



CALIFORNIA  
INSTITUTE FOR  
RURAL STUDIES

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# THE STATUS OF FARM LABOR HOUSING

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And the Health of Workers



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## Preface

This report is intended to provide an overview of the scientific literature concerning housing occupied by hired farm workers, and possible associations of exposures of risks to worker health with their place of residence. Implied by this statement is that both the physical status of a dwelling as well as the built environment in which it is located may present exposures that are risks to the health of the residents.

For purposes of clarity in the present report, the term “farm worker” will be used herein to refer to hired or contracted farm workers. By definition, this use of the term refers to workers engaged in either crop or livestock production. In portions of this report, if the discussion refers only to crop workers, or only to livestock workers, then this distinction will be explicit in the text.

Direct measures of the current health status of hired farm workers are scant. Even fewer are objective physical examinations of representative samples of this population. Absent such research, it is difficult to determine the relationship, if any, of the housing conditions to health status among hired farm workers.

Studies that rely on a non-representative sample of participants face the additional challenge of seeking to relate research results to the health status of the larger population. Convenience samples – deliberately chosen to avoid the problem faced by researchers seeking to study a “difficult to reach” population – are more prevalent in the literature than are samples based on a random sample selected from the entire population.

The United States Environmental Protection Agency has promulgated a guideline concerning studies that may seek to generalize results of a convenience sample to the entire population [Mage et al. 2006]:

“[T]he results only pertain to the sample itself, and should not be used to make quantitative statements about any population – including the population from which the sample was selected.”

It is therefore necessary that the present report carefully distinguish findings from studies based on accurately representative samples of the population from those which are based on convenience samples. Except for reports published in the peer-reviewed scientific literature, studies reporting findings concerning housing conditions as they related to farm worker health that were based on convenience samples are discussed in a separate section of the present report titled “Additional studies of farm worker housing and health”.

As generally understood, the term “farm worker” refers to any person who performs a task on a farm for the purpose of producing an agricultural commodity intended for sale. There are three principal categories of such persons.

- Self-employed farm workers, typically “farmers” or “ranchers”;

- Unpaid family workers, typically spouses, siblings, children, or other relatives of self-employed farm workers;
- Hired farm workers, including contract workers.

In the present report, as previously stated, the term “farm worker” will refer only the third category: hired and/or contracted farm workers. By definition, persons working off-farm who are engaged in any type of post-harvest processing of agricultural commodities are not considered “farm workers” in the present report. But persons performing post-harvest tasks on a farm, and employed by the farmer, are included in our term “farm worker”.

Many, if not most, “farm workers” are employed to perform short-term tasks, and do not usually have full-time, year-round jobs. The *Census of Agriculture* reports the number of “workers” at the national, state and county level. But these figures do not correspond to the actual number of individuals because each farm operator tells the *Census* the count of persons they have hired. If a particular person is hired for a short-term job with one farmer, and is subsequently hired by another farmer, the worker will be double-counted in the *Census* figures. In addition, persons employed by labor contractors are generally not directly employed by a farm operator, i.e., do not appear on the farm payroll, and will not be represented in the *Census* figures of “workers.”

Consistent with labor economics, we will use the term “farm employment” to refer to the annual average of monthly employment of farm workers, sometimes described as full-time equivalents (FTE). In agricultural production, with a great many jobs that are temporary, or short-term, two persons each working a total of six months will only count as one FTE in a description of farm employment.

Therefore, we use the term *jobs* to refer to hiring of a person to perform a farm job, regardless of whether it is short-term or not. Clearly, the number of farm jobs exceeds the number persons actually working, while the corresponding *employment* will be less than the number of persons working.

It is beyond the scope of the present report to discuss determinations of the actual number of hired farm workers at the national, state, or county level of geography.

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# The Status of Farm Labor Housing and the Health of Workers

Immigration of workers from Mexico and Central America, the Mexicanization<sup>1</sup> of rural America, and dramatic changes in the scale of agricultural production have transformed the nation's farmscape. But like a thousand-piece puzzle with many hundreds of missing pieces, our knowledge of where farm laborers live and the conditions of their dwellings rests on piecemeal information, some of it anecdotal.

Today, most farm laborers are settled, living off-farm with family members in market housing. But there is still a geographic association of hired farm workers with job opportunities. Lacking authoritative direct measures of the *absolute number* of hired and contract farm laborers employed in each state or locality, it proves necessary to instead determine *labor demand* by geography to inform research about where farm laborers likely reside.

The geographic distribution of labor demand reflects the location of farm *jobs*. But labor demand estimates are not equivalent to the numbers of employed workers. Farm jobs vary greatly in duration – many workers may be needed to meet the labor demand for a short-term crop harvest but the equivalent total labor demand for year-round work on a dairy farm would require fewer workers.

## Demand for hired farm labor – size and geographic distribution

Farm output, whether measured in value or in physical quantity, has increased substantially over the course of the past forty years. Less apparent has been the decline of the amount of farm work performed by farmers and unpaid family workers, and today's reliance on hired and contract farm labor for the majority of all farm work. As of 2012, the total annual amount of hired and contract labor utilized on U.S. crop and livestock farms is estimated to be 2.6 billion person-hours.

During the same four decades, there has been a substantial overall expansion of labor-intensive U.S. crop agriculture – vegetable, fruit, nursery and tobacco farming – in acreage harvested and annual tons produced. While the combined farm gate value of sales of these crops accounted for about 15% of all farm production in 2012, they required a 52% share of all hired and contract labor on U.S. farms: an estimated 1.35 billion person-hours.

Only a few states have the favorable combination of conditions for growing large quantities of these commodities: mild climate, good soils, irrigation water, labor availability and access to

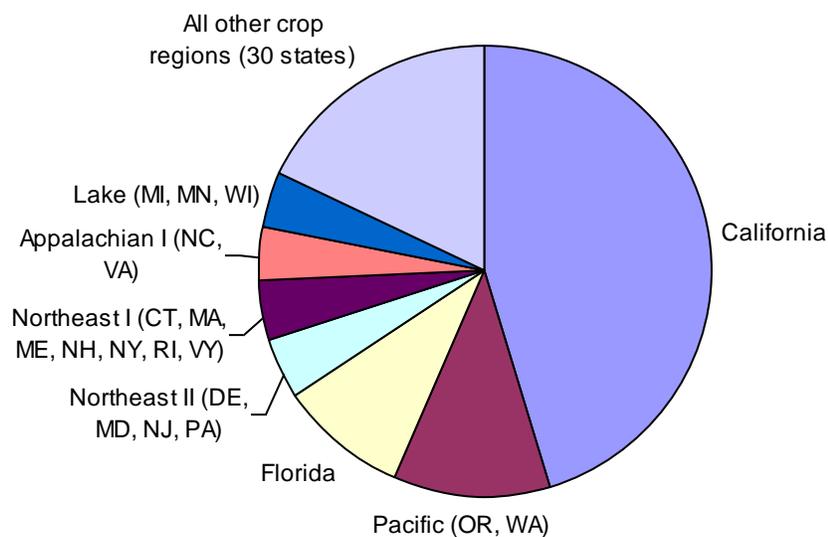
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<sup>1</sup> "The state (in industry or farming) of having or being supplied with a large number of [Mexican](#) personnel or laborers" —Merriam-Webster unabridged dictionary.

markets. Exceptionally favorable conditions exist on portions of the two principal coasts and nearby valleys.

The chart in Figure 1 represents the estimated relative shares of annual farm labor demand, measured by the number of work hours required to grow and harvest labor-intensive crops in the U.S. during 2012, in each of the top-ranked seven USDA Crop Regions as well as for all other Crop Regions combined. California and Florida are each distinct Crop Regions as defined by USDA. The methodology used for this estimate is described in detail elsewhere [Villarejo. 2012. Appendix I]; an update to the method is described in a recent report by the Legal Services Corporation in its updated determination of funding allocations for Migrant Legal Services.<sup>2</sup>

**Figure 1. Labor Demand, Labor-Intensive Crop Agriculture Total Annual Hours, U.S., by USDA Crop Region, 2012**



California led the nation during 2012 in estimated labor demand for labor-intensive crops with 45% of the U.S. total, followed by the Pacific Crop Region (Oregon & Washington) with 11%,

<sup>2</sup> See [http://www.lsc.gov/sites/default/files/LSC\\_Report\\_AgWrkr\\_Update\\_Jan\\_30\\_2015.pdf](http://www.lsc.gov/sites/default/files/LSC_Report_AgWrkr_Update_Jan_30_2015.pdf); however, in the present report, for the 13 states that mandate workers compensation insurance for all farm laborers, it is assumed that non-wage labor expenses were 18% of wages, in all other states, it was assumed non-wage costs were 11% of wages, and for the nation as a whole, non-wage costs were 13% of wages.

and Florida with 9%. These four states accounted for about two-thirds of estimated U.S. hours of work to produce specialty and tobacco crops. The next four ranked USDA crop regions together accounted for an additional about one-sixth of the labor demand for those crops.

## Farm worker housing – tenure: national perspective

The most recent published report describing the housing status of the nation’s hired crop and livestock workers is based on the 2005-07 Current Population Survey (CPS) conducted by the Bureau of Labor Statistics [Kandel. 2008]. This national, cross-sectional sample distinguished the housing status of non-citizen hired farm workers from that of citizen workers (Table 1). Hired managers and foremen were included in this sample.

**Table 1.**  
**Housing, U. S. Hired Farm Workers, 2005-07 (Kandel. 2008)**

Characteristic	Noncitizen	Citizen	Total
Persons per dwelling (average)	4.7	3.4	3.9
Families per dwelling (average)	1.8	1.2	1.4
Own dwelling	24%	69%	53%
Rent dwelling	62%	18%	34%
Noncash rental	13%	12%	13%
Public housing	1.4%	0.7%	0.9%
House or apartment	81%	89%	86%
Mobile home, trailer, other	19%	11%	14%

The CPS sample of hired crop and livestock worker households indicates that many shared their dwelling with non-family members. Just over half resided in a dwelling owned by them or a member of their family. The typical dwelling was a house or apartment while one out of seven lived in a mobile home, trailer or other type of non-permanent dwelling.

The extent of shared living quarters was greatest among non-citizen workers, averaging 1.8 families per dwelling as compared with 1.2 among citizen workers. A dwelling that housed non-citizen workers typically had more residents as compared with dwellings occupied by citizen workers, an average of 4.7 vs. 3.4 persons per dwelling. Just 24% of non-citizen hired crop and

livestock workers resided in a dwelling owned by them or a member of their immediate family. Nearly one in five non-citizen workers resided in a mobile home, trailer, or other, most likely temporary, quarters.

These housing findings from 2005-07 can be compared with an earlier cross-sectional survey of farm worker housing tenure and wage compensation based on a national sample of 1,785 workers drawn from the 1984 CPS [Perloff. 1991]. Foremen and managers were carefully excluded from this sample.

Nearly half the 1984 sample resided in owned housing, about one-quarter resided in rental units, and the remaining one-fourth lived in rent-free housing provided by the employer. Those who lived in owned housing were more likely to be younger, white, female and better educated, and less likely to be Hispanic, and a head of household than workers living in rent-free housing. Nearly three-fourths of renters were crop workers.

The rate of homeownership found in 2005-07 was nearly the same as in 1984, but substantially fewer workers in 2005-07 lived in free, employer-provided housing; one-eighth lived in free housing in 2005-07 vs. one-fourth in 1984. This finding also implies that fewer hired workers lived on farms in 2005-07 as compared with 1984.

A limitation of the CPS samples is that they are based on surveys conducted in the month of March, a time when relatively fewer hired workers are employed on U.S. farms as compared with later months of the year. Workers who migrate from a permanent home base to distant jobs where temporary housing prevails are more likely to be present at times when labor demand is greatest, such as late spring, summer, and early fall periods.

Also, the CPS sample relies on the Census Bureau's Master Address File, which likely excludes informal dwellings lacking a mailing address, an unknown number of which are likely occupied by farm laborers. Recent research has demonstrated that a notable share of dwellings occupied by currently employed farm laborers are informal dwellings, such as unfinished garages, shacks, lean-tos, abandoned vehicles, or "under-the-trees" [Sherman, et al. 1997; Kissam. 2012; Kissam. 2011; Stoecklin, et al. 2011; Wadsworth, et al. 2014].<sup>3</sup>

The CPS data did not provide information about the physical quality of housing, nor about the health status of participants in the survey. Nor did the CPS determine residential density, such as persons per room used for sleeping.

## Hired crop worker housing – tenure: national perspective

The National Agricultural Worker Survey of the U.S. Department of Labor (NAWS) is the only nationally valid source of information about the status of hired crop farm worker housing. The

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<sup>3</sup> See also the documentary film, *The Invisible Mexicans of Deer Canyon*, A Film by John Carlos Frey, Gatekeeper Productions LLC, 2006.

NAWS conducts face-to-face interviews with an accurately drawn, national, cross-sectional sample of hired crop farm workers. The most recent NAWS findings, for interviews conducted during FYs 2010-12, indicates 79% of all U.S. hired crop workers were settled, living permanently in the U.S. with their family members [Carroll. 2014]. This is a substantial increase from NAWS 2005-07 findings that 67% of workers were settled [Carroll. 2009]. The most recent NAWS findings indicate just 6% were follow-the-crop migrant workers, 14% were shuttle migrants and only 2% overall were newly arrived migrants from Mexico or Central America.

The NAWS findings indicate a significant trend over the years of fewer crop workers residing on-farm or in employer-provided housing. The housing findings are consistent with findings from the 2005-07 CPS sample. As was the case for the CPS samples, NAWS does not include measures of participants' health or housing quality and is limited in its ability to inform this review regarding the relationship of farm labor housing to the health of occupants.

## The status of hired farm worker housing – state and regional surveys

### California

Two statewide cross-sectional surveys of the California farm labor population included some information about housing: the National Agricultural Worker Survey of crop farm workers (NAWS) and the California Agricultural Worker Health Survey of both crop and livestock workers (CAWHS). The most recently published report based on interviews with California participants in the NAWS was based on 2,344 face-to-face interviews with statewide, randomly selected California crop workers conducted during 2003-04 [Aguirre. 2005]. Workers were asked to report their type of housing, the location of their living quarters relative to their work site, the number of rooms in the dwelling, the number of persons who sleep there, and the monthly or weekly housing costs. [U.S. DoL. NAWS Survey Instrument. 2002].

Nearly two-thirds (62%) of crop worker participants reported their place of residence to be a single-family dwelling. About a quarter (29%) said they resided in an apartment, six percent lived in mobile homes, two percent lived in dormitory or barracks-style housing, and one percent lived in duplexes or triplexes. Only three percent of workers lived on their employer's farm, and just one percent lived off-farm in housing owned by their employer.

The California Agricultural Worker Health Survey (CAWHS) was a one-time household survey that interviewed 970 randomly selected hired farm workers during the period March – December 1999. The sample was statewide and cross-sectional within seven representative communities [Villarejo & McCurdy. 2008]. The CAWHS included a series of questions copied from the 1990 U.S. Census of Population and Housing that sought to determine the status of

sanitation, washing, waste disposal and food preparation facilities in each dwelling visited by interviewers [CIRS. 1999].

Most dwellings in which hired farm workers resided were permanent structures – houses or apartments (81%). Informal dwellings - sheds, unfinished garages, lean-tos, tents, and abandoned vehicles - ranked next in importance (10%), followed by registered labor camps (6%) and vehicles (2%).

Two-thirds (67%) of CAWHS participants rented their dwelling. Nearly one-fourth of CAWHS dwellings (23%) were owned by the participant or another household member. Only in relatively remote communities, with relatively low real estate valuations, did the rate of homeownership among CAWHS households reach 50%. Where real estate valuations were relatively high homeownership rates were low: just 6% of CAWHS participants in the southern coastal city of Vista were homeowners.

In communities with limited housing availability, some hired farm workers face discrimination and live wherever they can find shelter. The long history of housing discrimination based on race/ethnicity in the “rural slums” of the southern San Joaquin Valley has been discussed [Ramirez & Villarejo. 2012].

California has dozens of small rural communities in which the Hispanic population exceeds 50%, nearly all of which are located in regions where agricultural production is dominant, and also have a plurality of private sector employees working as farm laborers. Described as *colonias*<sup>4</sup> by some, one scholar describes the life of residents as “...long hours of hard work...” that conclude with a return to “...deplorable living conditions...” [Mukhija. 2010].

During the late 2000’s there were two additional county-wide farm labor housing surveys that sought to determine the needs of their workforces as part of the housing element for county General Plan updates: Napa County [Strochlic et al. 2007] and Mendocino County [Strochlic et al. 2008]. The Napa County survey sought to estimate the counties’ hired farm worker population as well as describe then-occupied housing for this workforce.

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<sup>4</sup> “In the United States, a ‘colonia’ has a specific meaning, referring to a community within the mainly rural US-Mexico border region with marginal conditions related to housing and infrastructure. In many cases, these scattered and sparsely populated rural communities were formed when unscrupulous land owners inappropriately subdivided rural lands, offered plots via contract for deed, and made empty promises that utilities would soon be installed.” HUD.gov

**Table 2.**  
**Napa County Farm Laborers, by Place of Residence and Duration of**  
**Napa County Farm Employment, 2006, N=189**

<i>Place of residence</i>	<i>Regular (7 months or more)</i>	<i>Seasonal (3 – 6 months)</i>	<i>Temporary (less than 3 months)</i>
Napa County	76%	57%	0%
Adjacent counties	18%	17%	22%
Non-adjacent counties	6%	27%	78%
<i>Total</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>

The Napa County survey findings provided a snapshot of where the county's farm laborers were living. Many lived in an adjacent county (18%), and more than a few lived in a non-adjacent county (17%), commuting to work on a daily basis. This is shown in Table 2, which presents findings about the residence location of workers according to whether they were *regular*, *seasonal*, or *temporary* workers on Napa County farms.

Nearly all workers interviewed were born in Mexico or Central America, and everyone said they had come to the U.S. to find work to help support their families. Some 89% of the Napa County farm workers sent remittances to family members who remained abroad, averaging \$3,600 per year, a substantial share of earnings.

**Table 3.**  
**Napa County Farm Laborers, General Housing Conditions**  
**Napa County, 2006, N=189**

<i>Specific condition</i>	<i>Prevalence</i>
Persons per dwelling - mean	5.9
Crowded	61%
Extremely crowded	34%
Resides with unrelated persons	46%
Lives on farm	5%
Free housing	2%
Rental expense (monthly) - median	\$1,000

When asked about living conditions, findings reveal some interesting contrasts as well as similarities. As indicated in Table 3, crowded conditions were prevalent, and extreme crowding was widespread as well. Nearly half said they were living with unrelated persons, neither family nor significant others.

California also provides safe and affordable temporary housing in public Migrant Housing Centers, of which there are two dozen spread over the major agricultural counties where labor demand is greatest. Altogether, there are a total of 1,707 units for which the daily charge per unit is approximately \$11 - \$12.<sup>5</sup> Occupancy is limited to families, and subsidized child care is provided at most of the camps. The migrant centers are typically open about six months each year; the specific opening and closing dates are timed to coincide with each locality's period of peak labor demand. Assuming two members of each such unit is employed as a farm worker, the total number of workers housed in the state's Migrant Housing Centers is less than one percent of the state's 380,000 annual farm employment.

## Washington

The recent history of farm labor housing in Washington reflects some fundamental challenges as described in *Rural Migration News*.<sup>6</sup> "In 1969, some 267 Washington farms had licensed on-farm labor camps for 22,441 individuals; but by 1996, just 182 farms had licensed camps for only 9,600 individuals." State legislative action in 1995 designating the Washington State Department of Health as the agency with authority to license farm labor housing led to this sharp reduction in employer-provided housing.

Simultaneously, new, strict housing standards were established. Many growers complained about the new rules and the prospect of incurring substantial costs to modify existing labor camps in order to comply with the new standards; more than a few simply closed their camps.

Grower organizations and worker advocates jointly appealed to the state government to provide assistance to address the sudden shortage of farm labor housing. In 1999, then Gov. Gary Locke, allocated \$40 million to a 10-year capital fund for the specific purpose of developing safe, decent, affordable farm labor housing [WA-DCTED. 2005]. During the course of the next seven years, some 6,378 seasonal housing beds and 1,068 permanent housing units were constructed and placed into service [WA-DCTED. 2007].

The extreme vulnerability of workers who reside in employer-owned housing was noted in an ethnographic study of a large berry farm in a remote area of Washington [Holmes. 2011]. All 500 peak season workers lived in on-farm, labor camp housing furnished by the employer. The

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<sup>5</sup> See California Department of Housing and Community Development, Office of Migrant Services (Accessed 12/10/14, <http://www.hcd.ca.gov/fa/oms/>).

<sup>6</sup> See "Farm Labor Housing," *Rural Migration News*, Vol. 4, No. 4, October 1998 (Accessed 12/10/14, <https://migration.ucdavis.edu/rmn/>).

report identified a hierarchy based on ethnicity and citizenship in which white American citizens held executive and supervisory positions, and at the bottom migrant indigenous Mexicans (Triqui origin<sup>7</sup>) were berry pickers paid by a piece-rate. If a picker failed to meet the minimum production quota, set daily, then he/she was fired and kicked out of the labor camp.

## Florida

There are no published reports of statewide surveys of hired farm workers in Florida. However, a 2010 report on the need for farm worker housing in the state indicated there were 700 permits for labor camp housing for unaccompanied workers issued by the Florida Department of Health, comprising 33,409 beds [Abernathy. 2010]. Additional permits for 1,118 beds for unaccompanied workers were located within USDA-funded, Rural Development farm labor housing projects. Moreover, state and federally subsidized farm labor housing comprised 7,767 units. The estimated total capacity of all identified farm labor housing was 63,677 farm laborers and family members.

## Oregon

There are no published reports of statewide surveys of farm labor housing in Oregon. The most recent summary report about the state's farm labor housing supply found there were 307 permitted agricultural labor camps as of 2014 [Oregon OSHA. 2014]. A report ten years earlier found 365 permitted labor camps with 11,916 beds [Bitsch. 2010]. Permanent housing for farm workers funded by the USDA Rural Development program, and with other support, accounted for 1,058 units.

Oregon has relatively strict standards for employer-provided farm labor housing. Labor contractors who register a labor camp must prove they meet state labor contractor licensing requirements and post a \$15,000 bond. They must also provide qualified alternative housing if their labor camp is closed owing to code violations. The state's zoning laws and restrictions on agricultural land use tend to limit the ability of farm operators to provide on-farm housing.

## Texas

There are no published reports of statewide surveys of farm labor housing in Texas. The Texas Department of Housing and Community Affairs reported 31 licensed migrant labor housing facilities in the state in 2010.

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<sup>7</sup> The Triqui are a group of indigenous people that live mostly in the state of Oaxaca in Mexico. <https://intercontinentalcry.org/peoples/triqui/>

A recent study of farm labor housing in Texas chose to focus on just those counties of the state where the total number of *migrant and seasonal farmworkers*, including non-farmworker family members, had been once estimated to be 1,000 or more [Bowen National Research. 2012]. The number of farm worker *jobs* in Texas is about 160,400, according to the *Census of Agriculture*. County-by-county estimates of the number of such persons was published more than a decade earlier [Larson. 2000]. The recent study found 19 licensed migrant labor housing facilities in the selected counties, with a total 168 units comprising a capacity of 739 persons. In the same counties, there were nine facilities of permanent farm labor housing with 384 units and a capacity of 1,798 individuals. Thus, in those Texas counties with the largest presumed concentrations of farm workers, there was either licensed migrant farm labor housing or permanent farm labor housing for just 2,537 persons.

## North Carolina

There are no published reports of statewide surveys of farm labor housing in North Carolina. However, it is widely understood among growers and advocates that most migrant farm laborers reside in labor camps while working in the state. Some hired farm workers, such as livestock laborers, likely reside in other types of housing.

Two studies examining housing characteristics of farm worker families in North Carolina, and a small portion of adjacent Virginia, found most workers rented their home (72% - 78% in one study, 80% to 100% in the second), home ownership was less prevalent (16% - 22% in one study, 0% to 20% in the second), and labor camp housing was even less prevalent (0% - 12% in one study, 0% to 20% in the second) [Early et al. 2006].

A study of hired farm worker housing in six eastern North Carolina counties found 52% were rentals, 26% were owned, and 22% were grower-provided [Gentry et al. 2007]. The majority of dwellings (83%) were mobile homes, 12% were single-family detached homes, and 2% were barracks or small apartments.

The above referenced papers, and a series of additional studies of housing quality in North Carolina migrant labor camps, has developed well-documented, quantitative measures of the physical conditions and other risks to health found in the camps. The findings from these studies are summarized in a later section of the present report.

## Hired crop worker housing – agricultural guest workers: H-2A visas

Contract laborers with an H-2A visa, issued to foreign-born, agricultural guest workers entering the U.S., obligates employers to provide housing that meets quality standards established by the U.S. Department of Labor. These dwellings must be inspected prior to occupancy to assure that they qualify, and are also subject to inspection again after occupancy.

Several studies in North Carolina and Georgia found that migrant workers employed under the H-2A agricultural guest worker program had better housing conditions as well as better working conditions, and lower food insecurity, than workers without H-2A visas [Quandt et al. 2013b; Arcury et al. 2012a; Arcury et al. 2012b; Robinson et al. 2011; Hill et al. 2011; Mirabelli et al. 2010].

## Farm labor housing conditions: basic economic and social challenges

A study of the condition of the state's farm labor housing was undertaken in Florida that sought to identify concerns of all interested parties [Flock & Burns. 2006]. The study noted there were numerous anecdotal reports of sub-standard farm labor housing in the state, and that a large convenience household sample conducted in 21 states suggested that Florida may have had the largest proportion of in-state, sub-standard housing [Holden et al. 2001]. In a series of stakeholder meetings and focus groups with farm laborers, researchers identified four broad issues that need to be considered. These were:

- Availability/access:
  - lack of suitable housing units, especially at peak season;
  - NIMBY opposition to situating farm labor housing in the community.
- Affordability:
  - farm laborer earnings are, on average, too low to afford market housing by U.S. HUD standards;
  - most workers can't afford to purchase a home;
  - workers who rent find it difficult to meet the widespread advance lump sum payment requirement of first and last months' rent plus security deposit.
- Location matters:
  - housing integrated with the community makes it easier to utilize local shopping and health services;
  - remote locations promote worker invisibility;
- Housing quality: housing code enforcement is often absent allowing unhealthful conditions and deterioration to persist.

The supply of farm labor housing has been greatly diminished in California during recent decades owing to the elimination of thousands of labor camps, most of which were grower-owned [Peck. 1989]. According to this report, within a single decade, the number of licensed camps declined to just 496, as of December 1987, down from about 2,000 at the beginning of the 1980s.

Some farm operators, faced with new, strict farm labor housing standards, chose to close their labor camps rather than meet the costs of renovating old buildings. It is not known how many labor camps closed for this reason. Another factor, alarming to some employers, is a court decision holding that farm employers who provide housing as a condition of employment can be liable for Workers Compensation injury claims if the claimant is a worker whose injury was off-the-job, at home in their labor camp [South Carolina. 2010].

Therefore, the most significant recent development for housing hired farm workers in California is the very great increase in their reliance on unsubsidized, private-market, off-farm housing. But their housing conditions likely have not improved. An important consequence of the removal of thousands of labor camps that once provided shelter for many of the state's farm laborers is that the responsibility for finding and paying for housing has been outsourced by employers to the workers themselves. But lacking the resources or income needed to afford market housing, a large share of the labor force now live in cities within the major agricultural regions of the state, sharing their dwellings with other workers [Villarejo. 2014].

There is a less well-known factor which, in California, has contributed to the decline in employer provided housing: the state's farm labor market has undergone a dramatic shift in the employment relationship of hired workers to their jobs. Over the course of the past twenty-five years, labor contractors have become the main recruiter and employer of short-term and temporary crop workers. Correspondingly, most farmers no longer need to offer housing as an inducement to attract workers, which has been a major factor in the widespread tearing down of labor camps on the west side of the San Joaquin Valley [Forbes. 2007].

In the statewide CAWHS study, one-third (33%) of CAWHS dwellings were occupied by an unaccompanied worker without even one member of their nuclear family. In nearly all such instances, the other members of the participant's family were residing in Mexico or Central America. In 626 CAWHS dwellings (67%), the participant was accompanied by at least one family member. It was not unusual to find that a CAWHS participant was accompanied by his or her spouse, but that some or all of their children remained in Mexico.

Of CAWHS participants who were unaccompanied, 82% were male. Substantial differences were also found regarding the marital status of those who were unaccompanied as compared with those who were accompanied. Of married CAWHS participants, 82% were accompanied by at least one family member, while 66% of single CAWHS participants were unaccompanied.

## Informal dwellings

Several studies find California farm laborers residing in *informal* dwellings: unfinished garages, work sheds, barns, vehicles, and shacks not even recognized as structures by county property tax authorities. Many of these dwellings were never intended to be used for human habitation.

As reported previously, 10% of the dwellings that served as homes for hired farm workers in the statewide California CAWHS study were informal or irregular dwellings. The CAWHS staff was able to directly observe the extent to which some workers were residing in irregular, informal dwellings, such as sheds, unfinished garages, barns, or other types of *back houses*, often hidden behind a single family dwelling or duplex.

The CAWHS staff sought to independently determine whether each such dwelling was recognized by the local County Assessor as well as by the U.S. Postal Service as having a *situs* address. It is very likely that some irregular dwellings were neither enumerated nor contacted by the U.S. Census, and, therefore, were not represented in Census findings.

A recent study of 33 hard-to-count Census Tracts in major regions of agricultural production in California finds a 7.7% undercount of households when using methods employed by the decennial Census [Kissam. 2012; Kissam. 2011]. About half of the undercount was attributable to the prevalence of informal dwellings, most of which were occupied by hired farm workers.

The study found that “housing unit” does not coincide with “household” when multiple family/social units reside in the same dwelling. There were a considerable number of instances of informal clusters of dwellings on a single property (typically a main house and one or more “back houses”<sup>8</sup>). While this is a source of confusion for Census purposes, if not a likely source of enumeration error, the sharing of dwellings, both formal and informal, likely thought by Census enumerators to house a single family/social unit, was found to be widespread.

Of considerable importance, especially for the decennial Census that relies heavily on mail return response, the same study found a significant proportion of the dwellings enumerated by the research team did not have a postal address, either because the community lacked direct mail delivery (mail services exclusively to PO Boxes), or the dwelling itself was “low visibility,” i.e., an informal dwelling, possibly even a structure not intended for human habitation.

The survey found that 3.8% of the survey residences were back houses, camper shells, garages, or add-on rooms above garages. This figure did not include individual rooms in the main house that had been temporarily rented out to unrelated individuals, a widespread practice to provide temporary shelter for sojourners on a cash-only basis. For some homeowners, the additional income may help to meet mortgage payments.

A report from the prospective cohort MICASA project in Mendota, California, discussed research protocols to find hard-to-reach populations, such as hired farm workers [Stoecklin-Marois et al. 2011]. The authors report a multi-stage, cross-sectional survey of the community

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<sup>8</sup> The term “back houses” was used to describe some properties that had a main house as well as one or more additional dwellings, the “back houses,” that were used by farm laborers in Parlier, a community well-known to many Mexican immigrant and migrant workers [Sherman et al. 1997].

led to the finding that 9.4% of enumerated dwellings were *back houses* or informal dwellings that had possibly been missed by Census enumerators.

## Adverse health outcomes are associated with sub-standard farm labor housing conditions

Little is known about the health effects of housing conditions in which farm laborers reside. The research literature is sparse concerning careful measures of housing conditions and measures of health status from an accurately representative population of farm laborers. But among field studies of farm labor occupational safety and health hazards, one research report included measurement of labor camp drinking water in Colorado for coliform and nitrate contamination, concluding that two out of the five labor camps studied had unsafe drinking water [Vela-Acosta et al. 2002].

No one has ever conducted a statewide, cross-sectional survey of farm labor dwellings in California or any other state, and simultaneously measured housing conditions that pose a risk to resident health and simultaneously conducted comprehensive physical and psychological examinations of all participating residents. Until such a study is conducted, research will have to rely on regional or local community findings.

A comprehensive policy review that relied on the peer-reviewed academic literature, sponsored by California Rural Legal Assistance's Rural Justice Forum, described adverse health conditions associated with sub-standard housing for U.S. as well as California's hired farm workers<sup>9</sup> [Villarejo et al. 2009]. Two additional review articles from the academic literature that focus on housing challenges and associated risks to health facing California's hired farm workers have also been published [Villarejo. 2011; Villarejo & Schenker. 2007]. Therefore, with few exceptions, only the most recently published academic journal articles on associations between farm labor housing and health are discussed below.<sup>10</sup> Finally, the main CAWHS findings linking specific health outcomes to identified housing conditions are briefly reviewed as well.

There are two principal types of studies of farm worker health: exposure studies, and health status studies. Reports in the published academic literature are typically based on one or the other type of research [Villarejo et al. 2009].

Most studies of farm labor housing are dwelling exposure studies, focusing on measurements of dwelling conditions known to present health risks to residents. For example, determining whether the paint in the rooms of a dwelling is lead-based, or whether dust or other residues show evidence of well-known environmental contaminants, such as restricted pesticides or

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<sup>9</sup> This policy research report relied on peer-reviewed academic journal articles published prior to June 2008.

<sup>10</sup> Generally, peer-reviewed journal research reports published subsequently to July 2008.

cockroach feces, can provide quantitative evidence of exposure to health risks. Some exposure studies also collect biological specimens from residents to confirm that contaminants found in the dwelling have been absorbed into the residents' bodies. For example, urine samples may have biomarkers identifying specific types of pesticides.

A few research reports examine the built environment, such as resident access to retailers providing healthy food, or availability of recreational facilities in the neighborhood. Exposures such as these have been shown in research on the general U.S. population to be associated with health status.

Specific to California are research reports on air and water quality that affect large portions of important centers of agriculture production in the state where large numbers of hired farm workers, as well as farmers and many others, are known to reside. Fouled air in the San Joaquin Valley has been widely reported by governmental agencies and researchers to be the second worst in the nation, exceeded only by Southern California. Air pollution, on some occasions, has been bad enough to trigger health warnings for very young children and the elderly. During one late autumn, the Friday Night Lights game (aka High School Football) was cancelled owing to the elevated respiratory health risk associated with air pollution.<sup>11</sup>

Groundwater quality in both the Salinas Valley and the Tulare Lake Basin region of the San Joaquin Valley has been studied with the finding that nitrate levels may be above the level of acceptable risk in large areas of both regions [Dzurella et al. 2012]. Water from private wells in rural areas that are not part of a municipal system may present a higher risk [French et al. 2014].

Recently published research continues this trend of primary reliance on exposure studies to inform policy discourse about health risks to hired farm workers associated with their living conditions. The heat index in migrant farmworker labor camp dwellings in North Carolina was directly determined to be a health risk for workers seeking recovery from work-related heat stress [Quandt et al. 2013a]. Housing conditions, such as cooking and eating facilities as well as drinking water quality, frequency of violations of housing regulations, privacy, personal security and hygiene, all of which are believed to present risks to health, also in North Carolina migrant labor camps, were found to present in five additional reports [Quandt et al. 2013b; Bischoff et al. 2012; Arcury et al. 2012a; Arcury et al. 2012b; Vallejos QM et al. 2011]. A review of risk factors for pandemic influenza suggested that the effects of hired farm worker employment, social and economic factors put this population at high risk for contracting the disease [Steege et al. 2009].

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<sup>11</sup> Cf. "Valley smog blows the whistle on games," *Fresno Bee*, September 14, 2002.

# Hired crop worker housing: measures of health-related housing quality

## Crowded dwellings

At a meeting of the 2013 task force on farm labor housing and transportation in California, Sergio Sanchez, with the California Strawberry Commission, described his visits with workers in East Salinas, a low-income, mostly Hispanic neighborhood where many hired farm workers live.<sup>12</sup> He visited a number of homes where the rooms had lines of mattresses leaning against the walls. This arrangement of mattresses during daylight hours was necessary because it wouldn't be possible to walk through the rooms without stepping on someone's mattress in their sleeping space on the floor. He described sanitation problems as "devastating" in these conditions of extremely crowded housing.

Numerous studies of farm labor housing report crowded, or extremely crowded conditions [Holden. 2001; Early et al. 2006; Gentry et al. 2007; Villarejo. 2011]. The national convenience sample of purposefully selected crop worker housing finds crowding was prevalent: a majority of the units surveyed were crowded [Holden et al. 2001].

The recent study of farm labor housing in Napa County asked workers who were surveyed about the physical condition of housing [Bay Area Economics. 2013]. Three-fourths of participants responded to a query concerning problems with the current housing: the largest number of complaints was crowded conditions, followed by "cold and/or drafty; not enough heat" and "missing or torn window screen".

The California Agricultural Worker Health Survey (CAWHS) [Villarejo. 2011], a population-based survey of hired farm workers, was a multi-stage household sample, and included detailed queries about housing arrangements. CAWHS participants were asked to report the number of persons who sleep in the dwelling as well as the number of rooms in the dwelling. The highest number of persons residing in a single dwelling was 17, found in a five-room structure. Six or more persons were found to be resident in each of 227 dwellings, or one-fourth of the total number of dwellings in the survey. At the other size extreme, just 56 of the total of the 3,842 persons enumerated lived alone. Overall, the reported average number of residents per dwelling was 4.33.

CAWHS project field staff repeatedly presented anecdotal evidence of "crowding" which they observed in dwellings occupied by CAWHS participants. "Crowding" is described in the literature as corresponding to an average occupancy of 1.01 or more persons per room [Myers

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<sup>12</sup> Presentation by Sergio Sanchez on May 8, 2013, at the forum on farm worker housing and transportation, sponsored by AgInnovations, California Department of Food and Agriculture, Sacramento.

et al. 1996]. By this measure, 48% of all CAWHS dwellings were “crowded,” and 25% of CAWHS dwellings were “extremely crowded” (1.51 or more persons per room).

Almost half (42%) of CAWHS dwellings were shared by two or more unrelated households. This figure varied greatly from site to site. In Vista, the community where the proportion of dwellings with families “doubling-up” was largest, this figure was a striking 87%. Shared dwellings could not be simply characterized. It was found that sharing arrangements in some instances involved groups of unaccompanied men while in other cases it was two or more families, in which spouses and children were present. It was also found that a “primary” renter would sometimes sub-lease a room, or a bed, to help meet the rental cost, which partly accounts for the large proportion of shared CAWHS dwellings.

Researchers from North Carolina also found substandard conditions to be common in migrant housing, noting that noise and overcrowding have been linked with depression and anxiety [Vallejos et al. 2011]. During studies conducted in 2007 and 2008, researchers collected data via interviewer-administered questionnaires to farmworkers living in randomly selected farm labor camps. Residents from 168 camps were interviewed. One moderately substandard condition, an arbitrary measure based on the number of housing deficiencies, was the lack of adequate facilities for the number of people living within the camp, an indicator of overcrowding. [Vallejos et al. 2011] This study concluded that 78% of camps had one or more residents who felt their living conditions were overcrowded and that between 26% and 31% of the camps had less than the minimum square footage per person in a sleeping room. This study also noted the importance of having access to enough washing machines: pesticide residues may be prevalent on farmworker clothing and many farmworkers have only a limited amount of clothing owing to their poverty status. The data showed that between 4% and 28% of the camps were in violation of the North Carolina health and safety standard that requires one washtub or washing machine for every 30 residents. [Vallejos et al. 2011].

A study that included a large convenience sample of farm labor housing units in Washington State did not directly determine the number of persons per room used for sleeping [Washington State Farmworker Housing Trust. 2008]. However, the authors estimate 32% of workers in the survey resided in a crowded dwelling.

The MICASA prospective cohort study in Mendota, California, found an association between the 22% prevalence of *nervios* (a culturally defined condition of extreme agitation) with some aspects of substandard housing conditions, although crowding was not among the variables studied in the analysis [O’Connor et al. 2013].

## Structural deficiencies

The few studies that have examined the physical condition of farm labor housing find structural deficiencies to be prevalent in a great many dwellings [Holden. 2001; Early et al. 2006; Gentry et al. 2007; Arcury et al. 2012a]. These include holes in exterior walls, broken plumbing, broken screens, leaky roofs, non-functional air conditioning or heating systems, unsafe drinking water and other conditions. In one large study of North Carolina labor camps, 74% of dwellings had structural damage [Arcury et al. 2012a].

Overall, respondents reported that 4.4% of dwellings in the CAWHS sample lacked plumbing and 3.8% lacked food preparation facilities. Some 20% were entirely without telephone service. The absence of plumbing or kitchen facilities was associated with the type of dwelling. Just 1% of permanent structures lacked such facilities, but 17% of informal or labor camp structures did not have either or both of these facilities. All of the vehicles that served as dwellings lacked both plumbing and kitchen facilities (100%).

Housing conditions and sleep quality in North Carolina migrant farmworker labor camps were studied: negative sleep quality was associated with poor housing conditions [Sandberg et al. 2012]. Use of personal protective equipment and appropriate pesticide safety practices were negatively associated with workplace and housing conditions in male workers residing in North Carolina migrant labor camps [Leveresque et al. 2010].

Some 35% of hired crop workers interviewed in Washington State reported housing problems: 27% reported peeling, cracking or chipped paint; 17% had heating problems or lacked heat; 17% had plumbing problems; 16% had electrical problems; 15% had holes in the floor or walls; 13% reported drafts through holes or windows; 12% had leaking ceilings; 4% lacked plumbing and/or a toilet [Washington State Farmworker Housing Trust. 2008].

## Pest infestations

Among sub-standard housing conditions, one that is most likely associated with adverse health outcomes is pest infestations. Those studies that actually looked for evidence of pest infestations in farm labor housing found numerous instances of such conditions [Bradman et al. 2005; Bradman et al. 2007; Sandberg et al. 2012]. Rodents and cockroaches were the most prevalent pest encountered by residents.

## Exposure to agricultural chemicals

Substantial research has sought to determine the extent of household exposure to restricted-use pesticides, such as organophosphates, in farmworker housing in several agricultural regions of the U.S. It had been speculated that when such materials are applied to nearby fields,

residues transported to the home, in workers' clothing, for example, present a risk to vulnerable populations, including pregnant women and young children.

A recent, population-based, case-control study finds an association between neurodevelopment disorders and prenatal proximity to agricultural pesticide use in California [Shelton et al. 2014]. Out of 970 participants, one-third of mothers lived, during pregnancy, within 1.5 km of an agricultural pesticide application. Associations were found between autism spectrum disorder (ASD) and nearby applications of organophosphates and, separately, chlorpyrifos. Pyrethroid applications were associated with both ASD and developmental delay.

The CHAMACOS<sup>13</sup> prospective cohort study of women and children in the Salinas Valley of California examined metabolites of organophosphate pesticides found in urine samples from mothers twice during pregnancy and from their children five times during childhood, and then sought to determine if there were any relationships with mothers' reports of their child's respiratory symptoms at ages 5 and 7 [Raananet et al. 2014]. It was found that early-life exposure to OP pesticides was associated with respiratory symptoms consistent with possible asthma in childhood.

In the same cohort study, residues of manganese (Mn) found in dust sample of homes were associated with nearby applications of the fungicides maneb and mancozeb, both of which have large components of Mn by weight [Gunier et al. 2013]. Mn dust concentrations increased with the number of farmworkers in the home and with the amount of agricultural Mn fungicides applied within three kilometers of the residence during the month prior to sample collection.

A comparative study of azinphosmethyl take home pathways among pesticide handlers, green fruit thinning workers, and organic orchard workers in two Washington State tree fruit orchards found a wide range of residue concentrations in commuter vehicles and worker homes [Fenske et al. 2013]. The levels of residue concentration were greater in commuter vehicle dust than in house dust, and levels on house dust from handlers' homes higher than levels from fruit tree thinners' homes. Vehicle and house dust residue concentrations were highly associated. A safety questionnaire administered to all participants found significant differences across worker groups for availability of laundry facilities, work boot storage, frequency of hand washing, commuter vehicle use, parking location, and safety training. The authors concluded that additional intervention activity is recommended with a focus on potential sources of contamination, such as work sites and commuter vehicles used to travel to the workplace.

Additional research on possible associations between inferred pesticide exposure on population health has found a negative health effect on farmworker women's birth outcomes in agricultural areas where methyl bromide was applied within 5 km (~ 2 miles) of their place of

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<sup>13</sup> CHAMACOS is an acronym for Center for the Health Assessment of Mothers and Children of Salinas.

residence [Gemelli et al. 2013]. Negative associations with fetal growth parameters were stronger when large (5 km and 8 km) versus smaller (1 km and 3 km) buffer zones were used to estimate exposure.

Another study found no consistent association between children's or prenatal women's exposure to organophosphate residues in their homes and autonomic development of their children under the age of 5 [Quiros-Alcala et al. 2011]. A study of in-utero exposure to DDE or DDT among pregnant women found no association with obesity among their children at age 7 [Warner et al. 2013]. Similarly, no statistically significant decrease of average IQ of 7-year-olds was found in the same cohort of children who had been exposed in-utero to organophosphate pesticides found in their mothers [Bouchard MF et al. 2011].

The possible confounding of agricultural pesticide exposure measurements with similar residues from non-agricultural pesticides, such as home pest control products, has also been studied. Residue samples of six different restricted-use pesticides taken from urban Oakland homes were compared with samples from farmworker households in Salinas. Except for chlordane-dimethyl, no differences were found in the concentration of the pesticides between urban or farmworker dwellings, but chlorpyrifos concentration was lower in all sites following its ban for residential use [Quiros-Alcala et al. 2011]. It is likely that household chemicals, such as pest control sprays, are more important sources of pesticide contamination in homes than are secondary exposures to five of the six pesticides that were applied in distant crop fields.

An earlier study found associations between some diagnosed autism spectral disorders and maternal proximity to nearby agricultural pesticide applications in the San Joaquin Valley of California [Roberts et al. 2007]. But subsequent published comments pointed out several limitations of the finding. First, there were just 8 cases of ASD and 105 control cases, suggesting the association may be of limited statistical significance [McGovern. 2007]. A second published comment pointed out that, of the ASD cases, most were among non-Hispanic White or non-Hispanic African-American women, who were more likely to be of low-income families, socio-economic groups with an excess of cases of marginal iodine nutrition, which has been independently shown to be a risk factor for ASD [Sullivan. 2008].

There are numerous reports in the literature in which farm workers' exposure to agricultural chemicals are discussed. Most such studies find evidence of pesticides in or about the home, often in rugs or furnishings, and often attributable to contaminated work clothing being brought home. In a series of studies, researchers in the Salinas Valley of California measured exposures to pesticides in the homes of pregnant women and also determined the concentration of specific metabolites of organophosphates in the urine of both the women and their children, chemicals that were widely used then in agricultural production [Bradman et al. 2005; Bradman et al, 2007].

An exposure monitoring study of children resulting from drift contamination near aerial spray applications found that children's exposures occurred primarily outdoors, not within their homes [Weppner et al. 2006]. Earlier studies in Washington State had found evidence of pesticide contamination of homes located near farm land that had been treated with agricultural chemicals [Lu et al. 2000]. As an elaboration of this research, the Salinas Valley investigators collaborated with colleagues in Washington State who had also been studying associations between exposures to organophosphates and children's health for the purpose of assessing "lessons learned" to guide future research [Fenske et al. 2005]. Finally, the Washington State research group compared metabolites of organophosphorus pesticides contained in urine samples collected from children of pesticide applicators and children of farmworkers with similar samples from children of urban Seattle area [Fenske et al. 2005]. The researchers found similar evidence of exposures in all three groups, but children of pesticide applicators had substantially higher metabolite levels than did Seattle children and farmworker children. The report concludes that workers who have direct contact with pesticides, such as mixers, loaders and applicators, should be the focus of public health interventions.

## Other health outcomes associated with housing conditions

Housing conditions and sleep quality in North Carolina migrant farmworker labor camps were studied: negative sleep quality was associated with poor housing conditions [Sandberg et al. 2012]. Use of personal protective equipment and appropriate pesticide safety practices were negatively associated with workplace and housing conditions in male workers residing in North Carolina migrant labor camps [Leveresque et al. 2010].

Research undertaken to determine the effectiveness of community-based interventions to reduce farmworker children's exposure to household organophosphate pesticide exposure yielded a negative result in the Yakima Valley of Washington State [Thompson et al. 2008]. There was no significant change in objective measures of children's exposure despite substantial community-based educational intervention.

The largest such current research project of this type is the MICASA<sup>14</sup> study in Mendota, California, in which a sample of hired farm workers (N~750) have been recruited to be participants in a long-term cohort study of population health [Stoecklin-Marios et al. 2011]. Among findings to date are a substantially high prevalence of muscle-skeletal disorders [Xiao et al. 2013], of the ethno-specific health condition *nervios* among male workers [O'Connor et al. 2013], and of various types of occupational and non-occupational injuries [McCurdy et al. 2013]. Also, it was found that knowledge of measures to protect against heat-related illness

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<sup>14</sup> MICASA is an acronym for Mexican Immigration to California: Agricultural Safety and Acculturation.

was lower than should have been the case, given the widespread educational and workplace training the workers had experienced [Stoecklin-Marios et al. 2013].

Recently, a community-based collaboration with academic and other researchers released the findings of a study of population health and local environmental risks in the agricultural East Coachella Valley of Riverside County, including neighboring toxic waste disposal sites [London J et al. 2013]. Another of this project's research findings was a report on asthma prevalence and vital statistics [Villarejo et al. 2012]. This latter report finds a lower prevalence of adverse birth outcomes and of asthma ER cases than in statewide data.

The CAWHS made it possible to identify associations between some specific dwelling conditions and particular health outcomes. Among the substandard housing conditions reported by participants in the CAWHS, notable ones were the lack of complete plumbing, the absence of complete food preparation and refrigeration facilities, informal dwellings, crowded conditions, and sharing a dwelling with only unrelated persons. Among male CAWHS participants residing in dwellings without complete plumbing or food preparation facilities, persistent diarrhea (lasting more than three consecutive days), was seven times more likely to be reported than among workers residing in dwellings with full facilities (Odds Ratio = 7.2; 95 percent Confidence Interval 3.0 – 17.0;  $p < 0.001$ ). Female participants who resided in an informal dwelling were five and one-half times more likely to report persistent diarrhea than those who lived in a single family house or apartment (Odds Ratio = 5.5; 95 percent Confidence Interval 1.5 – 19.8;  $p < 0.01$ ).

Male participants who live in an informal dwelling were two and one-half times more likely to experience *nervios* (feeling extremely anxious or agitated) as compared with workers residing in a single family house or apartment (Odds Ratio = 2.5; 95 percent Confidence Interval 1.5 – 4.4;  $p < 0.01$ ). Some living arrangements were associated with unhealthful behaviors. Male participants who were unaccompanied by any family member and resided with only unrelated persons were two and one-half times more likely to engage in binge drinking (five or more drinks in a single episode) than accompanied workers (Odds Ratio = 2.6; 95 percent Confidence Interval 1.4 – 4.8;  $p < 0.01$ ).

Unaccompanied males were more likely than married males who were accompanied by family members to engage in risky sexual behaviors. Overall, among CAWHS participants, of 387 males and 194 females tested for active syphilis, four males and one female tested RPR- and TPPA-positive [Brammeier et al. 2008]. Of 192 males and 194 females tested for CT, three males and no females tested positive. No cases of GC were found.

The same study summarized a number of self-reported sexual risk behaviors:

- most participants did not report any methods to protect against STDs;

- 12% of males and 5% of females reported ever having an STD diagnosis;
- 29% of males and 10% of females reported having sexual relations with two or more partners within the past 5 years;
- 42% of males reported ever having sexual relations with a commercial sex worker;
- unmarried males were more likely than married males to have had sexual relations with a commercial sex worker in the past 2 years.

## Additional studies of farm worker housing and health

### Hired crop worker housing – a national convenience sample

A national convenience-sample survey reports useful information about the condition of purposefully selected housing units occupied by hired crop farm workers during the period December 1997 through June 2000 [Holden et al. 2001]. Some 42% of the units were single family dwellings while 21% were apartments. Employers owned 25% of all units, and half of these were provided free of charge to their employees. Specific findings about the physical conditions of housing from this survey are discussed in a later section of the present report.

### Hired crop worker housing – state and local convenience samples

The most recent county-wide survey of farm labor housing in California was conducted in Napa County in 2012 [Bay Area Economics. 2013]. This study relied on interviews obtained from a convenience sample of workers.

The findings in the BAE report are generally in qualitative agreement with prior studies of farm labor housing in Napa County. The relative absence of affordable housing, overcrowded living conditions, and separation of family members owing to the lack of family housing are circumstances found throughout the state.

About 31% of survey participants lived in the county's Farmworker Housing Centers, 37% resided in their permanent home in Napa County, 19% lived in temporary housing while working in Napa County, 10% reported commuting to a Napa County farm job from a permanent home outside of the county, and 3% did not provide sufficient information to determine where they lived. Most survey participants lived in apartments (34%) or Farmworker Housing Centers (31%); 14% lived in mobile homes or trailers, 12% lived in single family homes, and 9% lived in bunk houses or dormitories.

However, there are some significant problems with the specific findings of the BAE research, most of which are associated with the survey methodology. It is evident that the convenience sample of 350 farm workers was not likely representative of the county's actual farm labor population. This follows from the fact that 31% of the convenience sample resided in the Farmworker Housing Centers that have fewer than 5% of the beds occupied by the county's hired farm workers.<sup>15</sup> Thus, the BAE sample from the Farmworker Housing Centers likely included at least six times as many participants than would likely have been the case in a random sample of the worker population. The authors of the BAE report made no apparent effort to weight the survey findings to take account of oversampling of the Farmworker Housing Center residents.

Finally, the BAE report authors failed to ask survey respondents about their type of employer (grower, vineyard management company, farm labor contractor) and, where appropriate, about the location of their temporary housing, i.e., within Napa County or in another county. The authors dismiss any responsibility of the County to even consider the housing needs of those who are employed by labor contractors. The BAE report argues that since most such workers are transported into the county on a daily basis by their employer, they obviously must reside out-of-county, relieving the County of responsibility for their housing needs and making it solely the responsibility of the labor contractor. But the lack of suitable affordable housing for Napa County farm workers is the single largest factor in explaining why they must be transported into Napa County for their jobs in the first place.

The recent study of farm worker housing in Napa County, California, summarized their observations as follows [Bay Area Economics. 2013].

“With the exception of vineyard supervisors, most farmworker households qualify as ‘very low’ or ‘extremely low’ income households relative to Napa County’s area median income. The County has a limited supply of market-rate housing that is affordable at such income levels, which leaves many farmworkers with few options other than shouldering an excessive housing cost burden, living in overcrowded accommodations in order to share rent, or commuting in from lodging located outside of the county.”

The BAE report also ignored a crucial fact of budgeting by foreign-born farm workers: remittances to their home country to support their family members. The overwhelming

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<sup>15</sup> Figure 5 of the BAE report (cf. p. 31) indicates that occupancy in the Farmworker Centers fluctuates on a seasonal basis; the 12-month average is about 60%. Even if each bed were successively occupied by three different persons during successive seasons of the year, there would be just  $0.6 \times 3 \times 180 = 324$  persons per year. Peak season employment is about 6,500; the fraction of county farm laborers residing in the Farmworker Centers is about 4.98%.

majority of California's farm laborers came to this country to work and provide for their family members, many of whom remain in the sending country.

A survey of crop farm workers focused exclusively on the Coachella Valley, an important agricultural region of Riverside County far inland from the California coast. The convenience sample of 525 hired farm workers conducted during the 2006 harvest season found that 40% said they lived in mobile homes, 24% lived in a house, 17% lived in an apartment, 5% lived in a car, and 3% lived "outdoors" [Colletti et al. 2007]. The study also reported that 2% of workers said they lived in quarters not intended for human habitation; among migrant farm workers in the area, some 30% said they lived in such quarters.

California's farm employers report sharply curtailed on-farm housing: only 3.6% of farm employers participating in the 2012 annual survey of wages and benefits indicated they provided housing for seasonal employees; the 1986 survey of farm employers, the first to separately report benefits for seasonal and year-round employees, found 20.6% of employers said they provided housing for seasonal workers [Farm Employers Labor Service. 2012 and 1986]. The proportion of employers who provided housing for permanent, year-round workers was greater in both reports, but also showed a decline over this time frame.

A large-scale, convenience sample survey among 2,856 hired crop workers in Washington State during the 2006 growing season reveals useful information about the condition of the purposefully selected housing units [Washington State Farmworker Housing Trust. 2008]. Some 79% of hired crop workers interviewed were settled, living year-round with family members. Just 11% were homeowners; 50% rented a house, apartment or mobile home; 19% lived in a labor camp; 8% lived in an RV or trailer; 6% rented a bed, cot, or bunk; and 6% lacked permanent shelter. Overall, 17% lived in housing provided by their employer; 14% lived on-farm in this type of housing. Specific findings about housing conditions found in this survey are discussed further in a later section of the present report.

Some 35% of crop farm workers interviewed in the state of Washington said that they had difficulty finding suitable rental housing [Washington State Farmworker Housing Trust. 2008]. Of these, 45% said there was no housing available, while 44% said they lacked sufficient funds to pay the up-front costs, such as a deposit and first-and-last monthly rent.

A convenience sample among 931 crop farm workers in Southwest Florida centered in the Immokalee area sought to estimate total number of harvest-time migrant workers, and compared that finding to the number of permitted farm labor camps in the area [Roka & Emerson. 2002]. The vast majority of workers were unaccompanied Mexican men who shared living quarters, typically six to a dwelling unit. Just 10% of workers interviewed lived with their families or other relatives. The study estimated 31,000 farm laborers were employed in the

region, but there were only slightly less than 13,000 beds in permitted housing available to house the much larger workforce.

A regional study based on a convenience sample of 513 vineyard and winery workers in the North Willamette Valley included a query about housing [Lopez-Cervillos et al. 2012]. It was determined that 67% of workers interviewed shared their dwelling with unrelated persons.

## Housing conditions and health in the general population

The literature on housing conditions and health in the general population is quite extensive and includes a considerable number of reports addressing associations between sub-standard housing conditions and health status. A special issue of the *American Journal of Public Health* included a comprehensive review article on the health of populations residing near environmental hazards [Brender et al. 2011]. Adverse health outcomes linked to specific environmental hazards were: adverse birth outcomes, childhood cancer, cardiovascular disease, respiratory illness, end-stage renal disease and obesity.

Most studies of sub-standard housing and health concern populations markedly different from hired farm workers. It is problematic to extrapolate the findings, particularly from inner-city neighborhoods of Eastern U.S. metropolitan regions to California's agricultural valleys.

A cohort study of urban, low-income, young children, at 1-year, 3-year and 5-year intervals following birth found that homelessness and doubled-up family episodes were associated with poor health status, impaired cognitive development and increased use of health care services [Park et al. 2011]. A study of New York City residents whose dwellings had been contaminated with the pesticide chlorpyrifos many years earlier found that children had significantly lower scores of both psychomotor and mental development, and the disparity increased with each successive standard deviation of greater neighborhood poverty [Lovasi et al. 2011]. Both neighborhood poverty status and chlorpyrifos were independently associated with adverse neurodevelopment.

A recent, large-scale study of the sale and rental of housing in American cities found a significant prevalence of discrimination against several racial/ethnic minority groups [U.S. HUD. 2012]. Some 8,000 individuals were recruited from 28 American metropolitan areas and pairs of them were asked by researchers to separately seek home purchases or rentals in their communities. As compared with non-Hispanic White participants, in home sale offerings, the study found systematic, nationwide, discriminatory practices against African-American, Hispanic, and Asian-American participants. Discrimination in rental housing against African-American and Asian-American participants was also found, but not found against Hispanic participants.

## Discussion

The long history of farm labor in the U.S. is intimately associated with the provision of housing for workers, whether for indentured servants, enslaved persons, sharecroppers, or hired farm hands. During the late 19<sup>th</sup> and most of the 20<sup>th</sup> century, proximity to the job and the vastness of America's rural geography encouraged many farmers and ranchers to offer on-farm living quarters to their hired laborers.

The housing available to hired farm workers varies greatly across our nation's many diverse farm regions. Labor camp housing for migrant and seasonal workers still predominates in regions where crop production is concentrated within only a relatively small portion of the year. In other regions, especially in those where year-round production has greatly expanded, most workers are settled.

Immigration patterns have affected housing options. During the post-IRCA surge of migration from Mexico and Central America, some employers realized that labor camp housing was no longer essential to attract workers. When the proportion of undocumented workers increased, farm operators, especially those in California and Arizona, turned to labor contractors to fill their labor needs. Enforcement of regulations intended to protect residents from risks to their health or safety, or to prevent housing developments on agricultural land, may have resulted in loss of a current or potential labor camp dwelling. An important outcome of these factors was the razing of thousands of farm labor camps, forcing workers to rely on market housing.

One of the most significant demographic developments of the past four decades has been the Mexicanization, and Latinization, of much of the nation, especially in agricultural regions. A consequence of this is the concentration of new immigrants, and their offspring, in cities. Spanish is now widely spoken in cities where it was once rare. Shops and stores in these cities now cater to this recently arrived population.

An important result of this settlement pattern is that many new migrants find it attractive to find a way to live in these cities; some established residents will rent a room, or a space on the floor, to the new arrivals. Other enterprising individuals may even rent an entire single family home to several families to share, thereby spreading the cost among a larger number of wage earners.

There is also evidence that the Great Recession's impact on housing has been to force many low income persons out of their homes, whether losing their home to foreclosure, or inability to pay the rent when jobs were lost. Doubling or tripling up of dwellings by families has again become a way to survive.

As more and more farm laborers find ways to become settled residents of the U.S., whether authorized by immigration policy or not, cities will be the magnets that exert a “pull” on where they will settle. Some, but not all, farm laborers will follow their urban cousins.

In this context, the “pull” factor of finding places to live in cities becomes the antidote to the “push” associated with the loss of labor camp housing. This is most pronounced in California where tens of thousands of farm laborers now live in swaths of cities of the major agricultural counties. But it is likely that more and more centers of production of specialty crops – fruits, vegetables, ornamentals – and tobacco, will soon follow a similar trajectory.

It really doesn’t matter whether growers find they don’t need to provide housing to attract workers, or whether stricter regulation of housing standards lead some employers to close their labor camps to avoid the cost of compliance. Either way, many farm laborers will need to find their way to cities to find housing.

Overlaying these trends is the greatly increased proportion of hired farm workers who come from Mexican and Central American villages where indigenous languages are spoken. Thus, the U.S. hired farm labor workforce is a multi-ethnic mix: non-Hispanic White, mostly citizens; Mexican Mestizo Hispanic, citizen, or permanent legal resident, or undocumented; Indigenous, citizen, or legal resident, or undocumented; Central American Hispanic, citizen, or legal resident, or undocumented; Caribbean, citizen, or legal resident, or undocumented; African-American, citizen, or legal resident; plus very small numbers from South America or Asia.

An outstanding question will be whether the requirement that farm employers provide housing for contract agricultural guest workers under the H-2A program survives changes to immigration law. Growers want to eliminate that requirement.

## Farm laborers are a vulnerable population

Underlying this entire discussion is the self-evident fact that U.S. hired farm workers are a vulnerable population [Villarejo. 2012]. Hired farm workers have a five-fold higher occupational fatality rate than among all industries combined; have the lowest rate of medical insurance (25%) of any major occupational category; are excluded by Federal law, along with domestic workers, from many labor standards that protect workers in all other industries; and have low socio-economic status by reason of race/ethnicity, low annual income, and, oftentimes, marginal immigration status.

Recent scholarship has amplified understanding of the vulnerability of farm workers to incorporate the notion of “structural vulnerability,” by which social stratification and racism together relegate some to the status of a permanent underclass [Holmes. 2011; Quesada et al. 2011]. At the very bottom of this hierarchy are migrants to the U.S. who come from villages

where indigenous languages are spoken. A recent book frames this concept within the experience of a cohort of Triqui migrant workers over a three-year period following farm jobs in the Pacific Coast region [Holmes. 2013]. Throughout these reports, the very worst farm labor housing conditions were found in the dwellings where indigenous migrants were living.

A corollary of this concept is the potential for antagonism between different ethnic groups for jobs and work assignments [Duke. 2011]. This antagonism between workers can be expressed in terms of race, citizenship, physical stature (often linked to ethnicity), and perceptions of moral and physical hygiene. Such tensions hinder the ability of all hired workers to collectively seek redress from abusive work environments and detrimental living conditions.

An example of the hierarchical patterns of employment and living conditions was recently reported in a comparison of non-indigenous and indigenous farm laborers in Oregon [Farquhar et al. 2008]. Statistically significant differences were noted-- to the disadvantage of indigenous farm laborers-- in types of jobs, annual duration of Oregon farm employment, access to health clinics, and the number of persons per dwelling.

A relatively under-studied health issue is the greater vulnerability of workers who live in housing provided by their employer. Farm labor camps owned and operated by employers have become less prevalent, but more than a few remain in operation. The cohort study of workers employed on a berry farm in Washington State reported how a worker failed to meet the picking quota volume for the day, and was immediately fired and then evicted from his labor camp home on the owner's farm [Holmes. 2013].

The vulnerability associated with residing in an employer-owned migrant labor camp may have significant mental health consequences. An 18-month-long anthropological field investigation of workers living in farm labor camps described this internalization as "structural violence" felt by some who are socially isolated, viewed by the mainstream society as marginalized persons, who are poorly paid, and who live in sub-standard conditions [Benson. 2008].

## Housing costs in California – a special concern

Despite the plunge in home values triggered by the on-going financial crisis, housing costs in California are high in comparison to the rest of the country. This results in an irreconcilable problem facing low-wage workers and their families in the state. The working poor cannot afford to pay market rents, let alone meet the conventional financial standards required to qualify for home purchase.

There is a second aspect to the issue of affordability. As demonstrated in the Napa and Mendocino farm labor housing studies, a majority of workers come to the U.S. to work and send money home to support their family members who remain in Mexico or Central America. Typically, at least 15% of annual earnings are earmarked for this purpose. The consequences of

this multi-faceted conflict lead to the doubling-up, or tripling-up, of farm worker families in rental housing, or the discovery that 19 people are sharing a four-room dwelling.

Some workers seek to resolve this conflict by commuting on a daily basis from communities with more affordable housing costs, even if it requires as long as a two-hour commute each way. Thus, many workers may have jobs in a given county but to get to work they must commute, often in a *raitero* van or bus, for which \$5 to \$10 is the daily fee. Efforts to enumerate farm workers as “belonging” to a specific county for purposes of allocating resources to provide services may be confounded by this reality.

Despite the fact that farm labor housing is so diverse, this review demonstrates that housing occupied by farmworkers includes both rural and urban residences, much of it crowded and in poor repair. The literature demonstrates there are additional exposures to health risks in many farm labor dwellings including: physical isolation, proximity to toxic waste disposal sites, fouled drinking water supplies, poor air quality, structural defects, electrical wiring that fails to meet code requirements, rodent infestation, cockroach infestation, failure to meet minimal sanitation standards, presence of mold and mildew, and pesticide contamination. Some workers have been found living in circumstances not intended for human habitation, such as animal stables, unfinished garages, abandoned vehicles, crude shacks, and “under the trees”.

The literature is sparse on findings regarding exposures that may impact the mental health status of residents. There are considerable challenges in assessing mental health status, including that of applying social norms of the predominate culture to a population that includes a majority who were born and raised in foreign countries in communities with very different social norms.

Although the research literature establishes the exposures described above, very little research has actually linked farm worker housing conditions to the objectively measured health status of the occupants. The scientific challenges facing researchers was well-described in a review of scholarship of agricultural worker health and safety [NRC/NAS. 2008]. This report describes the problem as follows:

“The central importance of housing conditions for health status has been well understood for more than a century...The issue is complex: socioeconomic status, housing conditions, risky behavior, workplace exposure, and immigrant worker acculturation may all be linked in unknown ways to observed health outcomes. The challenge to public health investigators to untangle these factors is daunting...”

There are three on-going studies of the health of families, including hired farm workers, in agricultural regions of California in which housing circumstances likely plays an influential role in health outcomes. All of these are linked to California Rural Legal Assistance through its on-going collaboration with the researchers. These are the CHAMACOS study of residents of Salinas, the MICASA study in Mendota, and the Eastern Coachella Valley health survey. Of

considerable importance is the additional participation of Arcury's research group in North Carolina.

The CHAMACOS cohort of women and children seeks to examine whether adverse health outcomes are linked to exposures of toxic chemicals in the home or nearby environment. The initial group included pregnant women.

The MICASA cohort of hired farm workers and resident family members seeks to measure population health and determine possible links between adverse health outcomes and occupational and environmental risk exposures. The cohort is limited to settled families.

The California Institute for Rural Studies has joined with the Eastern Coachella Valley Building Healthy Communities partnership to identify the health concerns of residents of four low-income communities in which large numbers of hired farm workers reside (Coachella, Mecca, North Shore and Thermal). The project has trained community partners, and provides oversight, to conduct a cross-sectional health survey among more than one-thousand residents to determine the prevalence of the health conditions of greatest concern. In addition to the health survey, researchers are completing environmental assessments within the randomly selected residences. These are both observational and environmental samples.

Discussions of farm labor housing and health should proceed from knowledge of where workers live and the condition of their housing. While there is reasonably comprehensive knowledge for North Carolina and California, information of comparable quality is sorely lacking for the nation as a whole.

A basic challenge to researchers is that of developing a nationwide needs assessment based on simultaneous determination of living conditions and health status. In the next section of this review, it is suggested that this could be accomplished.

Finally, nearly all research on farm labor health has been focused on crop workers. Yet, fully one-third of all direct-hire farm labor expense reportedly paid by U.S. farm operators in 2012 was for livestock worker employment. The largest segment of hired labor on livestock farms is among dairy farm operations, typically these workers reside on-farm.

Future studies of living conditions among hired farm workers necessarily must include livestock workers and their family members. Although quite limited in scope, recent research indicates 40% of hired dairy workers are foreign-born, nearly all of Mexican origin. In this aspect, it appears that hired dairy workers are likely to have demographic characteristics that are similar to those of foreign-born crop laborers.

From the perspective of future research on the adverse health consequences of sub-standard farm labor housing, here is what is required:

- Include measures of resident socioeconomic status in future research on housing;
- Research on farm labor housing must include the larger cities of California's major agricultural valleys;
- A cross-sectional survey of the actual condition of housing occupied by current farm laborers is essential – we simply don't have any reliable data on dwellings where workers live;
- A cohort study of families who move from sub-standard housing to better living conditions.

## Recommendations

**Recommendation 1. Improve existing and develop new affordable and decent housing** for specialty crop farmworkers and their families by establishing new, dedicated state funding sources, and by reducing costs and barriers to such improvement. This is the primary recommendation developed by a year-long convening of California's farm labor housing and transportation stakeholders [Ag Innovations Network. 2014]. There are several types of government subsidized housing dedicated to use by farm laborers. The U.S. Department of Agriculture 514/516 Farm Labor Housing Program of direct grants and low interest loans supported 721 active projects with 16,803 units as of September 2010, mostly located "off-farm" [U.S. GAO, 2011]. However, eligible residents must be U.S. citizens, or non-citizens with permanent resident status, as well earning a substantial portion of their income through the primary production of agricultural or aquacultural commodities.

Since most farmworkers have low annual earned income, creating new safe and affordable housing is unlikely to be met by private developers who rely on market rate returns on their investment. The positive impact of two new, subsidized farmworker housing projects on workers and the larger community in Woodburn, Oregon, has been described [Nelson. 2008]. Those projects helped provided a group of profoundly marginalized workers with a sense of belonging to the community where they work and live.

A California state bond issue more than a decade ago providing funding for farm labor housing in the state, as did a similar allocation of resources in Washington State. But those resources were quickly depleted. There are a series of questions about priorities for new resources: would non-farm laborers who are employed in food processing be considered "farmworkers" in obtaining access to housing; would unaccompanied workers be eligible for rental housing; would undocumented workers be eligible for rental housing? Among other concerns is whether government subsidized housing projects designated for farmworkers remain occupied if those

workers move to non-farmworker jobs, and whether a future sale would enable the original occupant to capture the amount of the subsidy.

**Recommendation 2. Advocates and policy-makers should oppose proposals by farm employers who seek non-immigrant temporary guest workers under the H-2A to substitute housing vouchers** instead of the current requirement to provide living quarters. At present, the H-2A program requires farm employers to provide decent and safe living quarters that is subject to inspection by the Wage and Hour Division of the U.S. Department of Labor. The pre-occupancy inspection is part of the certification process that is necessary for approval of applications to obtain workers under the H-2A program. Additionally, an inspection later, following occupancy, is also required. Many farm employers would prefer to employ workers under the program, but regard the housing requirement as expensive and burdensome.

During FY 2014, applications for 136,822 job placements were submitted by farm employers, but not all of these jobs were filled [USCIS. 2014]. An innovative labor organization, the Farm Labor Organizing Committee, in 2004 successfully won a joint agreement with the North Carolina Growers Association and the Mt. Olive Pickle Company to represent all H-2A contract workers in North Carolina employed through NCGA that led to an estimated 1,000 grievances filed by workers [Smith-Nonini. 2009].

**Recommendation 3. New research is needed** that simultaneously assesses housing conditions and determines the health status of resident farm laborers and their family members. This effort should include in-home measures utilized by local housing code inspectors, collection of dust and wipe samples, and a comprehensive assessment of the health status of all residents. The research design should carefully include a statistically significant representation of unaccompanied, foreign-born workers as well as settled families.

**Recommendation 4. A nationally valid cross-sectional survey of the condition of housing currently utilized by hired crop farm workers is needed.** A possible approach would be to contract with the U.S. Department of Labor's NAWS survey to randomly select a nationally representative sub-set of NAWS participants who would be asked to allow a home visit by the interviewer to conduct a complete assessments as described above. NAWS participants would be offered an additional stipend if they agreed to participate in these assessments.

**Recommendation 5. Attention should be given to the housing conditions of livestock workers,** many of whom live on or adjacent to their work site. It is well-established that residing on a livestock farm presents additional health risks not usually considered in contemporary studies of farm labor housing.

**Recommendation 6. A prospective cohort study should be undertaken of changes in the health status** of farm worker families who move to publicly subsidized private market housing from less satisfactory dwellings. Such a study should include behavioral changes, such as childrens' school performance as well as personal risk behaviors.

**Recommendation 7. Future research on farm labor housing** should seek to include measures of the socio-economic status of residents as independent variables using standards generally accepted in the published literature.

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