HUNGER IN THE FIELDS: FOOD INSECURITY AMONG FARMWORKERS IN FRESNO COUNTY

CATHY WIRTH
RON STROCHLIC
CHRISTY GETZ

NOVEMBER 2007

CALIFORNIA INSTITUTE FOR RURAL STUDIES

TABLE OF CONTENTS

TABLE OF FIGURES

ACKNOWLEDGEMENTS

The Fresno County Farmworker Food Security Assessment was made possible with funds from the Network for a Healthy California and the Community Food and Nutrition Program. We are grateful for their financial support and their interest in contributing to improving the nutritional status of farmworkers and their accompanying family members.

A number of people worked on various aspects of this project and collaborating with them has been a particularly gratifying part of this work. Martha Alvarado, Estela Lara, Rosemary Moreno and other staff from Centro La Familia Advocacy Services in Fresno spent many long, hot hours in the Central Valley sun conducting interviews with farmworkers. Javier Melesio also did a wonderful job of conducting interviews with Mixteco-speaking farmworkers. Edie Jessup of Fresno Metro Ministries, Ellen Braff-Guajardo of The California Endowment (formerly California Rural Legal Assistance), Gloria Pecina of United Health Centers and Nayamín Martínez of the Centro Binacional para el Desarrollo Indígena Oaxaqueño (Binational Center for the Development of Indigenous Communities, CBDIO) all helped to arrange focus groups and/or offered invaluable advice based on their experience working with farmworkers and others in Fresno County. Finally, this research would not have been possible without the participation of the 452 farmworkers who graciously agreed to be interviewed and who were willing to share their time, perspective and opinions with us.

Several people also helped with the data entry and analysis stage of this project. We could not have completed the statistical analysis of the assessment data without the expert help of Tom Piazza of the Survey Research Center at the University of California, Berkeley and Mark Nord of the USDA. Tom very generously shared his time and statistical expertise to answer our questions about how to analyze and present this complicated data set. Mark was an invaluable source of information about how to best utilize and interpret data from the U.S. Household Food Security Survey Module. In addition, we are grateful for the assistance of Vini Pabon, Erin Derden-Little, Becca Brier-Rosenfield and Yara Lomeli-Loibl, who helped with data entry and analysis.

EXECUTIVE SUMMARY

The workers who cultivate California's extremely fertile farms often struggle to meet their basic needs, including access to adequate and nutritious food. However, almost no research has been carried out on hunger and diet among California farmworkers. In 2005, the California Institute for Rural Studies conducted an assessment that aimed to quantitatively describe farmworkers' experiences with hunger and their ability to access healthy foods such as fruits and vegetables. The quality of farmworker diets not only has important implications for the well-being of farmworkers, but also reflects upon the larger functioning of California's agricultural system.

The central component of the assessment was a survey that was conducted in-person with 454 farmworkers in Fresno County. The survey sample included 394 native Spanish-speaking respondents and 60 native Mixteco-speaking respondents. Mixteco is one of Mexico's many indigenous languages and indigenous language speakers are one of the fastest-growing and poorest subpopulations of farmworkers in California. Fresno County was selected as the study site because of its status as the top agricultural county in the United States, high rates of food insecurity and a large concentration of agricultural workers. Surveys were administered at five locations throughout Fresno County, including two urban sites, two rural sites and one farm labor camp. In order to capture seasonal variations, half of the surveys were conducted in the winter months and half in the summer months.

The overall prevalence of food insecurity among farmworkers participating in the assessment was 45%. Thirty-four percent of respondents were food insecure without hunger while an additional 11% were food insecure with hunger. Factors associated with food security include income, documentation status, migration status, accompaniment status and food stamp utilization. While the percentage of food secure respondents was virtually identical in the summer and in the winter, the prevalence of hunger was lower in the summer.

With respect to diet quality, the findings indicate that many farmworkers have diets high in fat and low in fruit and vegetable consumption. Fully 86% of respondents reported a high-fat diet (i.e., over 30% of calories from fat), while 42% consumed less than three servings of fruits and vegetables per day. Variables associated with fruit and vegetable consumption included migration status, education and being allowed to bring fruits and vegetables home from the fields. Variables associated with fat consumption included income, migration status, gender and accompaniment status. There were no differences with respect to fruit/vegetable or fat consumption between the winter and the summer. In the summer, however, there was an increase in the percentage of respondents reporting fast food consumption, which is likely associated with less time for cooking coupled with more disposable income.

The assessment also elicited information about participation in food assistance programs. The school lunch and WIC programs were the most highly utilized programs among eligible respondents. Notably, these programs do not have documentation status requirements and have children as a central part of their target population. In contrast, only 48% of eligible respondents reported food stamp utilization. Participation in this program varied by season: 55% of eligible respondents utilized the program in the winter, compared with only 37% in the summer.

Findings from a sub-sample of 60 Mixteco farmworkers revealed stark differences between the winter and summer months. In the winter, 76% of native Mixteco-speaking respondents experienced food insecurity and 48% experienced hunger. Conversely, none reported food insecurity or hunger during the summer. Higher rates of food insecurity during the winter may be associated with challenges obtaining employment among these relative newcomers. Findings regarding diet and nutrition found lower rates of both fruit/vegetable and fat consumption than non-Mixteco respondents.

Rates of food insecurity, hunger and poor diet were even higher among marginalized subgroups, such as undocumented workers, migrant workers and native Mixteco speakers. Reducing food insecurity, hunger and poor diet has important implications in terms of the human rights and health status of this population and the contributions they are able to make to California's agricultural economy. Given the wealth of food produced in California in the very regions where farmworkers are concentrated, it is not a question of supply but of ensuring that farmworkers have the resources and ability to obtain adequate and nutritious food.

INTRODUCTION

California's rich agricultural heritage produces an abundance of fruits and vegetables that are consumed throughout the U.S. and the rest of the world. Nonetheless, relatively little of it finds its way into the homes of the farmworkers that plant, tend and harvest those same products. The incongruity of this situation has not gone unnoticed by those familiar with life in the fields. As Cesar Chavez once noted, "It is ironic that those who till the soil, cultivate and harvest the fruits, vegetables and other foods that fill your tables with abundance have nothing left for themselves."

Despite anecdotal evidence of farmworkers' struggles to adequately feed themselves and their families, there is limited empirical information regarding the nature of this problem. The California Institute for Rural Studies (CIRS), in collaboration with the University of California Cooperative Extension Building Food Security Working Group, conducted the Fresno Farmworker Food Security Assessment in 2005 to better understand issues associated with hunger and access to a healthy diet among agricultural workers.

BACKGROUND

Two prior studies indicated that hunger and poor diet might be significant problems for farmworkers in California and set the stage for this research. CIRS conducted the California Agricultural Worker Health Survey (CAWHS) in 1999, a large-scale survey of the health status of approximately 1,000 agricultural workers in six major agricultural regions throughout California (Villarejo et al. 2000). The survey included a self-reported interview and a medical examination. The CAWHS identified high levels of obesity and diet-related disease among agricultural workers in California. Eighty-one percent of male respondents and 76% of female respondents were overweight, while 28% and 37% of males and females respectively were obese (Villarejo et al. 2000). The CAWHS survey also found high rates of high blood pressure, serum cholesterol and anemia among farmworkers. On the whole, 53% of male respondents and 46% of female respondents had at least one of three risk factors associated with chronic disease: obesity, high blood pressure and/or high serum cholesterol. Given that the median age of the respondents was 34 years and considering the level of physical activity involved in agricultural work, these findings pointed to possible dietary connections. As the CAWHS report (Villarejo et al. 2000) states,

> "…the risks for chronic disease, such as heart disease, stroke, asthma and diabetes, are startlingly high for a group that is mostly comprised of young men who would normally be in the peak of physical condition. Hired farm work is often very strenuous and surely qualifies as regular exercise. Unhealthful diet is likely to be a major contributor to the conditions noted above. It is a tragedy and more than a little ironic that the labor force that is responsible for producing such a great abundance of healthy food in California should themselves be suffering from the effects of poor nutrition."

The second study contributing to this assessment was the first California Health Interview Survey (CHIS), a telephone survey of health status and behaviors administered to a

representative sample of California residents. Among other items, the survey measures the food security status of adults below 200% of the Federal Poverty Level.

Food security is a useful measure of hunger and food access, in particular because standardized tools exist to measure individual and household food security status (Bickel et al. 2000)[1]. At an individual or household level, food security is characterized by access to sufficient and nutritious food. Food insecurity is characterized by an ability to obtain sufficient food or food that meets the need for a nutritious and varied diet. Food insecurity can take many forms, ranging from reliance on a diet limited to a small number of inexpensive staples to hunger at its most severe.

A number of studies have demonstrated the relationship between food insecurity and poor health outcomes including heart disease, diabetes, high blood pressure and behavioral health conditions such as major depression (Stuff et al. 2004; Vozoris et al. 2003; Siefert et al. 2001). Research has also identified negative impacts of food insecurity on children, including greater frequency of childhood illnesses, poor academic performance and psycho-social problems (Alaimo et al. 2001a; Alaimo et al. 2001b; Kleinman et al. 1998; Olson 1999).

The 2001 CHIS results revealed a surprising and somewhat counterintuitive trend with respect to food security. The heavily agricultural San Joaquin Valley, which accounts for just over half of the state's agricultural production (Great Valley Center 2005), had some of the greatest levels of food insecurity in California. In fact, all eight of the San Joaquin Valley's counties were among the ten counties with the highest rates of food insecurity in California, with 33% to 41% of low-income residents classified as food insecure (Harrison et al. 2002). The CHIS was conducted again in 2003 and 2005, with similar results. In 2003, the San Joaquin Valley still had comparatively high levels of food insecurity, with five of the top ten most food insecure counties in California (Harrison et al. 2005). In 2005, it had four of the top ten most food insecure counties in the state (Harrison et al. 2007).

The fact that the CHIS found such high rates of food insecurity in the San Joaquin Valley, an agricultural area that is home to many of California's farmworkers, raised questions about whether farmworkers might be suffering from particularly high rates of food insecurity. However, although the CHIS focuses on low-income California residents, it is hard to know to what extent it accurately reflects conditions experienced by farmworkers. As it is a telephone survey, California residents without phones are by nature excluded. Farmworkers, in particular those with the lowest income or in more precarious housing situations, are more likely to be without telephones. These limitations in sampling meant that the actual level of food insecurity among farmworkers could be even greater than indicated by the CHIS data.

Both the CHIS and CAWHS raised concerns about the extent of hunger and poor diet/nutrition among farmworkers and their family members. A number of studies in California and other states had similar findings. These studies are described below and helped inform the CIRS assessment.

[1] See Appendix A for more detailed information on how food security is defined and measured.

Some of the most extensive evaluation of farmworker food security has been done in North Carolina, which has a growing population of immigrant farmworkers. From 2002 to 2004, a series of four studies were conducted in North Carolina, in which a total of 371 farmworker households were surveyed. Rates of food insecurity among the four samples ranged from 49.1% to 71.3% (Quandt et al. 2006). Qualitative information collected through additional in-depth interviews revealed that food insecurity was greatest in the winter, when agricultural employment is more limited.

Another comprehensive study of farmworker food security was conducted in Texas (Weigel et al. 2007). Data on food security and health status were gathered from 100 farmworker households. The findings revealed that 82% of households were food insecure, with 33% experiencing food insecurity without hunger and 49% food insecurity with hunger. Food insecurity was linked to negative health outcomes, primarily in the area of mental health.

Additional studies on farmworker food security and nutrition have been conducted in Pennsylvania, Virginia and Michigan. A study carried out in Pennsylvania in 2002 and 2003 included surveys with 401 migrant farmworkers and focus groups with another 117 farmworkers. Levels of food insecurity were low, as reported by only 8.2% of respondents (Cason et al. 2003). Nonetheless, the research found higher rates of obesity and unhealthy eating habits among participants in the Pennsylvania study, 57.5% of whom reported they had gained weight after arriving in the U.S. In a 24-hour dietary recall, 38% indicated they had eaten no servings of fruits, while 19% had eaten no vegetables. A survey of 49 farmworkers in Virginia (Essa 2001) found that 98% of respondents were food insecure at the household level. Focus group data from that assessment indicated farmworker concerns about unhealthy diets. Reported barriers to eating better included low income levels, insufficient time to prepare healthy food and lack of familiarity with where and how to get the foods they wanted. Another study of 150 migrant farmworkers in Michigan found that participating farmworkers suffered from a variety of diet related diseases, with 89% reporting inadequate fruit and vegetable intake (Kowalski et al. 1999).

Several studies have examined diet and nutrition among California farmworkers. A series of studies exploring dietary behaviors among Latinos in Monterey County included samples of male farmworkers living in labor camps (Winkleby et al. 2003; Winkleby et al. 2006). The studies, conducted in 1990 and 2000, found high levels of fat intake and low fruit/vegetable consumption among residents of labor camps. These rates were also higher than non-farmworker Latinos living in other parts of Monterey County.

As the vast majority of farmworkers in California are Latino and earn very little, two other studies involving low-income Latino populations in California deserve mention. A study of 630 low-income Latino, Vietnamese and Cambodian legal immigrants in California, Texas and Illinois found that a total of 81% came from households that were food insecure: 40% food insecure without hunger, 27% food insecure with moderate hunger and 14% food insecure with severe hunger (Kasper et al. 2000). Among a sample of 212 low-income Latino families from six different counties in California, a total of 61% families were food insecure: 45% food insecure without hunger, 13% food insecure with moderate hunger; and 3% food insecure with severe hunger (Kaiser et al. 2004).

Rates of food insecurity among the general U.S. population are significantly lower than for farmworkers. The 2006 Current Population Survey Food Security Survey indicates that 11% of all U.S. households experienced food insecurity at some point during the year (Nord et al. 2007). Nonetheless, food insecurity is higher among low-income populations and certain ethnic groups. For example, 36% of households with incomes below the federal poverty level experienced food insecurity, the case for nearly 20% of all Hispanic households (Nord et al. 2007).

RESEARCH METHODS

Goals and Objectives

The Fresno Farmworker Food Security Assessment had several key goals and objectives:

- To identify the prevalence of food insecurity among farmworkers using a standardized tool.
- To gain a better understanding of farmworker diets, with a focus on fat and fruit/vegetable consumption.
- To identify differences in diet and nutrition among farmworkers in the winter and summer.[2]
- To identify demographic characteristics and other factors associated with variations in food security and diet/nutrition among farmworkers.

Assessment Location

All of the farmworkers interviewed for this assessment were based in Fresno County, in the heart of California's San Joaquin Valley. Fresno County was chosen as the study site for several reasons. The San Joaquin Valley is one of the most productive agricultural regions in California and is home to six out of seven of the state's most productive agricultural counties (USDA 2004). Forty-five percent of hired farm laborers in California work in the San Joaquin Valley (USDA 2004). Of the San Joaquin Valley's eight counties, Fresno County is the most productive agriculturally, with 2004 production valued at $4.7 billion (Fresno County Department of Agriculture 2004). This makes it the county with the highest valued agricultural production not only in California, but in the entire United States. In addition, the 2002 Census of Agriculture identified Fresno as the California County with the greatest number of hired farmworkers (USDA 2004).

While the experience of farmworkers in other areas of the state is surely different in some respects, Fresno County provides the opportunity to examine the reality of many California farmworkers. A variety of methods were employed to ensure that the assessment was conducted with a diverse sample of farmworkers. The demographic profile of the study sample is in fact quite similar to that of farmworkers at the state level. However, the study sample was primarily a convenience sample in one region of the state. As such, the findings should not be considered representative of the experiences of all farmworkers in either Fresno County, California or the United States. Nonetheless, the results provide a valuable window into the experiences of several hundred farmworkers and lay the foundation for future exploration and investigation.

---

[2] Agricultural work is scarcer and incomes are consequently lower in the winter, however farmworkers may also have more time to prepare healthier meals, with less room in their budgets for fast food. In the summer, work is more plentiful and incomes are higher, however there is less time to prepare healthy food and more disposable income with which to consume processed and fast foods.

Survey Design

The central component of the assessment was a comprehensive survey administered to farmworkers throughout Fresno County. Parts of the survey utilized existing instruments and additional sections were developed to suit the particular goals and objectives of this study. The survey was developed in consultation with a taskforce composed of a variety of Fresno-based organizations with a stake in farmworker food security issues. These included farmworker advocates, farmers, hunger and nutrition advocates, food assistance programs, health care providers, nutrition educators, public sector agencies, University of California Cooperative Extension and local non-profits and service providers. The survey also incorporated information gleaned from focus groups conducted with farmworkers at the start of the assessment process. The survey instrument was piloted and refined numerous times prior to administration.

To measure food security status, the survey includes the eighteen-item U.S. Household Food Security/Hunger Survey Module, also known as the "core module." Based on respondents' answers to the eighteen questions, they are assigned a food security scale value ranging from 0 to 10. These scale values, in turn, correspond to one of four food security status categories: food secure, food insecure without hunger, food insecure with moderate hunger and food insecure with severe hunger.[3]

The core module was adapted to this assessment in two ways. The standard core module asks respondents about their food-security related experiences in the last twelve months. However, the module can be modified to apply to the thirty-day period prior to survey administration (Bickel et al. 2000). As one of the goals of this assessment was to measure differences in food security between the summer and winter, the thirty-day version was used. The survey utilized a Spanish-language version of the core module that was developed at UCLA (Harrison et al. 2003). However, we made several small changes to the UCLA instrument in response to concerns arising from pilot testing this instrument, which appeared to indicate that some of the questions did not capture the original intent of the English-language version. Mark Nord of the USDA, who has worked extensively on administering, testing and refining the core module, was consulted and indicated that these changes seemed to clarify the questions without changing their intent (Mark Nord, personal communication 2006).

To measure dietary quality, Spanish-language versions of a rapid dietary fat screener and a dietary fruit and vegetable screener were utilized. The screeners were developed by Patricia Wakimoto in conjunction with Gladys Block of the University of California, Berkeley (Wakimoto et al. 2006). Wakimoto's Spanish-language screeners are targeted specifically to Mexican-Americans and collect information on the number of times per week that respondents consume a variety of fruits, vegetables and fatty foods. Results for fruit and vegetable consumption are converted to a daily measure that translates to the number of fruit and vegetable servings per day. Results for fat consumption, representing the frequency of consumption of fatty foods, can be presented as a raw score or converted to a rough estimation of the percentage of calories from fat in a respondent's diet.

---

[3] See Appendix A for more information on the food security status categories, including new terminology introduced in 2006 that replaces the categories used here.

In addition to these two instruments, we developed a series of questions to collect information on a variety of additional topics of interest. These included satisfaction with and perceptions of diet quality, barriers to food security, utilization of food assistance programs, food shopping patterns, transportation to food shopping, amount spent on groceries and prepared food, interest in nutrition classes, gardening opportunities and other interventions and demographic information.

Survey Administration

The survey was administered in-person with 454 farmworkers in Fresno County in 2005. Health outreach workers from Centro la Familia, a Fresno community-based organization conducted the surveys in Spanish. The health outreach workers were familiar with the communities in which the survey was administered, had extensive experience working with farmworker populations and were native Spanish speakers.

Each survey took approximately 30-45 minutes to complete. In order to capture seasonal variations, 227 surveys were conducted in the winter months (January to April 2005) and 227 in the summer months (June to September 2005). Surveys were administered in five areas of Fresno County with high concentrations of agricultural workers, including two urban Fresno zip codes (93702 and 93706), two rural towns (Huron and Parlier) and one farm labor camp (Five Points, CA).

Respondents were selected using a convenience sampling methodology, in locations where farmworkers tend to live or to congregate. Respondents were approached in public places such as parks, or at their places of residence and were asked if they would like to participate in the survey. They were offered a small monetary compensation, packets containing information on food assistance programs and healthy eating, and incentives such as a cookbook and t-shirt promoting the 5-A-Day message in Spanish.

One respondent per household was selected to be interviewed. For sampling purposes, a household was defined as a unit of family members that purchase food together. In households with more than one member, the household member with the greatest knowledge of household food purchasing and consumption was interviewed. This was typically a woman in households with female members. Respondents were screened based on four criteria: at least 18 years of age; that they or a household member have been employed in agriculture during the past twelve months; that they be one of the people responsible for buying food for their household; and not having traveled outside the U.S. during the past month (which might impact food security status and food consumption patterns). The University of California Committee for the Protection of Human Subjects approved the survey; all respondents were informed of their rights and provided consent.

Sub-Sample of Native Mixteco Speakers

Included in the 454 surveys was a sub-sample of 60 surveys administered in Mixteco to indigenous farmworkers speaking Mixteco as their native language. Mixteco, a complex tonal language with many dialects, is one of over sixty indigenous languages in Mexico. Today, Mixtecos are the fourth largest indigenous group in Mexico (Mindek 2003). The Mixteco population in Mexico is primarily based in the state of Oaxaca, as well as parts of Puebla and Guerrero.

A sample of Mixteco-speaking farmworkers was included in this assessment for several reasons. Indigenous farmworkers are one of the fastest growing segments of farmworkers in California (Aguirre International 2005). They are generally more likely to be undocumented, migratory and more recent arrivals in the U.S. (Aguirre International 2005), factors which may put them at special risk for food insecurity.

The sample was based on a convenience methodology and respondents were sought out in neighborhoods known to be home to Mixteco farmworkers. Referrals to additional respondents came via word of mouth, as well as the Centro Binacional para el Desarrollo Indígena Oaxaqueño (Binational Center for the Development of the Indigenous Communities, CBDIO), a social service agency serving Mixtecos. Since Mixteco is primarily an oral language and few people are familiar with it in its written form, the survey was not translated into Mixteco. Rather, a native Mixteco-speaking interviewer administered the survey using "sight-translation" based on the Spanish survey instrument.

Additional Assessment Components

The Fresno Farmworker Food Security Assessment included several other components that complemented the information collected through the survey. Focus groups with farmworkers were conducted both prior to and after survey administration, in order to collect information to help guide survey development and to follow-up on issues of interest that emerged from the survey. Prior to survey administration, focus groups were held with two particular sub-sets of farmworkers: single men and women with families. Two additional focus groups were held after the survey had been completed: one with men living in a labor camp and one with native Mixteco speakers.

In addition to the focus groups, key informant interviews were conducted with a variety of individuals and organizations familiar with issues affecting farmworkers in Fresno County. These included farmers, service providers, nutrition educators and public sector representatives. The interviews focused on perceptions of farmworker food security and suggestions for addressing these issues.

Data Management and Analysis

The data were analyzed using the Statistical Package for Social Sciences (SPSS). Data from native Spanish-speaking respondents (n=394) were analyzed separately from data from native Mixteco-speaking respondents (n=60), due to significant differences between these two populations with regard to demographics, income and experiences with food insecurity, as well as the more exploratory nature of the research conducted with native Mixteco speakers.

The data were not weighted or adjusted in any way, particularly as the sample included in the assessment was not meant to be representative of a larger population of farmworkers. For the most part, however, the sample was reflective of the demographics of farmworkers at the state level. One notable exception is the gender balance of the sample, which contains a higher proportion of women than the average farmworker population. This is due to the fact that the survey was administered to the household member with the greatest knowledge of household food consumption and purchasing patterns, biasing respondent selection in favor of female respondents. While this may have shaped the results in some ways, an exploratory attempt to

weigh the data to correct for the larger proportion of female respondents did not seem to have a significant impact on results related to food security.

The central dependent variable in the assessment was food security status. Fruit/vegetable and fat consumption were also examined as measures of diet quality. Summary statistics are reported for each of these variables overall and for different sub-populations. In addition, regression analyses were conducted to determine the major predictive factors. For food security status, a logistic regression was utilized. In this case, two binomial logistic regressions were carried out, one with *food secure/food insecure* as the dependent variable and one with *hungry/not hungry* as the dependent variable. Linear regressions were conducted on fruit/vegetable and fat consumption, as values for these variables were continuous in nature.

RESULTS

Demographics

The survey respondents had a similar demographic profile to the overall population of farmworkers in California, as described by the National Agricultural Workers Survey (NAWS) (Table 1), with several exceptions. Because the survey was administered to the household member with the greatest knowledge of household food consumption and purchasing patterns, our sample included a higher proportion of women than the general population of farmworkers. In addition, income, as represented by the percentage of respondents reporting incomes below the Federal Poverty Line (FPL), was lower for the study sample than for the California NAWS sample.[4]

[4] However, this may be related to challenges faced as part of the assessment in measuring monthly income and not to an actual difference in income between assessment respondents and NAWS respondents Income was calculated from information about how much respondents earned in the previous week, based on how many hours they worked that week and their hourly wage. Weekly earnings were then projected out to monthly earnings. This method of calculating income has some advantages, mainly that it is more reliable to collect information on earnings and hours worked in the previous week than over longer periods of time. Farmwork can be highly variable and respondents may not know exactly how much they worked or what they earned in the course of a month or a year. However, the variability of farmwork is also the weakness of this weekly framework for data collection, as earnings may differ from one week to the next, making projections from weekly to monthly earnings unreliable. For example, particularly in the winter, a number of respondents reported that they had not worked at all the previous week. While calculations based on this figure place their monthly as well as their weekly earnings at $0, this is likely not the case. Although the biases of this method may balance out, in that some respondents may have worked more than usual in the previous week and some may have worked less, it is not clear how accurate the monthly income figures from the assessment are.

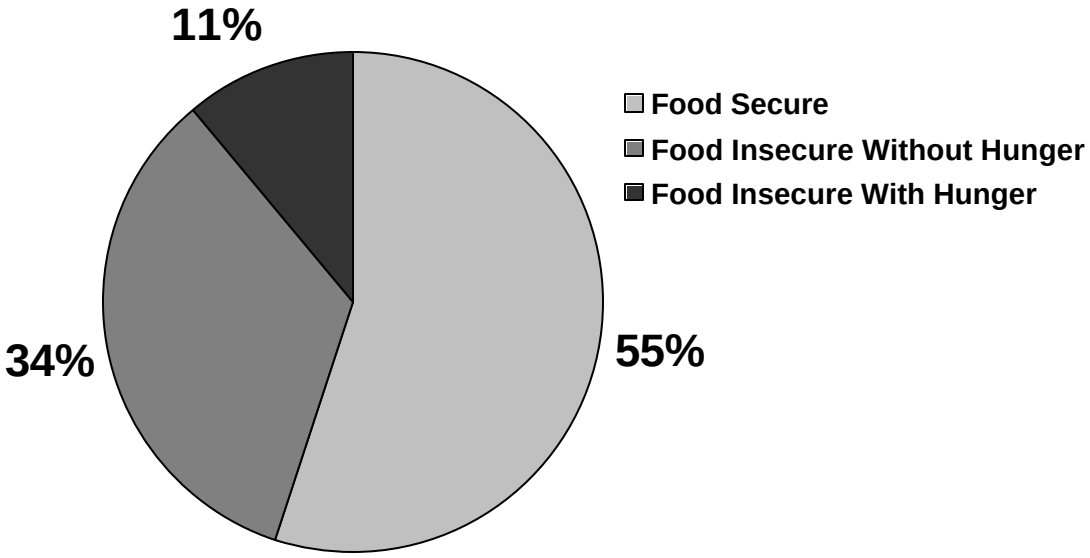
Table 1. Selected demographic characteristics of the Fresno Farmworker Food Security Assessment sample (n=394), as compared to demographic data for California farmworkers from the 2003-2004 National Agricultural Workers Survey.

	Fresno Farmworker Food Security Assessment (2005)	CA NAWS (2003-2004)
Gender	42% Male 58% Female	73% Male 27% Female
Age	Mean: 35	Mean: 32
Years of education	72% 6th grade or less	63% 6th grade or less
Years in U.S.	Mean: 10 14% 2 years or less	Mean: 11 22% 2 years or less
Country of birth	Mexico: 94%	Mexico: 91%
Documentation status	59% Undocumented	57% Undocumented
Income	Below FPL: 48%	Below FPL: 22%

Prevalence of Food Insecurity

The overall prevalence of food insecurity among farmworkers participating in the assessment was 45% (Figure 1). Thirty-four percent of respondents were food insecure without hunger while 11% were food insecure with hunger.

Figure 1. Food security status of farmworkers participating in the Fresno Farmworker Food Security Assessment (n=394).



Food security status for farmworkers participating in the survey was determined based on responses to the eighteen-question U.S. Household Food Security/Hunger Survey Module. The

percentages of respondents that answered affirmatively to select questions regarding adult and child food insecurity are presented below (Table 2).

Table 2. Percent of respondents answering affirmatively to select questions related to adult and child food insecurity on the U.S. Household Food Security/Hunger Survey Module.

Adult Food Insecurity	***Percent Reporting***
Food bought just didn't last and didn't have money to get more	50%
Couldn't afford to eat nutritious meals	48%
Ate less than should because there wasn't enough money to buy food	18%
Hungry but didn't eat because couldn't afford enough food	12%
Adult in household didn't eat for a whole day because there wasn't enough money for food	4%
Child Food Insecurity	
Relied on only a few kinds of low-cost food to feed children because were running out of money to buy food	53%
Children not eating enough because just couldn't afford enough food	40%
Children were hungry but just couldn't afford more food	7%

Causes of Food Insecurity

One of the primary objectives of this research was to identify predictors of food security status. Based on a review literature regarding variables that have been shown to have an impact on food security status, several demographic variables were selected for logistic regressions, with *food secure/insecure* and *not hungry/hungry* as dependent variables. Independent variables included income, rent, education and food stamp utilization (Rose et al. 1998; Gundersen and Gruber 2001; Gundersen and Oliveira 2001; Nord 2003; Nord et al. 2007; Wilde and Nord 2005). Variables such as being a senior, a single parent, or a homeowner have been found by the literature to influence food security status (Rose et al. 1998; Gundersen and Gruber 2001; Nord 2003; Nord et al. 2007). However, these variables were not included in the analysis, as they were not considered as relevant to farmworker populations as the general population, since only a small proportion of farmworkers are seniors, single parents or homeowners. Conversely, a variety of farmworker specific variables were selected for inclusion in the analysis, including remittances to Mexico (or country of origin), migratory status, documentation status, length of residence in the U.S., accompaniment status and whether respondents brought home food from the farm.

Of these variables, income was by far the most significant predictor of both food insecurity and hunger ($p<.01$), with increasing income associated with increased likelihood of being food secure and increased likelihood of not being hungry (Table 3).

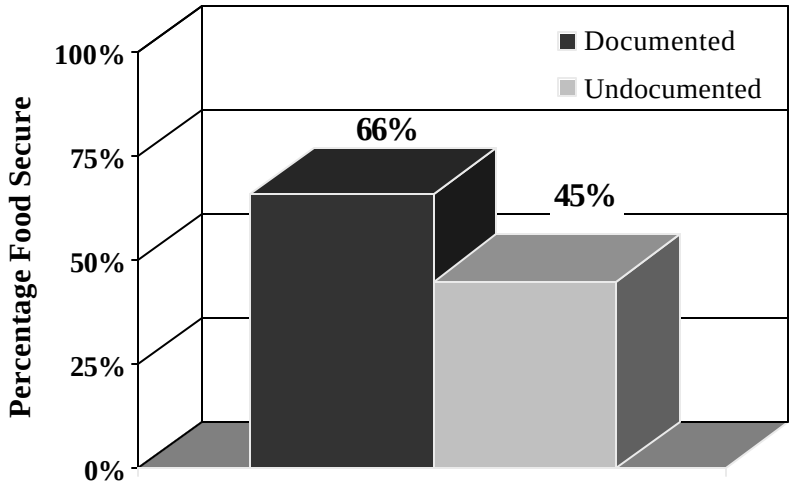
Table 3. Mean income for respondents at varying levels of food security.

Food Security Status	Mean Income
Food secure	$762
Food insecure without hunger	$542
Food insecure with hunger	$319

The relationship between income and food security is reflected in open-ended responses to survey questions, for example, "What I earn isn't enough to buy better food," "I don't have enough money to buy food that is recommended to be healthy," and "We try to eat well, but often can't because there isn't enough money." Focus group participants had similar comments. As a farmworker explained, "With more money, we would eat better. It has been a long time since our salaries have gone up. They've actually gone down. We used to get twenty or twenty-five cents per plant for pruning grapes, now we only get sixteen cents a vine." Another echoed similar sentiments, explaining that with more money "I would buy vegetables, I would make fruit juice in the mornings, I would buy better meat, fish, shrimp, better chicken…Right now I buy whatever is cheapest."

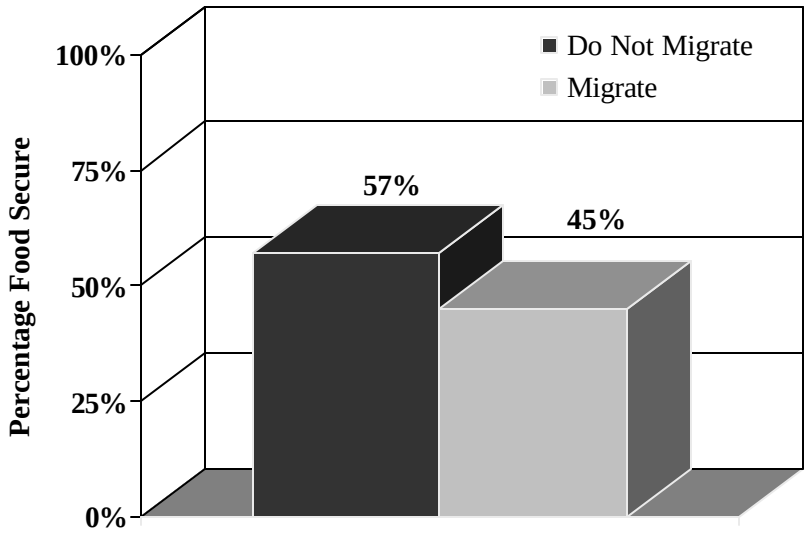
Documentation status was a significant predictor of food insecurity and hunger as well ($p<.05$), with 66% of documented workers food secure, compared with 45% of undocumented workers (Figure 2). The strong relationship between documentation and food security status merits further investigation. The literature has identified negative impacts of income shocks on the food security status of low-income households, with limited resources to absorb those shocks (Gundersen and Gruber 2001; Tapogna et al. 2004). Undocumented workers, who face greater barriers to finding permanent work, housing and transportation, may be particularly susceptible to such shocks.

Figure 2. Food Security and Documentation Status



Migratory status[5] was a significant predictor of food insecurity and hunger as well (p<.10). The findings revealed that 57% of non-migratory respondents were food secure, compared with 45% of those that do migrate to follow the crops (Figure 3). Migrants were also more likely to be food insecure with hunger. Farmworkers that migrate to follow the harvest, or who come from households with migratory members, may be more vulnerable to economic shocks, which are associated with changing residence (Tapogna et al. 2004). Their income is less predictable and they may find themselves in communities where they are not familiar with resources and are not well-connected to networks that might enable them to stretch or increase their food dollars.

Figure 3. Percentage of food secure respondents that migrate and do not migrate.



Accompaniment status was a predictor of food insecurity with hunger (p<.10), but not food insecurity in general. Accompanied respondents – defined as those living with a spouse and/or children – were less likely to be food insecure with hunger. This may be due to the ability of respondents living with immediate family to purchase and prepare food in a more cost-effective manner. It may also be that accompanied respondents were able to rely on family members to mitigate income shocks.

Finally, food stamp utilization was associated with increased food security (p<.10). Nonetheless, while approximately half of the survey respondents were deemed eligible for food stamps based on income and their – or their children's – documentation status, only about half of those eligible actually took advantage of this program.

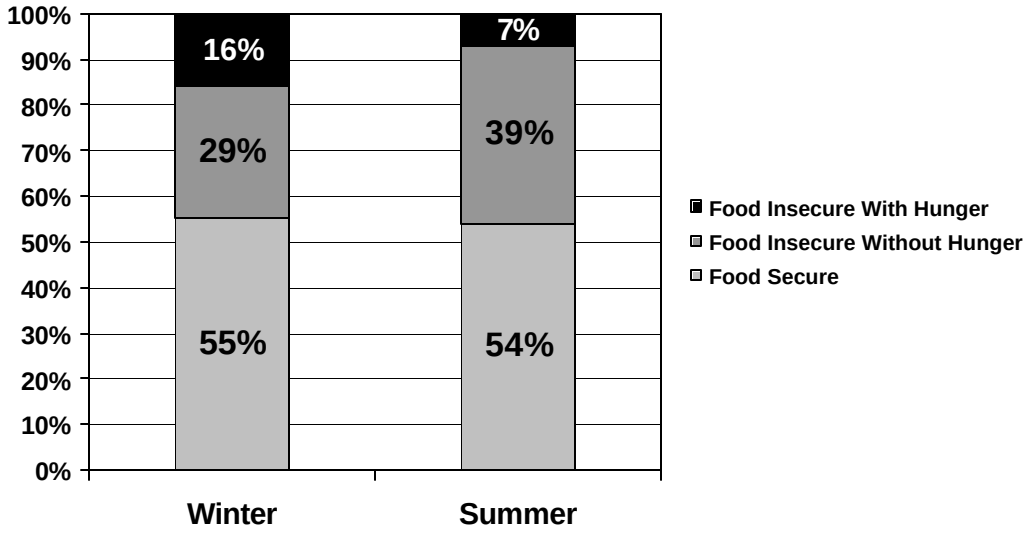
Seasonal Differences in Food Security

Another goal of the Fresno Farmworker Food Security Assessment was to evaluate seasonal differences in the food security status for farmworkers participating in the study. While the percentage of respondents that were food secure was virtually identical in the summer and in

[5] Respondents were considered to be migrants if they or a family member with whom they live migrated to follow the harvest during the previous twelve months.

winter, the prevalence of hunger was higher in the winter than the summer (Figure 4). These results confirmed our hypotheses, given less work and lower incomes during the winter months.

Figure 4. Seasonal differences in food security status among Fresno Farmworker Food Security Assessment respondents (n=394).



Most of respondents' demographic characteristics (gender, age, education, time in U.S., documentation status) were not significantly different in the summer and in the winter.[6] However, there were significant seasonal differences with respect to factors including income, housing costs, the value of remittances sent to Mexico (or country of origin) and food stamp utilization rates. Winter and summer summary statistics for these variables are presented below (Table 4). While income was higher in the summer, respondents were also more likely to pay higher rents and to send more money to family members in the form of remittances. A smaller proportion of respondents also received food stamps in the summer. Thus, higher incomes in the summer may have been offset by additional expenses and lower rates of food assistance.

Table 4. Summary statistics for key variables during the winter and summer. All differences are statistically significant at p<.01

	Winter	Summer
Mean monthly per person income	$492	$781
Mean monthly per person rent	$114	$154
Mean monthly remittances	$70	$100
Food stamp utilization	Yes: 38%	Yes: 23%

Fruit/Vegetable and Fat Consumption

Findings from the dietary fat and fruit/vegetable screeners reveal diets that are high in fat and low in fruit and vegetable consumption (Table 5). The 2000 Dietary Guidelines for Americans

[6] Since there was no way of following up with respondents participating in the first (winter) round of surveys, findings from the winter and summer surveys are based on two separate sets of respondents.

recommended that adults consume at least five servings of fruits and vegetables per day, with no more than 30% of calories from fat (Dietary Guidelines for Americans 2000).[7] On average, respondents consumed 3.6 servings of fruits and vegetables per day, with 42% consuming less than three servings per day (considered "low fruit and vegetable consumption"). These figures are comparable to similar figures for the overall U.S. population. In addition, 86% of respondents obtained more than approximately 30% of their calories from fat, compared with 62% of the general U.S. population.

Table 5. Fruit/vegetable and fat consumption among Fresno Farmworker Food Security Assessment participants (n=394) as compared to the general U.S. population.

	Fresno Farmworker Food Security Assessment	U.S. - General Population
Low fruit and vegetable consumption (less than 3 servings per day)	42%	40%*
Mean fruit and vegetable servings per day	3.6	3.4**
High fat consumption (more than 30% of calories)	86%	62%***

*2003 Behavioral Risk Factor Surveillance System (BRFSS). Source: (CDC 2006)
** 2000 Behavioral Risk Factor Surveillance System (BRFSS). Source: (Serdula et al. 2004).
***1999-2000 National Health and Nutrition Examination Survey (NHANES). Source: (Basiotis et al. 2002)

Predictors of Fruit/Vegetable and Fat Consumption

A goal of the Fresno Farmworker Food Security Assessment was to identify factors associated with fat and fruit/vegetable consumption. The literature identifies several demographic variables associated with fruit and vegetable consumption, including income, education, age, race, gender and marital status (Subar et al. 1995; McClelland et al. 1998; Billson et al. 1999; Pollard et al. 2001; Pollard et al. 2002; Guthrie 2004; Lin et al. 2004).[8] Based on that, income, education, age, gender and accompaniment status (as a variation on marital status) were selected for inclusion in a linear regression, with fruit and vegetable consumption as the dependent variable. Several farmworker-specific variables were also included, including migration, documentation status, years of residence in the U.S. and whether respondents brought fruits and vegetables home from work. The season the survey was conducted was also included because of impacts on fruit and vegetable availability and prices.

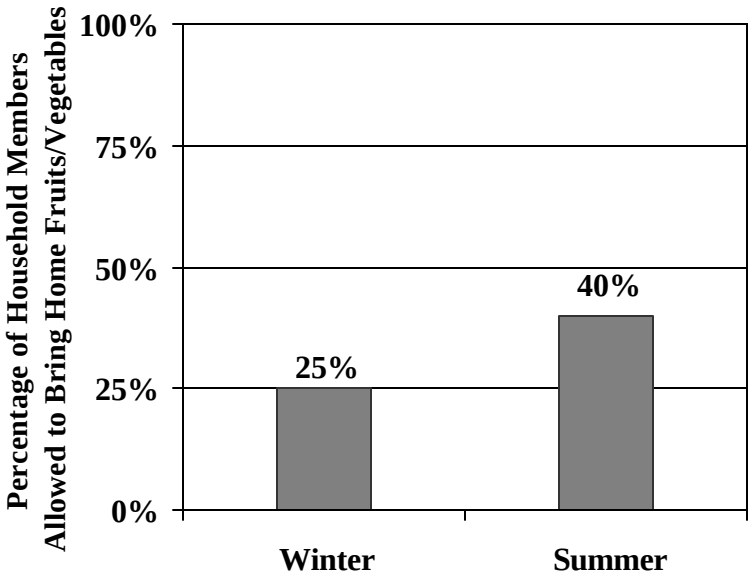
Variables significantly associated with fruit and vegetable consumption include migration, education and bringing fruits and vegetables home from work (all significant at $p<.01$). As with

[7] The 2005 version of the Dietary Guidelines for Americans was recently released and includes some changes from the 2000 edition. The 2005 Guidelines recommend that adults consume 4.5 cups of fruits and vegetables per day, and 20%-35% of their calories from fat (Dietary Guidelines for Americans 2005). However, many screeners, including those utilized in the Fresno Farmworker Food Security Assessment, were designed with the older recommendations in mind. In addition, most national statistics on fat and fruit/vegetable consumption are presented in relation to the older recommendations. As a result, the information presented here is also in the older format.
[8] While food stamp utilization has been seen to have an impact on food security status, there is little evidence that it is associated with fruit and vegetable consumption (Gleason et al. 2000).

food security, migratory status was negatively associated with fruit and vegetable consumption. In fact, respondents in households where at least one member migrates to follow the harvest eat almost a full serving less of fruits and vegetables per day than their counterparts in non-migrant households. Education was positively correlated with fruit and vegetable consumption.

Respondents in households that bring home fruits/vegetables from work eat an average of 0.8 more servings of fruits and vegetables per day than those that do not. As a focus group participant offered, "In the summer you can eat in the field and you can bring home a little. That way you can eat a little more fruit." The impacts of this may go beyond just the individual household. As a survey respondent explained, "We eat a lot of fresh fruit and vegetables. We share between the neighbors. People bring different things and share them." Nonetheless, even at the height of the summer harvest, only 40% of respondents reported that someone from their household was allowed to bring home fruits or vegetables from work (Figure 5).

Figure 5. Percentage of households, by season, with a member that is allowed to bring home fruits/vegetables from work.



Along with fruit and vegetables, the literature identifies several demographic and lifestyle characteristics associated with fat consumption, including gender, income, education, marital status, age, tobacco use, physical activity levels, alcohol consumption and dietary knowledge and awareness (Johansson et al. 1999; Mattisson et al. 2001). Income, education, age, gender, accompaniment status, migration, documentation status and years of residence in the U.S. were included in a linear regression analysis, with fat consumption as the dependent variable. The season when the survey was conducted was also included, because of associations with both income and farmworker work schedules, which are in turn associated with preparing food at home or eating out.

Variables with a significant impact on fat consumption include income and migration ($p<.05$), and gender and accompaniment status ($p<.10$). Fat consumption increased slightly with income,

while migrants consumed less fat than non-migrants. Women reported less fat in their diets than men and accompanied individuals consumed more fat than unaccompanied respondents.

Seasonal Differences in Fruit/Vegetable and Fat Consumption

Contrary to hypotheses that fruit/vegetable and fat consumption would differ by season, given variations in factors including income and time available for food preparation, the findings do not indicate any seasonal differences with respect to either variable (Table 6). Nonetheless, there was a significant increase in the percentage of respondents consuming fast food during the summer. That is consistent with focus group comments. As one individual reported, "In the summer we work ten hours a day in the fields or packing houses and we don't have a lot of time to cook. We eat at fast food restaurants two or three times a week. In the winter when I'm not working I try to prepare healthier meals." As another focus group participant explained, "When you're not working there's more time to cook. When you're working, there isn't time; we eat pizza and fast food."

Table 6. Seasonal differences in fruit/vegetable, fat and fast food consumption.

	Winter	Summer
Low fruit and vegetable consumption (less than 3 servings per day)	42%	41%
High fat consumption (greater than 30% of calories)	83%	90%
High fast food consumption (more than once a week)	15%	25%

Additional Barriers to Fruit/Vegetable Consumption

The survey also elicited barriers to a healthy diet, particularly fruit and vegetable consumption. A range of issues were examined, including cost, access, taste preferences and knowledge of how to prepare healthy food. The frequency of these barriers is reported below (Table 7).

Table 7. Reported frequencies of a variety of potential barriers to healthy eating.

Barrier	Frequency
"I don't know how to prepare healthy foods very well"	49%
"I don't buy much fruit because it's very expensive"	49%
"I don't buy many vegetables because they're very expensive"	45%
"I don't have enough time to prepare food at home these days"	35%
"The stores where I live don't sell many fruits and vegetables"	35%
"It's hard for me to get to the store"	32%
"It's hard to get healthy food where I live"	32%
"The fruits and vegetables where I most shop are low quality"	29%
"I don't prepare many vegetables because my children don't like them"	25%
"I don't like vegetables very much"	24%
"I don't prepare many vegetables because my spouse doesn't like them"	18%

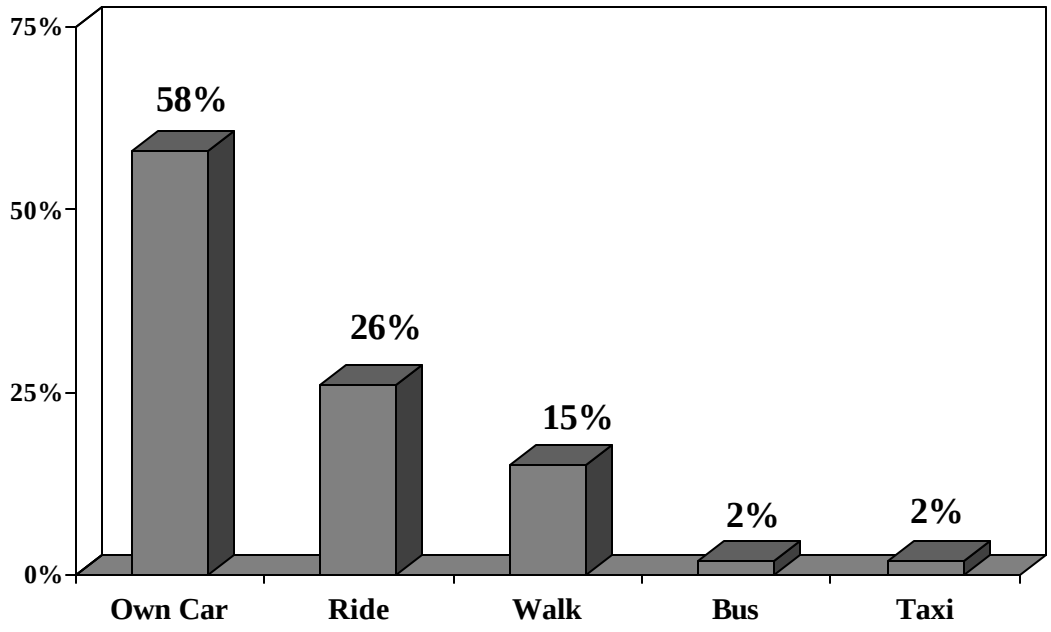
Of these, the only barriers significantly associated with fruit and vegetable consumption had to do with the affordability of fruits and vegetables. As such, while income is not directly correlated with fruit and vegetable consumption, the price of fruits and vegetables and whether they are perceived as "too expensive" is correlated with that. Respondent comments to open-ended questions indicated that "I need to eat more vegetables, but we can't buy them" and, "I don't have money to buy vegetables, so we eat a lot of beans and potatoes." Several of the barriers mentioned above address the issue of access to health food. These include "It's hard to get healthy food where I live," "The stores where I live don't sell many fruits and vegetables," and "The fruits and vegetables where I most shop are low quality."

With respect to access, respondents were asked about where they do the majority of their food shopping, how they get to the store and the cost of transportation to shopping. Almost all respondents (94%) did the majority of their food shopping at major chain supermarkets or local grocery stores, although the local grocery stores vary considerably in size. The remaining 6% did the majority of their shopping at corner, liquor or convenience stores. Over half (58%) of respondents traveled in their own cars, an additional 26% got rides from others and 15% walked (Figure 6). Of those who got rides, 73% paid for the ride at an average cost of $20 round trip.

The survey also explored respondent knowledge about how to prepare healthy food as a potential barrier to improved diet/nutrition. Responses to the statement "I don't know how to prepare healthy food very well" were not significantly correlated with fruit and vegetable consumption. However, there were interesting patterns in this regard. Nearly two in three men (64%) reported low knowledge of preparing healthy food than women (38%). This is a particular issue for unaccompanied males in the U.S. on their own, who are not accustomed to cooking for themselves. In that regard, unaccompanied men offered comments such as, "Since we're here alone, we don't know how to prepare food like women do," and "I know I have bad eating habits, but I don't have a woman here in the U.S. to cook for me." A focus group participant commented that, "People who have their wives here may not have much [food], but they prepare it well. When it's just a man, it's not so good. It's better when you have your wife here." Similarly,

another focus group participant explained that "In Mexico, you have your mother and your sisters. When you are taken out of there you don't know how to do anything."

Figure 6. Forms of transportation to where respondents do the majority of their grocery shopping.



Access to Food Assistance Programs

The assessment also sought to identify rates of farmworker participation in food assistance programs including food stamps, food banks, WIC and school-based meal programs. Rates of utilization among eligible respondents were highest for the school lunch and WIC programs, in fact surpassing overall rates for Fresno County (Table 8). Notably, these programs do not have documentation status requirements and have children as a central part of their target population. Food banks were the least utilized food assistance resource, with utilization rates of only 12%.[9]

Respondents cited a variety of reasons for not using food banks, including lack of information about when and where food distribution took place, lack of time or transportation to get to distribution sites, perceptions that food banks are only for families or unemployed people, shame and not liking the kinds of foods offered. Several respondents also mentioned that food bank place limits on how often they can receive food (for example, only once every three months).

[9] Nonetheless, 25% reported that they had utilized food banks at some point in the past.

Table 8. Percentage of eligible respondents participating in food assistance programs at the time of survey administration.

	Fresno Farmworker Food Security Assessment Sample	Fresno County
Food Stamps	48%	53%*
WIC	89%	78%**
School Lunch	97%	74%*
Food Banks	12%	

* 2004 Fresno County Nutrition Profile, CA Food Policy Advocates
** 2003 Fresno County Nutrition Profile, CA Food Policy Advocates

Nearly half (48%) of eligible[10] respondents reported utilizing the food stamp program, which is comparable to 53% of eligible Fresno County residents. However, food stamp participation varies by season (Table 9). Whereas 55% of eligible respondents utilized the program in the winter, only 37% of *eligible* respondents did so in the summer. Many respondents interviewed during the summer believed they were not eligible for this program because they were working or earned too much.

Respondents cited a range of additional reasons for not using the food stamp program. Several feared that receiving food stamps would compromise their immigration status and chances of gaining residency status.[11] Comments in that regard included, "I don't want problems, I'm getting my papers in order," and "They told me it would affect my immigration status." Several respondents also explained that they were not aware of eligibility requirements or how to apply. A number of undocumented parents were unaware that they could receive food stamps for their U.S.-born children. Finally, some respondents mentioned that they did not feel comfortable receiving public benefits, explaining that "I'm ashamed," and "I don't want to ask for help." Respondents receiving food stamps were asked how much they received each month. When this amount is divided by the actual number of household members, it is quite low (Table 9).

Table 9. Comparison of Food Stamp program utilization in the winter and in the summer.

	Winter	Summer
Percent of eligible respondents utilizing food stamps	55%	37%
Mean monthly food stamp benefits per household member	$20	$10

[10] Eligibility was determined based on survey variables including household size, household income and whether at least one adult in the family was documented and/or had children born in the U.S.
[11] This is based on fears of incurring "public charge" status, under which immigrants receiving some forms of public assistance "may face adverse immigration consequences." Although participation in food assistance programs does not in fact result in "public charge" status, many farmworkers, and even some health and social service providers, are misinformed on this issue.

Results for Mixteco Farmworkers

As noted, the assessment included a sub-sample of 60 Mixteco-speaking farmworkers. This sample was excluded from the above analysis because the findings were distinct in many ways. Further, since sample was small and very much a convenience sample, the results are considered more exploratory than conclusive. These findings should be interpreted with caution.

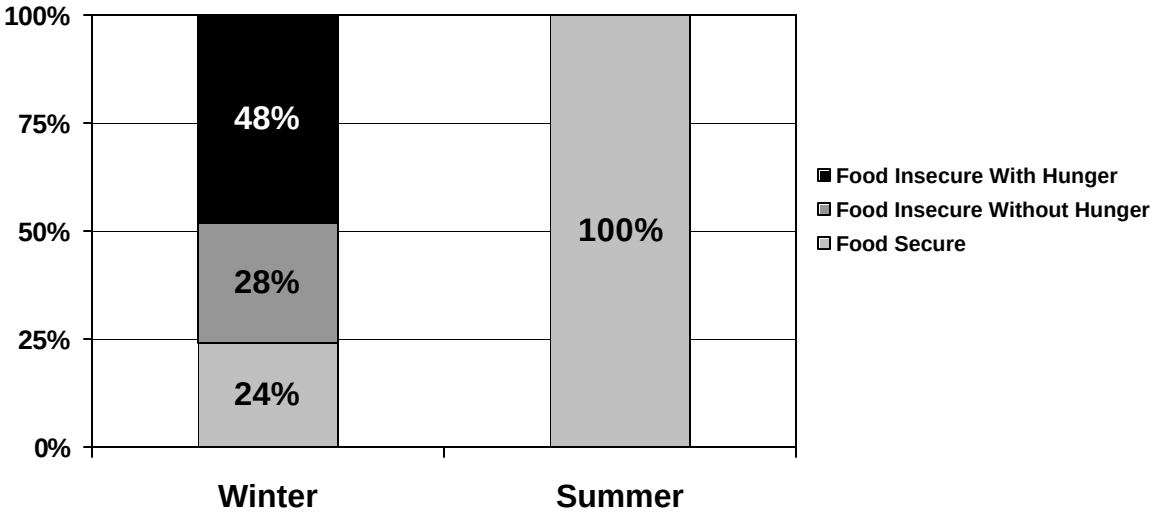
On average, native Mixteco-speaking respondents were younger, less educated, more recently arrived in the U.S., more likely to be undocumented and less likely to speak Spanish fluently than non-Mixteco respondents (Table 10). This is consistent with demographic trends reported for indigenous farmworkers in the 2003-2004 National Agricultural Workers Survey (Aguirre International 2005).

Table 10. Comparison of demographic characteristics: Mixteco-speaking respondents (n=60) and native Spanish-speaking respondents (n=394).

	Native Mixteco Speakers	**Native Spanish Speakers**
Age	Mean: 27	Mean: 34
Education	6^{th} grade or less: 90% 0 years: 29%	6^{th} grade or less: 72% 0 years: 0%
Years in U.S.	Mean: 5 2 years or less: 15%	Mean: 10 2 years or less: 14%
Country of birth	Mexico: 100%	Mexico: 94%
Documentation status	Undocumented: 98%	Undocumented: 59%
Mean monthly income per person	Winter: $271 Summer: $1,927	Winter: $475 Summer: $781

Patterns regarding food security status and income were also quite different for the Mixteco sample. In the winter, mean monthly per capita income was $271, with 40% of households reporting no income at all during the week prior to the survey. In comparison, non-Mixteco respondents reported average monthly income of $475 per person in the winter, with only 17% of households reporting no income during the week prior to survey administration. Given such low incomes, it is not surprising, but still sobering to find that 76% of native Mixteco-speaking respondents experienced food insecurity during the winter, while 48% experienced food insecurity with hunger (Figure 7). Additional research (Moos 2008) has corroborated many of these findings. In contrast, Mixteco respondents reported a mean monthly per person income of $1,927 during the summer, with virtually no instances of zero income during the previous week. Consequently, 100% of the Mixteco sample was food secure during the summer.

Figure 7. Seasonal differences in food security status among native Mixteco-speaking respondents (n=60).



There are a number of possible explanations for these dramatic differences between summer and winter results for the Mixteco sample. One possibility is sampling bias. The majority of respondents in the winter sample were women with families, while almost half the respondents in the summer sample were unaccompanied men. Given limited employment opportunities in the winter, women are at greater risk of unemployment and under-employment than men.

Mixteco respondents appear to work more temporary and transitory jobs than Spanish-speaking respondents. As seen below, native Mixteco speakers worked less in the winter and more in the summer. They were also more likely to work under piece rate pay schemes[12] and to have a household member who migrates to follow the harvest (Table 11). It is therefore not surprising that Mixteco respondents might be more susceptible to seasonal fluctuations in income.

Table 11. Comparison of seasonal variations in hours of work, type of payment and migration patterns between native Mixteco-speaking respondents (n=60) and native Spanish-speaking respondents (n=394).

	Native Mixteco Speakers		**Native Spanish Speakers**	
	Winter	*Summer*	*Winter*	*Summer*
Mean hours of work per week	33	60	35	41
Pay scheme	58% piece rate	100% piece rate	91% hourly	96% hourly
Migratory status (household member)	47%	73%	25%	14%

[12] Under piece rate pay schemes workers are paid based on the amount of work performed, e.g., crop harvested, vines pruned, etc. This is in contrast to hourly pay schemes, where workers are paid the same amount per hour regardless of the amount of work performed. Piece work is generally considered to have higher income-generating potential, especially for fast workers. However, employment under piece rate schemes is generally less stable.

Differences in employment patterns between Mixteco and native Spanish-speaking respondents raise interesting questions about the economic coping strategies utilized by each group. Mixteco respondents reported much higher fluctuations in availability of work and income between the summer and the winter than non-Mixteco respondents. In contrast, non-Mixtecos were more likely to work in one place and for a set wage. This kind of stability has advantages but also implies a certain income ceiling. The strategy employed by many Mixteco respondents, of working long hours at piece rate during the harvest and following the harvest to maximize work hours is less stable, but generated notably higher earnings during the summer. Nonetheless, these higher earnings may not have been enough to provide a buffer for the winter months when incomes were significantly lower.

Finally, a comparison of findings regarding diet and nutrition reveals notable differences between the Mixteco and non-Mixteco respondents (Table 12). Almost all Mixteco respondents consumed less than three servings of fruits and vegetables per day. Conversely, the percentage reporting a high-fat diet was significantly lower than non-Mixteco respondents.

Table 12. Comparison of fruit/vegetable and fat consumption between Mixteco (n=60) and non-Mixteco (n=394) respondents.

	Native Mixteco Speakers	Native Spanish Speakers
Low fruit and vegetable consumption (less than 3 servings per day)	92%	42%
Mean fruit and vegetable servings per day	1.8 (+/- 0.76)	3.5 (+/- 1.7)
High fat consumption (more than 30% of calories)	30%	86%

These results, particularly regarding low fruit and vegetable consumption, are corroborated by comments from a focus group with Mixteco-speaking farmworkers. The participants indicated that while fruits are popular, they are often considered a luxury, mainly to be eaten in the summer, when they are more affordable and available on-farm. Conversely, focus group participants reported that vegetables are not an important component of the traditional Mixteco diet. They also noted that the vegetables they ate in Mexico, for example greens such as purslane, are not easy to find in the U.S.

RECOMMENDATIONS AND CONCLUSIONS

Reducing Food Insecurity and Hunger

Key variables associated with food security and hunger include income, documentation status, migratory patterns and food stamp utilization. Not surprisingly, income was the most significant predictor of food security status. Unfortunately, it is also a highly challenging issue to address, as low wages are prevalent in agriculture. Since many agricultural workers are paid minimum wage, advocating for a minimum wage that is closer to a living wage could make an important contribution with respect to improving food security for many farmworkers. Among respondents participating in the Fresno Farmworker Food Security Assessment, 64% earned the 2005

California minimum wage of $6.75 per hour, while another 14% earned $7.00 per hour. Only 5% of respondents made more than $8.00 per hour.

Documentation status is another important factor affecting food security. Undocumented workers were more likely to experience both food insecurity and hunger. In the absence of comprehensive immigration reform, addressing eligibility requirements to permit more undocumented individuals to access food assistance programs would increase their food security. Efforts to educate undocumented workers about the extent to which they and/or their children are eligible for food assistance could also make a large difference. Outreach for programs like food banks, that also do not generally require that recipients be documented, should be expanded. Promising initiatives along these lines are already underway in Fresno County. These include the Fresno County Food Bank's Mobile Pantry program which brings food to rural areas of the county and Fresno Metro Ministry's Food Assistance Hotline, a 24-hour Spanish-language service with information regarding food assistance programs in the callers' vicinity (Edie Jessup, personal communication 2006).

Food stamp utilization was associated with improved food security. However, the findings indicate that this program is underutilized by eligible farmworkers, especially in the summer. Utilization of this program can be increased via greater outreach and clarifying misconceptions about eligibility, including income, parental/children's documentation status and concerns about incurring "public charge" status.

Finally, farmworkers from households where one or more members migrate to follow the harvest were found to be at greater risk of both food insecurity and hunger. Migrating to follow the harvest involves constant changes in employment, housing and a host of other factors affecting household finances. Migrants may also be less well-equipped to take advantage of community resources or networks to access food. Special consideration should be given to targeting food assistance programs and outreach to migrant households.

Increasing Fruit and Vegetable Consumption

The assessment findings indicate diets that are high in fat and low in fruit and vegetable consumption. Fully 86% of respondents obtain more than 30% of their calories from fat while 42% consume less than three servings of fruits and vegetables per day. Factors associated with fruit and vegetable consumption include migratory status, education and the ability to bring fruits and vegetables home from work. Variables significantly associated with fat consumption include income, migration, gender and accompaniment status.

The ability to bring produce home from the fields was positively associated with fruit and vegetable consumption. Individuals in households where the respondent or spouse brought produce home from work reported 0.8 more servings of fruits and vegetables per day than their counterparts. Nonetheless, only 25% of respondents in the winter and 40% of respondents in the summer reported being allowed to do so.[13] As one focus group participant commented, "Now [in the winter] we don't bring anything home…all we bring home is exhaustion." There are a variety

[13] The lower percentage in winter may reflect more limited availability of produce at that time.

of reasons that growers may choose not to allow workers to bring produce home from the fields, including concerns about food safety, farmworkers re-selling produce at lower prices in secondary markets, and costs associated with monitoring what workers take. Finding collaborative solutions to these challenges and allowing more farmworkers to bring home food for personal consumption could have positive impacts on farmworker diets.

Nutrition education is another potential area of intervention with respect to fruit and vegetable consumption. Knowledge of preparing healthy food did not have a significant impact on fruit and vegetable consumption. Nonetheless, 64% of men and 38% of women reported not knowing how to prepare healthy food. Focus groups also revealed that women were more likely than men to consider fruits and vegetables an important part of a healthy diet. Nutrition education efforts targeting unaccompanied male farmworkers could have positive impacts on their diets and nutrition. Forty percent of male respondents indicated that they would be "very interested" in information about how to prepare healthy food.

Reaching out to Mixteco-Speaking Farmworkers

Although the findings from Mixteco-speaking farmworkers are exploratory in nature, they highlight a number of potentially important issues regarding food security among indigenous farmworkers. The high rates of food insecurity and hunger among this population during in the winter are cause for concern and point to the need for more rigorous research. Outreach to Mixteco farmworkers in the winter could make an important difference to the well-being of these workers and their families. An additional intervention is access to low-interest loans to help tide these individuals over the winter. Mixteco focus group participants report reliance on high interest loans of approximately 10% per month (120% per year) to make ends meet during the winter. The high payments on these loans clearly detract from these individuals' ability to meet their food and other basic needs.

There is also a need for culturally appropriate outreach in indigenous languages. Many Mixteco farmworkers do not speak Spanish fluently and their dietary preferences are quite distinct from other farmworkers. While many social services in California and the Central Valley are accessible to Spanish speakers, that is generally not the case for those speaking indigenous languages. Expanded outreach efforts in indigenous languages with education to increase the cultural competency of providers could help remedy these disparities.

Conclusions

California's agricultural bounty is dependent on the hundreds of thousands of agricultural workers that produce healthy and nutritious food for consumers throughout the U.S. and the world. Reducing food insecurity, hunger and poor diet has important implications in terms of the human rights and health status of this population. Given the wealth of food produced in the very regions where farmworkers are concentrated, it is incumbent on all of us to ensure that farmworkers have access to the fruits of their labors.

REFERENCES

Aguirre International (2005). "The California Farm Labor Force: Overview and Trends from the National Agricultural Workers Survey." Burlingame, CA.

Alaimo, K., C. M. Olson, et al. (2001a). "Food Insufficiency and American School-Aged Children's Cognitive, Academic and Psychosocial Development." Pediatrics **108**(1): 44-53.

Alaimo, K., C. M. Olson, et al. (2001b). "Food insufficiency, family income and health in US preschool and school-aged children." Am J Public Health **91**(5): 781-786.

Anderson, S. A. (1990). "Core indicators of nutritional status for difficult-to-sample populations. ." Journal of Nutrition **120**: 1559-1600.

Basiotis, P. P., A. Carlson, et al. (2002). "The Healthy Eating Index: 1999-2000." U.S. Department of Agriculture, Center for Nutrition Policy and Promotion.

Bickel, G., M. Nord, et al. (2000). "Guide to Measuring Household Food Security, Revised 2000." U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis, Nutrition and Evaluation.

Billson, H., J. A. Pryer, et al. (1999). "Variation in fruit and vegetable consumption among adults in Britain. An analysis from the dietary and nutritional survey of British adults." European Journal of Clinical Nutrition **53**: 946-952.

Cason, K., S. Nieto-Montenegro, et al. (2003). "Dietary Intake and Food Security Among Migrant Farm Workers in Pennsylvania." Harris School Working Paper, Series 04.2.

Centers for Disease Control and Prevention (2006). "5 A Day: Data and Statistics." Accessed July 29, 2006 from http://apps.nccd.cdc.gov/5ADaySurveillance/.

Essa, J. S. (2001). Nutrition, Health and Food Security Practices, Concerns and Perceived Barriers of Latino Farm/ Industry Workers in Virginia. Human Nutrition, Foods and Exercise, Virginia Polytechnic Institute and State University. M.S.

Fresno County Department of Agriculture (2004). "Fresno County Agricultural Crop and Livestock Report." Fresno, CA.

Gleason, P., A. Rangarajan, et al. (2000). "Dietary Intake and Dietary Attitudes Among Food Stamp Participants and Other Low-Income Individuals." U.S. Department of Agriculture, Food and Nutrition Service.

Great Valley Center (2005). "The State of the Great Central Valley of California." Modesto, CA.

Gundersen, C. and J. Gruber, Eds. (2001). The dynamic determinants of food insufficiency. Second Food Security Measurement and Research Conference, Volume II: Papers, U.S. Department of Agriculture, Economic Research Service.

Gundersen, C. and V. Oliveira (2001). "The Food Stamp Program and Food Insufficiency." American Journal of Agricultural Economics **83**(4): 875-887.

Guthrie, J. F. (2004). "Understanding Fruit and Vegetable Choices: Economic and Behavioral Influences." U.S. Department of Agriculture, Economic Research Service.

Harrison, G. G., C. A. Disogra, et al. (2002). "Over 2.2 Million Low-Income California Adults Are Food Insecure; 658,000 Suffer Hunger." UCLA Healthy Policy Research Brief. UCLA Center for Health Policy Research. Los Angeles, CA.

Harrison, G. G., A. Stormer, et al. (2003). "Development of a Spanish-language version of the US household food security survey module." Journal of Nutrition **133**(4): 1192-1197.

Harrison, G. G., G. Manalo-LeClair, et al. (2005). "More Than 2.9 Million Californians Now Food Insecure – One in Three Low-Income, An Increase in Just Two Years." UCLA

Healthy Policy Research Brief. UCLA Center for Health Policy Research. Los Angeles, CA.

Harrison, G. G., M. Sharp, et al. (2007). Food Security Among California's Low-Income Adults Improves, But Most Severely Affected Do Not Share in Improvement. UCLA Healthy Policy Research Brief. Los Angeles, CA, UCLA Center for Health Policy Research**:** 1-11.

Johansson, L., D. S. Thelle, et al. (1999). " Healthy dietary habits in relation to social determinants and lifestyle factors." British Journal of Nutrition **81**(3): 211-220.

Kaiser, L. L., A. C. Martin, et al. (2004). "Food insecurity prominent among low-income California Latinos." California Agriculture **58**(1): 18-23.

Kasper, J., S. K. Gupta, et al. (2000). "Hunger in legal immigrants in California, Texas and Illinois." American Journal of Public Health **90**(10): 1629-1633.

Kleinman, R. E., J. M. Murphy, et al. (1998). "Hunger in Children in the United States: Potential Behavioral and Emotional Correlates." Pediatrics **101**(1): e3-.

Kowalski, K., C. J. Hoffman, et al. (1999). "Nutritional patterns and needs of migrant term workers in northwest Michigan." Journal of the American Dietetic Association **99**(2): 221-224.

Lin, B.-H., J. Reed, et al. (2004). "U.S. Fruit and Vegetable Consumption: Who, What, Where and How Much." U.S. Department of Agriculture, Economic Research Service.

Mattisson, I., E. Wirfält, et al. (2001). "Fat intake is more strongly associated with lifestyle factors than with socio-economic characteristics, regardless of energy adjustment approach." European Journal of Clinical Nutrition **55**(6): 452-461.

McClelland, J., W. Demark-Wahnefried, et al. (1998). "Fruit and vegetable consumption of rural African Americans: baseline survey results of the Black Churches United for Better Health 5 A Day Project." Nutrition and Cancer **30**(2): 148-157.

Mindek, D. (2003). "Mixtecos." Comisión Nacional para el Desarrollo de los Pueblos Indígenas (CDI), Programa de las Naciones Unidas para el Desarrollo (PNUD). Mexico City.

Moos, Katherine. (2008). "Documenting Vulnerability: Food Insecurity Among Indigenous Mexican Migrants in California's Central Valley." Washington, DC: Congressional Hunger Center.

Nord, M. (2003). Keeping Warm, Keeping Cool, Keeping Food on the Table: Seasonal Food Insecurity and Costs of Heating and Cooling. Annual Meeting of the National Association for Welfare Research and Statistics. San Diego, CA.

Nord, M., M. S. Andrews, et al. (2007). Household Food Security in the United States, 2006. Economic Research Report Number 49. Washington DC, U.S. Department of Agriculture, Economic Research Service.

Olson, C. M. (1999). "Nutrition and Health Outcomes Associated with Food Insecurity and Hunger." J. Nutr. **129**(2): 521-

Pollard, J., D. Greenwood, et al. (2001). "Lifestyle factors affecting fruit and vegetable consumption in the UK Women's Cohort Study." Appetite **37**(1): 71-79.

Pollard, J., S. F. L. Kirk, et al. (2002). "Factors affecting food choice in relation to fruit and vegetable intake: a review." Nutrition Research Reviews **15**(2): 373-387.

Quandt, S. A., J. I. Shoaf, et al. (2006). "Experiences of Latino Immigrant Families in North Carolina Help Explain Elevated Levels of Food Insecurity and Hunger." Journal of Nutrition **136**: 2638-2644.

Rose, D., C. Gundersen, et al. (1998). "Socio-Economic Determinants of Food Insecurity in the United States: Evidence from the SIPP and CSFII Datasets." Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. Washington DC.

Rose, D. and R. Richards (2004). "Food store access and household fruit and vegetable use among participants in the US Food Stamp Program." Public Health Nutrition **7**(8): 1081-1088.

Serdula, M. K., C. Gillespie, et al. (2004). "Trends in Fruit and Vegetable Consumption Among Adults in the United States: Behavioral Risk Factor Surveillance System, 1994-2000." Am J Public Health **94**(6): 1014-1018.

Siefert, K., C. Heflin, et al. (2001). "Food insufficiency and the physical and mental health of low-income women." Women & Health **32**(1-2): 159-177.

Stuff, J. E., P. H. Casey, et al. (2004). "Household Food Insecurity Is Associated with Adult Health Status." J. Nutr. **134**(9): 2330-2335.

Subar, A., J. Heimendinger, et al. (1995). "Fruit and vegetable intake in the United States: the baseline survey of the Five A Day for Better Health Program." American Journal of Health Promotion **9**(5): 352-360.

Tapogna, J., A. Suter, et al. (2004). "Explaining Variations in State Hunger Rates." Family Economics and Nutrition Review **16**(2): 12-22.

U.S. Department of Agriculture, National Agricultural Statistics Service (2004). "California State and County Data, 2002 Census of Agriculture." Volume 1, Geographic Area Series, Part 5. Washington DC.

U.S. Department of Agriculture, U.S. Department of Health and Human Services (2000). "Dietary Guidelines for Americans." Washington DC.

U.S. Department of Agriculture, U.S. Department of Health and Human Services (2005). "Dietary Guidelines for Americans." Washington DC.

Villarejo, D., Lighthall, D., Williams, D., Souter, A., Mines, R., Bade, B., Samuels, S. & McCurdy, S.A. (2000). Suffering in Silence: A Report on the Health of California's Agricultural Workers. Davis, CA: California Institute for Rural Studies.

Vozoris, N. T. and V. S. Tarasuk (2003). "Household Food Insufficiency Is Associated with Poorer Health." J. Nutr. **133**(1): 120-126.

Wakimoto, P., G. Block, et al. (2006). "Development and reliability of brief dietary assessment tools for Hispanics." Preventing Chronic Disease **3**(3): A95.

Weigel, M. M., R. X. Armijos, et al. (2007). "The Household Food Insecurity and Health Outcomes of U.S.–Mexico Border Migrant and Seasonal Farmworkers." Journal of Immigrant and Minority Health **9**(3): 157-169.

Wilde, P. and M. Nord (2005). "The Effect of Food Stamps on Food Security: A Panel Data Approach." Review of Agricultural Economics **27**(3): 425-432.

Winkleby, M., J. Snider, et al. (2003). "Cancer-Related Health Behaviors and Screening Practices among Latinos: Findings from a Community and Agricultural Labor Camp Survey." Ethnicity and Disease **13**: 376-386.

Winkleby, M. A., S. Kim, et al. (2006). "Ten-Year Changes in Cancer-Related Health Behaviors and Screening Practices among Latino Women and Men in California." Ethnicity and Health **11**(1): 1-17.

Wunderlich, G. S. and J. L. Norwood, Eds. (2006). Food Insecurity and Hunger in the United States: An Assessment of the Measure. Panel to Review U.S. Department of

Agriculture's Measurement of Food Insecurity and Hunger. Washington DC, The National Academies Press.

APPENDIX A: DEFINING AND MEASURING FOOD SECURITY

In 1990, the American Institute of Nutrition released definitions of food security, insecurity and hunger that are still considered standard today (Anderson 1990). These definitions are presented below in Table 13.

Table 13. Definitions of food security, food insecurity and hunger as developed by the American Institute of Nutrition. Source: (Anderson 1990).

Food Security	"Access by all people at all times to enough food for an active, healthy life. Food security includes at a minimum: (1) the ready availability of nutritionally adequate and safe foods and (2) an assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies)."
Food Insecurity	"Limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways."
Hunger	"The uneasy or painful sensation caused by a lack of food...a potential, although not necessary, consequence of food insecurity...Hunger may produce malnutrition over time."

Food security, as per the above definition, includes both a quantity (enough food) and a quality (nutritionally adequate and safe foods) component, as well as an access condition, in that people must be able to acquire food in a socially acceptable way. Food insecurity occurs when one or more of these criteria are not met. Depending on how food insecurity manifests itself and on its level of severity, hunger may or may not accompany it.

In the U.S., the standard measure of food security is the USDA's U.S. Household Food Security/Hunger Survey Module, or the "core module" as it is often called (Bickel et al. 2000). The core module consists of eighteen questions that determine a household's food security status. The core module is designed only to measure food insecurity that results from being unable to afford adequate food. It does not measure food insecurity caused by any other limitations, such as lack of time, illness, or lack of access to food retail. All questions in the core module are phrased so as to clarify that the situation to which the question refers has occurred as a result of a lack of money and not for some other reason. For example, a common phrasing reads: "Did you ever cut the size of your meals or skip meals *because there wasn't enough money for food [italics added]*?"

Depending on the answers that a respondent gives to the eighteen questions included in the core module, their household is scored on a continuum of food security/insecurity. In 2005, when this study was conducted, the continuum included four levels of food security and insecurity (Table 14). As the two categories of food insecurity with hunger tend to represent very small segments of most populations, they are often collapsed into the larger category of "food insecure with hunger."

Table 14. U.S. Household Food Security Scale categories of food security, as defined in the USDA's "Guide to Measuring Household Food Security." Source: (Bickel et al. 2000).

Food secure	"Households show no or minimal evidence of food insecurity."
Food insecure without hunger	"Food insecurity is evident in household members' concerns about adequacy of the household food supply and in adjustments to household food management, including reduced quality of food and increased unusual coping patterns. Little or no reduction in members' food intake is reported."
Food insecure with moderate hunger	"Food intake for adults in the household has been reduced to an extent that implies that adults have repeatedly experienced the physical sensation of hunger. In most (but not all) food-insecure households with children, such reductions are not observed at this stage for children."
Food insecure with severe hunger	"At this level, all households with children have reduced the children's food intake to an extent indicating that the children have experienced hunger. For some other households with children, this already has occurred at an earlier stage of severity. Adults in households with and without children have repeatedly experienced more extensive reductions in food intake."

As of 2006, the USDA began using new terminology to describe food security status, after an expert panel determined that the core module could not effectively measure the physical sensation of hunger (Wunderlich and Norwood 2006). However, although the terminology has changed, the way in which each of the new categories for food security status are measured is exactly the same as the way in which each of the corresponding old categories was measured. So, results from prior years can be compared to results from 2006 and forward as long as the changes in terminology are kept in mind. As this study was conducted in 2005, the old terminology is utilized. The old and new terminology are compared below (Table 15).

Table 15. Comparison of old and new terminology used by the USDA to describe food security status. Source: USDA ERS Briefing Room. Food Security in the United States: Hunger and Food Security. http://www.ers.usda.gov/Briefing/FoodSecurity/labels.htm.

Old Terminology	New Terminology	Description of New Terminology
Food secure	**High food security**	"No reported indications of food-access problems or limitations."
	Marginal food security	"One or two reported indications—typically of anxiety over food sufficiency or shortage of food in the house. Little or no indication of changes in diets or food intake."
Food insecure without hunger	**Low food security**	"Reports of reduced quality, variety, or desirability of diet. Little or no indication of reduced food intake."
Food insecure with hunger	**Very low food security**	"Reports of multiple indications of disrupted eating patterns and reduced food intake."