

North Carolina MHA requires one washtub or washing machine for every 30 residents. Between 4% and 28% of camps had more than 30 people per laundry facility; most of the camps in this category lacked laundry facilities altogether. The presence of laundry facilities is important because many farmworkers live in poverty and have a limited number of changes of clothes. They need to be able to wear a clean set of work clothes each day to limit their exposure to pesticides. Many workers also lack transportation and rely on employers or supervisors to take them to town for shopping and to visit laundry facilities. The lack of laundry facilities in camps likely limits workers' ability to wear clean work clothes every day.

This study documents the prevalence of housing conditions that are likely to impact residents' health. Although we can describe ways in which the conditions documented here may impact the health of the workers exposed to those conditions, it would be ideal to be able to document associations between exposure to such conditions and health outcomes. The prevalence of potentially hazardous conditions documented here demonstrates the need for further research that is designed to simultaneously document housing conditions and health outcomes that are likely to be associated with those conditions.

All of the housing problems documented in the 2008 housing checklist violate NC migrant housing standards. Among the problems documented were several serious safety hazards. These missing items are relatively inexpensive safety measures that are required to be present in all camps and that could save lives in the event of an emergency.

It is important to document the variability of housing conditions because the vast majority of housing inspections of migrant camps occur prior to occupancy. In 2004, 1,538 camps received pre-occupancy inspections and 72 camps received compliance inspections after they were occupied [Buhler et al. 2007]. Most of the compliance inspections are in response to complaints or referrals or in response to a report of an accident or fatality. This study provides evidence that a focus on pre-occupancy inspections with a small number of post-occupancy inspections is not adequate to enforce housing quality standards. Pre-occupancy inspections are not able to confirm that employers are not housing more workers than the number for which the housing is certified. Nor are they able to ensure that facilities that break during the season are repaired or that proper sanitary measures are taken. In addition, several standards that are assessed in migrant housing inspections [North Carolina Department of Labor, 2008] are impossible to assess pre-occupancy. Many of the most common housing problems that were documented in the 2008 housing checklist would not be present prior to occupancy. Trash or litter was found in the yard of 41% of camps, trash cans were uncovered in 74%, mold and mildew were present in 63%, bathrooms were considered unclean in 33%, and kitchens were considered unclean in 22% of camps. Because so many of the conditions that are mandated by state and federal standards require adequate maintenance of migrant housing, it stands to reason that conditions in camps should be assessed while these camps are occupied.

Identifying the characteristics that are associated with substandard housing conditions and the points in the season when conditions tend to be worse can be useful when identifying how to improve enforcement of housing regulations. Inspectors could use this information to identify types of camps that should be targeted for compliance inspection. For example, random selection of approximately 15% of camps for post-occupancy inspection would

likely help improve housing conditions across the season because employers would know that there is a risk of the housing they provide being inspected during the season. Such knowledge would likely motivate employers to properly maintain housing. Furthermore, the selection of camps for post-occupancy inspection could take into consideration the specific types of camps that are most likely to have substandard conditions. One option would be to stratify the list of registered camps and then select camps for post-occupancy inspection as follows: 5% have no residents with H2A visas, 5% are registered for 11 or more residents, and 5% from the remaining list. This would ensure that camps with the highest likelihood of having substandard conditions are targeted for post-occupancy inspection.

It is important to consider this study's limitations when interpreting its results. This sample included only 3 camps that were not registered with the NCDOL at the time of the study. Advocates have reported that conditions in unregistered camps tend to be worse than those in registered camps. Though all partners who aided in creating the sampling frame for this study make an effort to include unregistered camps in their lists, these camps are difficult to find because employers try to keep them hidden and workers in them are often afraid to interact with visitors for fear of retaliation from employers and supervisors. The limited number of unregistered camps in this sample may have led to an underestimate of the prevalence of substandard conditions in farmworker housing. The interviewers who completed the housing checklists based on observed conditions and resident reports received detailed training about what to look for to document housing conditions for each item on the checklist, but the training they received cannot be considered to be equal to that of professional housing inspectors. Trained housing inspectors may have had different opinions about the conditions observed in the camps. Despite this limitation, most of the interviewers have years of experience visiting farmworker camps and talking to workers about their housing, which likely enhanced their ability to assess conditions in the camps.

## Conclusions

Substandard housing conditions are common in migrant farmworker temporary labor camps. The risk of living in a camp with substandard conditions is unevenly distributed among farmworkers, with women, children, indigenous language speakers, workers with fewer than 7 years of experience working in US agriculture, and workers without H2A visas having disproportionately high risk of being exposed to substandard conditions.

The results of these analyses provide evidence of the need for improved enforcement of migrant housing standards. Increasing the number of post-occupancy compliance inspections conducted is likely to lead to improved housing conditions. Targeting camps with characteristics that place them at increased risk of having substandard conditions for compliance inspection would help address the disparities in housing quality that this study documents.

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**Table I**

## Camp Characteristics, Farmworkers in Eastern North Carolina.

Camp Characteristics	2007 (N=43)		2008 (N=27)	
	n	%	n	%
Age of residents				
Mean age 18 to 29 years	10	23.3	1	3.7
Mean age 30 to 39 years	28	65.1	17	63
Mean age 40 or more years	5	11.6	9	33.3
Female adult residents present	12	27.9	6	22.2
Child residents present	-	-	4	14.8
Indigenous language spoken by at least 1 resident				
No	21	48.8	20	74.1
Yes	22	51.2	7	25.9
At least 1 resident has an H2A visa				
No	16	37.2	5	18.5
Yes	27	62.8	22	81.5
Residents' mean years experience working in US agriculture				
0 to 7 years	20	46.5	8	29.6
More than 7 years	23	53.5	19	70.4
Trailer present in camp	20	46.5	11	40.7
Barracks present in camp	12	27.9	6	22.2
House present in camp	25	58.1	11	40.7
Housing tenure				
Employer Provided	41	95.3	25	92.6
Rental	2	4.7	2	7.4
Number of residents in camp at baseline				
1 to 10	28	65.1	19	70.4
11 or more	15	34.9	8	29.6
Camp adjacent to agricultural fields	-	-	26	96.3
Livestock housed or fed near the camp	-	-	3	11.1

- Data not collected in 2007



**Table II**  
Migrant Farmworker Camp Characteristics Across the 2007 and 2008 Agricultural Seasons, Eastern North Carolina.

Camp Characteristics	2007						2008							
	5/1-6/8 n=39	6/9-7/7 n=36	7/8-8/5 n=40	8/6-9/4 n=38	6/13-7/11 n=26	7/12-8/10 n=26	8/11-9/9 n=27	n	%					
Modal Number of residents	n	%	n	%	N	%	n	%	n					
1 to 10	27	69.2	25	69.4	27	67.5	26	70.3	18	69.2	16	61.5	17	63.0
11 or more	12	30.8	11	30.6	13	32.5	11	29.7	8	30.8	10	38.5	10	37.0
Modal number of people per sleeping room														
1 to 2	27	69.2	21	58.3	25	62.5	22	59.5	17	65.4	16	61.5	16	59.3
3 or more	12	30.8	15	41.7	15	37.5	15	40.5	9	34.6	10	38.5	11	40.7
At least one resident says his sleeping room feels crowded	25	64.1	28	77.8	24	60.0	27	73.0	19	73.1	20	76.9	20	74.1
Mean square feet per person in sleeping rooms														
Less than 50	.1	-	-	-	-	-	-	-	8	30.8	7	26.9	7	25.9
50 or more <sup>2</sup>	-	-	-	-	-	-	-	-	18	69.2	19	73.1	20	74.1
All residents have a place to store personal belongings	26	66.7	26	72.2	37	92.5	33	89.2	22	84.6	23	88.5	26	96.3
Number of people per working shower in camp (mode)														
1 to 8 <sup>2</sup>	31	79.5	29	80.6	36	90.0	32	86.5	17	65.4	18	69.2	18	66.7
9 or more <sup>3</sup>	8	20.5	7	19.4	4	10.0	5	13.5	9	34.6	8	30.8	9	33.3
11 or more	1	2.6	1	2.8	2	5.0	2	5.4	4	15.4	4	15.4	3	11.1
Number of people per working toilet in camp (mode)														
1 to 15 <sup>2</sup>	-	-	-	-	-	-	-	-	25	96.2	25	96.2	26	96.3
15.1 or more	-	-	-	-	-	-	-	-	1	3.8	1	3.8	1	3.7
Number of people per laundry facility														
1 to 16 <sup>2</sup>	28	71.8	24	66.7	30	75.0	28	75.7	23	88.5	24	92.3	26	96.3
16.1 to 30 <sup>2</sup>	4	10.3	2	5.6	0	0	2	5.4	1	3.8	1	3.8	0	0
30.1 or more/none in camp	7	17.9	10	27.8	10	25.0	7	18.9	2	7.7	1	3.8	1	3.7
Camp has inadequate facilities	16	41.0	16	44.4	12	30.0	9	24.3	7	26.9	7	26.9	3	11.1

<sup>1</sup> indicates data not collected

<sup>2</sup>These categories comply with NC DOL temporary labor camp standards

<sup>3</sup>Some but not all camps in this category comply with the NC DOL standard that a camp have no more than 10 people per showerhead.

This category was added to test the hypothesis that more people per showerhead, even when the amount meets the standard may be associated with other housing conditions.

**Table III**  
**Housing Problems Documented in Migrant Farmworker Camps, Eastern North Carolina, 2008 (N=27)**

Housing Problems	n	%
Total number of exterior housing problems		
1	18	66.7
2	7	25.9
3	2	7.4
Total number of general interior housing problems		
0	2	7.4
1 to 5	22	81.5
6 or more	3	11.1
Total number of problems in bathroom		
0	7	25.9
1 to 2	15	55.6
3 to 6	5	18.5
Total number of problems in kitchen		
0	19	70.4
1 to 2	7	25.9
3 to 5	1	3.7
Camp Housing Standards Status		
Housing meets standards	3	11.1
Moderately substandard	18	66.7
Severely substandard	6	22.2

Table IV

Predictors of housing conditions 2007-2008 (N=43)

Camp Characteristics	3 or more people per sleeping room		9 or more people per working shower		30.1 or more people per laundry facility		Camp has inadequate facilities	
	Odds* Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Indigenous language speakers								
Some or all vs. none	2.2	1.0, 4.7	2.1	0.8, 5.6	1.9	0.7, 5.8	3.2	1.2, 8.4
Migrant Status								
No H2A residents vs. one or more	1.7	0.9, 3.3	2.5	0.5, 12.8	1.9	0.4, 8.9	2.3	1.1, 4.9
Work experience of residents								
0 to 7 vs. more than 7 years	2.5	1.5, 4.2	2.5	1.2, 5.3	2.6	0.8, 8.4	2.9	1.2, 6.7
Female residents								
Female residents vs. none	1.1	0.5, 2.6	3.7	0.9, 14.8	2.7	0.5, 14.7	3.2	1.2, 8.9
Housing Type								
Barracks present vs. no barracks present	1.5	0.5, 4.8	0.6	0.2, 2.1	3.5	0.7, 16.6	1.4	0.4, 4.9
Trailer present vs. no trailer present	0.4	0.2, 1.0	1.3	0.4, 4.2	0.5	0.1, 2.1	0.4	0.2, 1.1
House present vs. no house present	2.1	1.0, 4.5	0.6	0.3, 1.5	1.8	0.5, 7.1	1.6	0.7, 4.1
Camp size								
11 or more residents vs. 10 or fewer	2.5	1.3, 5.1	4.5	1.6, 12.6	2.3	0.8, 6.6	7.4	3.0, 18.4

\* odds ratios are from a repeated measures model that adjusts for time period

**Table V**  
**Frequencies of severely substandard camps by camp characteristic, 2008 (N=27)**

Camp Characteristics	Not severely substandard	Severely substandard	P-value <sup>I</sup>
Indigenous language speakers			
None	18 (85.7)	2 (33.3)	< 0.05
Some or all	3 (14.3)	4 (66.7)	< 0.05
Migrant Status			
No H2A residents	2 (9.5)	3 (50.0)	
One or more H2A residents	19 (90.5)	3 (50.0)	
Work experience of residents			
0 to 7 years	4 (19.0)	4 (66.7)	< 0.05
More than 7 years	17 (81.0)	2 (33.3)	< 0.05
Female residents			
No female residents	19 (90.5)	2 (33.3)	< 0.05
Female residents	2 (9.5)	4 (66.7)	< 0.05
Child residents			
No child residents	21 (100.0)	2 (33.3)	< 0.05
Child residents	0	4 (66.7)	< 0.05
Housing Types			
No barracks present	18 (85.7)	3 (50.0)	
Barracks present	3 (14.3)	3 (50.0)	
No trailer present	12 (57.1)	4 (66.7)	
Trailer present	9 (42.9)	2 (33.3)	
No house present	11 (52.4)	5 (83.3)	
House present	10 (47.6)	1 (16.7)	
Camp size			
10 or fewer	16 (76.2)	3 (50.0)	
11 or more residents	5 (23.8)	3 (50.0)	

<sup>I</sup>P-values calculated using a Fisher's Exact test.

**Table VI**  
**Multivariate Model - Predictors of housing conditions 2007-2008 (N=43)**

Camp Characteristics	3 or more people per sleeping room		9 or more people per working shower		30.1 or more people per laundry facility		Camp has inadequate facilities	
	Odds* Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Migrant Status								
No HZA residents vs. one or more	1.9	0.9, 4.0	2.6	0.6, 11.9	2.5	0.6, 10.1	3.4	1.2, 9.6
House present vs. no house present	2.4	1.1, 5.4	0.7	0.3, 1.7	1.9	0.6, 6.1	1.8	0.7, 4.5
Camp size								
11 or more residents vs. 10 or fewer	2.8	1.3, 5.8	4.9	1.5, 15.7	2.2	0.8, 6.1	8.6	3.5, 21.1

\* odds ratios are from a repeated measures model which adjusts for time period in addition to the variables included in the table