

Who is food-insecure in California? Findings from the California Women's Health Survey, 2004

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Abstract

Objective: To identify factors associated with food insecurity in California women.

Design: The California Women's Health Survey is an ongoing annual telephone survey that collects data about health-related attitudes and behaviours from a randomly selected sample of women. Food insecurity of the women was measured by a 6-item subset of the Food Security Module. Statistical procedures included chi-square tests, *t*-tests, logistic regression analysis and analysis of covariance.

Setting: California, USA.

Subjects: Four thousand and thirty-seven women (18 years or older).

Results: Prevalence of food insecurity was 25.7%. After controlling for income, factors associated with greater food insecurity were Hispanic or Black race/ethnicity; less than a 12th grade education; being unmarried; less than 55 years old; being Spanish-speaking; having spent less than half of one's life in the USA; sadness/depression; feeling overwhelmed; poor physical/mental health interfering with activities; and fair to poor general health. Among Food Stamp Program (FSP) participants, 71% were food-insecure. Among FSP-eligible women who had not applied for the programme, the prevalence of food insecurity was lower among women responding that they did not need food stamps than in women giving other reasons for not applying (23.9% vs. 66.9%, $P < 0.001$). Factors associated with food insecurity in FSP recipients included being unable to make food stamps last for 30 days, feeling overwhelmed, and having a birthplace in Mexico or Central America.

Conclusions: Along with several socio-economic variables, poor physical and mental health is associated with food insecurity. Whether food insecurity is a cause or effect of poor health remains in question.

Keywords
Food insecurity
Food Stamp Program
Women
California

Food security, defined as 'access by all people at all times to enough food for an active healthy life', is one of several conditions that support optimal human health and productivity^{1,2}. Households experience food insecurity when food availability or the ability to acquire nutritionally adequate, safe foods in socially acceptable ways is limited or uncertain. When food access becomes severely limited, adults and children in food-insecure households may experience overt hunger, 'the uneasy or painful sensation caused by lack of food'.

In 2004, 13.5 million US households (11.9% of all households) reported food insecurity at some point during the previous 12 months³. In 4.4 million households (3.9% of all US households), one or more individuals were hungry at least part of the year because they could not afford enough food. The prevalence of food insecurity is higher than the national average among households with incomes below the poverty level (36.8%); households with children headed by a single woman (33.0%) or man

(22.2%); Black households (29.7%); and Hispanic households (21.7%). Households located in central cities and non-metropolitan areas report greater food insecurity than those located in the suburbs and metropolitan areas outside central cities.

Although the prevalence of food insecurity is nearly six times higher in households with incomes below 185% of the poverty level than in households with incomes above that level, many factors, such as recent divorce, job loss or health problems, contribute to food insecurity and are not captured by the annual income measure⁴. There may also be local factors, such as lack of low-cost housing or transportation, that exacerbate food insecurity^{5–7}. Access to wild game, fish and gardens in rural areas increases food security^{5,8}. In low-income populations, food and financial life skills are associated with greater food security^{9,10}. Food-insecure adults are more likely to report physical and mental health problems, compared with those who are food-secure^{11–15}.

Food assistance programmes provide needy people with access to nutritious foods. However, demonstrating an impact of food assistance programmes on reducing food insecurity can be problematic in cross-sectional studies. A high prevalence of food insecurity and other nutritional problems is often reported among Food Stamp Program (FSP) recipients and may occur because the programme attracts and enrolls the neediest households¹⁶. Appropriate consideration of these selection bias problems is critical in evaluating and interpreting the relationship between food assistance participation and food insecurity.

From 2002 to 2004 in California, the prevalence of food insecurity (12.4%) exceeded the national average prevalence³. One factor in the high prevalence may be the large immigrant population in the state. California is the primary destination for immigrants to the USA, with slightly over half (56%) coming from Latin America and one-third (33%) from Asia¹⁷. In several of California's largest counties, including San Francisco, Los Angeles and Orange County, over 30% of the population is foreign-born. Low-income immigrant populations report very high levels of food insecurity¹⁸.

Identifying the subgroups at greatest risk of food insecurity is necessary to target social services efficiently. Given their role in feeding a family, low-income women, especially those in immigrant households, may be particularly vulnerable to food insecurity¹⁹. In the present study we use data from the 2004 California Women's Health Survey (CWHs) to identify factors associated with food insecurity among women, as determined by a 6-item subset of the Food Security Module (FSM). Since FSP recipients generally report high levels of food insecurity and their well-being is of particular interest to public health and social services programmes, we also examine factors related to greater food insecurity in this subpopulation of women.

Methods

The CWHs, coordinated by the Survey Research Group, is an ongoing annual telephone survey that collects data about health-related attitudes and behaviours from a randomly selected sample of women. A detailed description of the methodology is available elsewhere²⁰. The survey questions ask about past and present involvement in health-care systems, participation in public and food assistance programmes, food insecurity, prenatal care, breast-feeding, vitamin use, physical activity, substance use, utilisation of cancer-screening procedures, domestic violence, and demographic information. Trained interviewers conduct the interviews in English or Spanish. The questionnaire contains about 200 questions, and the English version takes about 30 min to administer. Data are collected monthly from January to December. The protocol pertaining to recruitment and data collection was

approved by the California Health and Human Services Committee for Protection of Human Subjects.

A screened random digit dial sample is used in the CWHs. All women who are 18 years and older and live in the selected household are eligible to participate in the survey. If more than one per household is eligible, one woman is randomly selected for an interview, conducted either at that time or later by appointment. Interviewers make two additional attempts to recruit participants who refuse initially to participate. Fifteen attempts are made to contact households with busy signals, no answer or message machines. The upper-bound response rate for CWHs in 2004 was 74%.

The questionnaire was developed by the California Women's Health Survey Group and staff working collaboratively with experts in women's health. Wherever possible, questions were selected from previously conducted national or statewide surveys to achieve comparability. Specific wording of the mental and physical health questions used in this study can be found in a summary report available online²¹.

The six food security items are a subset of the US Department of Agriculture (USDA) 18-item FSM and are recommended for use when the longer form is not feasible². The items were modified to refer only to the respondent and not to other adults in the household. The exact wording of the items was: (1) 'The food that I bought just didn't last, and I didn't have money to get more. Was that often, sometimes, or never true for you in the last 12 months?'; (2) 'I couldn't afford to eat balanced meals. Was that often, sometimes, or never true for you in the last 12 months?'; (3) 'In the last 12 months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food? Yes or No'; (4) 'If the response is "Yes", how often did this happen? Was it almost every month, some but not every month, or only in one or two months in the last 12 months?'; (5) 'In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food? Yes or No'; and (6) 'In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food? Yes or No'. Prevalence rates from the 6-item subset can be adjusted to be comparable to those estimated by the full 18-item instrument. However, since the short form does not contain any items specifically asking about inadequate food intake (i.e. skipping meals or cutting meal size) among children, it does not measure severe levels of hunger. The appropriate scoring for the short form, based on the number of affirmative responses, is: 0–1, food-secure; 2–4, food-insecure without hunger; 5–6, food-insecure with moderate hunger. In the logistic regression analyses, the dependent variable was coded in binary form as food-secure or food-insecure, the latter including with and without moderate hunger.

Of the 4557 interviews in the CWHs, 4037 (88.6%) were complete. Subjects providing complete interviews

were significantly more likely to be White, have higher incomes, less likely to be Hispanic/Latino, and less likely to be interviewed in Spanish than those with partial interviews. In the analysis, the data were weighted, based on guidance from the Survey Research Group, to reflect the age and racial/ethnic characteristics of the California population in the year 2000²⁰.

To identify factors associated with food insecurity, bivariate analyses were carried out using chi-square tests for the categorical and *t*-tests for the continuous variables. Selection of candidate variables was generally based on the literature reviewed above. In some cases categorical variables were collapsed into binary form. For example, low education was defined as: yes, <12 years; no, ≥12 years. We also included a self-reported item that specified whether the subject had ever been removed from her home by the state, county or court and went to live with people other than parents. The variable is considered a proxy for foster care and was included based on interest of the Department of Social Services. In the multivariate analyses, factors were tested for their relationship to food insecurity, controlling for income as a percentage of the federal poverty level. To minimise collinearity problems in the multivariate logistic regression analyses, variables were selected using stepwise procedures in three stages: (1) enter and select best demographic variables (age, education, race/ethnicity, household composition, employment status); (2) enter and select best immigrant status variables (Spanish-speaking, birthplace, proportion of life in the USA); and (3) enter and select best health correlates (general health, physical health, mental health). The final step examined the best candidate variables, significant at $P < 0.05$, from all three stages. A separate analysis of covariance was carried out among women who were receiving food stamps. An additional variable considered in the stepwise selection process for this subgroup included whether or not food stamps lasted 30 days. SAS version 8.0 (1999–2001) was used in all analyses (SAS Institute). The protocol for the data analysis reported here was exempted from human subjects review by the University of California Institutional Review Board.

Results

As shown in Table 1, the prevalence of food insecurity in the general population of women was 25.7%. Of these women, 17.7% were food-insecure without hunger and 8.0% were hungry. As expected, among the 225 women participating in the FSP, the prevalence of food insecurity was higher. About 71% of these women were food-insecure and, of these, 26% were hungry. Among FSP-eligible women who had not applied for the programme, the level of food insecurity was lower among women responding that they did not need food stamps than in women giving other reasons for not applying (23.9% vs. 66.9%, $P < 0.001$). Although low income is a major

determinant of food insecurity, almost 10% of the women with incomes of 250% of the federal poverty level or higher also reported some level of food insecurity.

Bivariate analyses

In the bivariate analyses in the general population, food insecurity was associated with several demographic, immigrant- and health-related variables (Tables 1 and 2). In addition to low income, some factors associated with greater food insecurity included the following: children in the home; female-headed household (single mother); being separated or part of an unmarried couple; pregnancy; younger age (18–24 years); having less than a 12th grade education or General Equivalency Degree; Black or Latino/Hispanic race/ethnicity; unable to work or out of work for more than a year; ever removed from one's home as a child (i.e. placed in foster care); and lack of health insurance. Immigrants reported higher levels of food insecurity than non-immigrants. Several indicators of mental, physical or emotional problems were also associated with greater food insecurity, including having a mental, physical or emotional problem that interferes with activities; having fair to poor health; being depressed or sad; and feeling overwhelmed.

Fewer of the above factors were significantly different among food-secure and food-insecure FSP recipients. However, the prevalence of food insecurity continued to vary by race/ethnicity: White (not Hispanic), 53.7%; Black (not Hispanic), 60.8%; Latino/Hispanic, 82.2%; and Other, 86.5% ($P < 0.0002$). Women who could not make food stamps last for an entire month were more food-insecure than those who could (78.3% vs. 49.8% food-insecure, $P < 0.0001$). The prevalence of food insecurity was also higher among FSP recipients who were foreign-born (86.8%) compared with US-born (61.7%, $P < 0.0001$); interviewed in Spanish (87%) rather than English (64.5%, $P < 0.0006$); and had less than 12 years of education (78.9%) compared with more education (66.4%, $P < 0.04$). Pregnant FSP recipients tended to report greater levels of food insecurity (89%) than non-pregnant recipients (69.7%, $P < 0.07$). Other factors significantly related to greater food insecurity included feeling overwhelmed, sadness and depression, and having spent a lower proportion of one's life in the USA (data not shown).

Multivariate analyses

In the multivariate logistic regression analyses in the general population, several factors remained independently associated with the odds of being food-insecure, after controlling for income as a percentage of the federal poverty level and all variables in the model (Table 3). Factors that increased the odds of food insecurity were Latino/Hispanic race/ethnicity; Black race/ethnicity; less than a 12th grade education; being unmarried; under 55 years of age; Spanish-speaking (i.e. interviewed in Spanish); and having spent less than half of one's life in

Table 1 Prevalence of food insecurity among California women, by selected household characteristics, 2004

Category	Total no. (%)	Food-secure (%)	Food-insecure		
			All (%)	Without hunger (%)	With hunger (%)
All	4037 (100)	74.3	25.7	17.7	8.0
<i>Household composition</i>					
With children, < 18 years					
Yes	1897 (46.8)	66.8	33.3	23.7	9.5
No	2140 (53.0)	81.0	19.0	12.4	6.6
With children, 6–12 years					
Yes	1005 (24.9)	63.8	36.2	25.7	10.5
No	3030 (75.1)	77.8	22.3	15.1	7.1
With children, < 6 years					
Yes	989 (24.5)	64.2	35.8	25.9	9.9
No	3045 (75.5)	77.6	22.4	15.1	7.3
Single mother					
Yes	669 (16.6)	52.0	48.0	33.2	14.8
No	3367 (83.4)	78.7	21.3	14.7	6.6
Pregnant woman					
Yes	125 (3.1)	62.9	37.1	30.1	7.1
No	3910 (96.9)	74.7	25.3	17.3	8.0
<i>Age of woman</i>					
18–24 years	498 (12.4)	59.9	40.1	30.7	9.4
25–34 years	829 (20.5)	67.7	32.3	22.9	9.3
35–44 years	879 (21.8)	75.6	24.4	17.1	7.3
45–54 years	718 (17.8)	75.3	24.7	14.4	10.3
55–64 years	450 (11.1)	78.9	21.1	12.1	8.9
65–98 years	663 (16.4)	87.4	12.6	9.7	2.9
<i>Birthplace</i>					
United States	2866 (71.2)	81.0	19.0	12.3	6.7
Mexico	540 (13.4)	38.4	61.6	45.2	16.4
All other	618 (15.4)	74.7	25.3	18.8	6.5
<i>Race/ethnicity of woman</i>					
White, not Hispanic	2173 (53.8)	85.5	14.6	8.2	6.4
Black, not Hispanic	252 (6.3)	63.3	36.7	24.2	12.5
Hispanic/Latino	1055 (26.1)	50.6	49.4	37.3	12.1
Other, not Hispanic	557 (13.8)	80.7	19.3	15.1	4.3
<i>Ever in foster care*</i>					
Yes	116 (2.9)	58.4	41.6	19.7	22.0
No	3915 (97.1)	74.8	25.2	17.7	7.6
<i>Household income-to-poverty ratio</i>					
Under 1.00	632 (16.9)	35.8	64.2	43.0	21.2
1.00–1.29	226 (6.0)	50.5	50.0	30.0	19.5
1.30–1.85	417 (11.2)	61.7	38.3	26.7	11.6
1.86–2.00	68 (1.8)	66.5	33.5	21.3	12.2
2.01–2.49	291 (7.8)	75.7	24.3	17.8	6.5
2.50 +	2103 (56.3)	90.5	9.5	7.0	2.5
All < 2.00		52.8	47.2	31.9	15.3
<i>Have health insurance</i>					
Yes	3345 (82.9)	79.4	20.7	14.3	6.3
No	692 (17.1)	49.9	50.1	34.1	16.0
<i>Have any health or mental problem that interferes with activities</i>					
Yes	812 (20.1)	64.5	35.5	21.5	14.0
No	3221 (79.9)	76.8	23.2	16.8	6.5
<i>Education</i>					
Low (< 12 years)	590 (14.6)	38.2	61.8	45.4	16.4
< 9th grade	291 (7.2)	31.2	68.8	50.3	18.5
Some high school	299 (7.4)	45.0	55.1	40.6	14.4
High school/GED	901 (22.3)	68.0	32.0	21.6	10.4
Some technical	24 (0.6)	79.9	20.1	13.8	6.4
Technical school	53 (1.3)	84.8	15.3	10.2	5.1
Some college	1076 (26.7)	78.1	21.9	13.3	8.7
College graduate	850 (21.1)	88.4	11.7	8.7	3.0
Postgraduate	543 (13.5)	93.3	6.7	5.2	1.5

Table 1. *Continued*

Category	Total no. (%)	Food-secure (%)	Food-insecure		
			All (%)	Without hunger (%)	With hunger (%)
<i>Marital status</i>					
Married	2172 (53.9)	80.5	19.5	14.5	5.0
Divorced	476 (11.8)	65.5	34.5	18.0	16.5
Widowed	330 (8.2)	82.7	17.3	10.8	6.5
Separated	123 (3.1)	42.0	58.0	32.0	25.9
Never married	676 (16.8)	71.8	28.2	21.5	6.7
Unmarried couple	256 (6.3)	48.9	51.0	37.5	13.6
<i>Interviewed in Spanish</i>					
Yes	600 (14.9)	34.9	65.1	48.3	16.9
No	3437 (85.1)	81.2	28.8	12.4	6.4
<i>Employment status</i>					
Full-time	1306 (32.4)	80.0	20.0	13.8	6.3
Part-time	528 (13.1)	71.1	28.9	20.7	8.8
Self-employed	276 (6.9)	84.9	15.1	10.5	4.7
Out of work > 1 year	112 (2.8)	47.7	52.3	35.6	16.7
Out of work < 1 year	153 (3.8)	63.9	36.1	25.5	10.6
Homemaker	706 (17.5)	68.1	31.9	23.5	8.5
Student	221 (5.5)	72.1	27.9	23.5	4.3
Retired	517 (12.8)	90.4	9.6	7.3	2.2
Unable to work	214 (5.3)	39.2	60.8	30.8	30.0
<i>Self-reported general health</i>					
Good to excellent	3334 (82.6)	80.0	20.1	14.2	5.9
Fair to poor	703 (17.4)	47.6	52.4	34.5	17.9

GED – General Equivalency Degree.

* Asks if subject had ever been removed from her home by the state, county or court, and went to live with people other than parents.

the USA. Other significant correlates of food insecurity included sadness/depression for two or more days during the previous month; feeling overwhelmed; poor physical/mental health interfering with activities; and general health being fair to poor. Several interactions were examined including those between being Spanish-speaking, having children at home and having low education, but none was significant.

In a separate analysis among FSP recipients only, analysis of covariance was used to identify variables that were significantly and independently related to greater food insecurity, expressed as a continuous variable (Table 4). These variables included being unable to make food stamps last for an entire month, being Spanish-speaking and feeling overwhelmed. Several interactions were examined but none was significant. The variables in

Table 2 Health-related and other variables associated with food insecurity among California women, 2004

Variable	Food-secure	Food-insecure
Years in the USA*	22.5 ± 15.8 (n = 603)	16.5 ± 11.5 (n = 472)
Proportion of life in the USA (0–1.0)	0.89 ± 0.23 (n = 3054)	0.72 ± 0.32 (n = 957)
Poor physical health (days)†	3.7 ± 7.1 (n = 3057)	6.6 ± 9.5 (n = 960)
Poor mental health (days)†	3.4 ± 6.2 (n = 3064)	7.2 ± 9.5 (n = 959)
Feeling overwhelmed (1 = very often to 5 = never)	4.2 ± 0.9 (n = 3066)	3.2 ± 1.3 (n = 967)
Feeling sad/depressed (days)†	3.5 ± 5.8 (n = 3065)	8.1 ± 9.1 (n = 967)
Poor mental or physical health interfered with activities (days)†	1.9 ± 5.2 (n = 3065)	4.9 ± 8.2 (n = 965)
Age (years)	46.7 ± 16.4 (n = 3069)	39.3 ± 14.8 (n = 968)

Data are presented as mean ± standard deviation.

All differences significant at $P < 0.0001$ (*t*-test).

* Among foreign-born women only.

† Each of these questions was coded as the number of days in the past month that the health problem occurred. For example, poor physical health was captured as: 'Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good? Response: ____ Number of days'.

Table 3 Variables independently associated with food insecurity in California women, 2004 (*n* = 4037)

Independent variable	Adjusted odds ratio* (95% confidence interval)
Race/ethnicity	
Latino/Hispanic	1.45 (1.07, 1.96)
African American	1.76 (1.21, 2.58)
Asian/Other	0.88 (0.63, 1.22)
White	1.00
Education	
Less than 12 years	2.03 (1.52, 2.72)
12 years/GED or more	1.00
Marital status	
Married	0.64 (0.52, 0.80)
Not married	1.00
Age	
Under 55 years	1.59 (1.23, 2.07)
55 years and older	1.00
Spanish-speaking (interviewed in Spanish)	
Yes	1.91 (1.27, 2.87)
No	1.00
Less than half of life spent in the USA	
Yes	1.56 (1.14, 2.15)
No	1.00
Sadness/depression	
2 or more days of month	1.61 (1.28, 2.02)
None/less than 2 days	1.00
Feel overwhelmed in past 30 days	
Very often/often/sometimes	3.10 (2.49, 3.85)
Rarely/never	1.00
Physical/mental health interfered with normal activities in past 30 days	
Yes (1 or more days)	1.81 (1.45, 2.27)
No (0 days)	1.00
General health	
Fair/poor	1.49 (1.14, 1.95)
Excellent/very good/good	1.00

GED – General Equivalency Degree.

*Adjusted for income as % of federal poverty ratio (multivariate logistic regression analysis).

the final model, which controlled for pregnancy status, education and income, accounted for about 20% of the variance in food insecurity.

Discussion

In this population of California women, the correlates of food insecurity are similar to those identified in other regional and national studies³. Low income is one of the strongest predictors, but other factors independently associated with food insecurity include race/ethnicity,

marital status, less than a 12th grade education and immigrant status. Several indicators of poor physical, mental and emotional health are also associated with food insecurity. This study, like most other studies that have reported associations between food insecurity and physical/mental health, is cross-sectional in design^{11,12,14,15}. One panel study also reported a significant association between changes in household food insufficiency and changes in mental health status among welfare recipients¹³. Nevertheless, whether food insecurity is a cause or effect of deterioration in mental health remains in question.

The unique contribution of our study is the examination of food insecurity, as experienced by women, in a large population-based, ethnically diverse sample. Whereas other studies ask about hunger among all adults in the household, the CWHs directs the questions to the individual female respondents. Our estimate of food insecurity among California women (25.7%) is more than twice as high as the figure (12.4%) reported by the Current Population Survey (CPS) for California households from 2002 to 2004³. The prevalence of food insecurity in this study is also higher than that previously reported in the California Health Interview Survey (CHIS)⁶. Conducted in 2003, the CHIS estimate of food insecurity prevalence among households with incomes less than 200% of the federal poverty level is 33.9%, compared with the estimate of 47.2% for the same income level in 2004. Although estimates from the CWHs and the CHIS are from two different years, the most likely reason for the difference lies in the methodology and specifically the wording of the questions in the surveys. In the CWHs, the six items (as detailed under methods) refer to food insecurity as it directly affects the individual woman responding to the survey. In the CHIS, the questions are worded to capture food insecurity among all adult household members. Since women tend to compromise their own food intakes to spare other family members¹⁹, the CWHs might be expected to yield a higher estimate than the CHIS and the CPS. Although not strictly comparable, reports from the CPS indicate that single women (living alone or with children) report higher levels of food insecurity than do single men (living alone or with children)³.

Table 4 Variables independently associated with food insecurity* in low-income California women who are food stamp recipients, 2004

Independent variable	Regression coefficient	Standard error	P-value
Food stamps last 30 days (1 = no, 0 = yes)	1.66811	0.30043	<0.0001
Born in Mexico or Central America (1 = yes, 0 = no)	0.74462	0.31155	<0.0177
Felt overwhelmed in past 30 days (range 1–5, where 1 = never and 5 = very often)	–0.30030	0.09183	<0.0001
Pregnancy status (1 = yes, 0 = no)	0.64954	0.44400	NS
Maternal education (range 1–8)	0.09839	0.07520	NS
Income, as % of federal poverty ratio	–0.08379	0.08197	NS

NS – not significant.

*Food insecurity is the dependent variable (range 0–6, where 0 = least and 6 = most food-insecure); *n* = 225, adjusted *R*² = 0.19.

Interestingly, our estimate of the prevalence of food insecurity among Latino/Hispanic women is almost identical (49.4% vs. 50.4%) to that reported in another recent survey, using the 10-item FSM, conducted in California in 2001 among more than 500 low-income Latina mothers with young children²². Although being interviewed in Spanish was strongly associated with greater food insecurity, other variables related to immigrant status (e.g. born in Mexico or Latin America) were similarly related. Moreover, in the multivariate analyses, the association was independent of income, household size and the woman's educational level. More analyses are needed to determine why the immigrant population is at particularly high risk of food insecurity. One possibility is that in households with recent immigrants, women attempt to spare both their children and husbands from hunger by reducing their own food intakes first, whereas in other types of households all adults share the burden more equally²³. Another possibility is that these households experience more confusion regarding food selection in American stores, compared with English-speaking, non-immigrant women. In focus groups with Mexican immigrants, this problem was mentioned as contributing to food insecurity, along with seasonal unemployment, lack of transportation and high cost of food. Immigrant families may, in effect, also be larger than reported to social services if some income is sent home as remittances or households temporarily shelter new arrivals from their countries of origin. Finally, immigrant women may not know how to access food assistance programmes or realise that their US-born children are potentially eligible for these programmes²⁴. They may also be afraid of applying for food assistance if they are undocumented immigrants. An important caveat to mention about the dataset is that interviews were conducted only in English and Spanish, and therefore immigrants who speak other languages are under-represented in the survey. Thus, other non-English-speaking immigrant groups may also be at increased risk of food insecurity.

The findings confirm that the FSP attracts and serves a relatively needy population, yet food insecurity persists among many recipients. An important and possibly modifiable factor contributing to food insecurity among FSP recipients is the inability to make food stamps last for an entire month. In Connecticut, inability to make food stamps last for a month was similarly related to food insecurity, independent of total food stamp allotment and maternal formal education¹⁰. Interventions teaching life skills, including shopping, menu planning and food preparation skills, may help increase food security in FSP recipients. A better system of client referrals to the community nutrition education programmes, such as the Food Stamp Nutrition Education and the Expanded Food and Nutrition Education Program, may be needed to provide this education. The federal Special Supplemental

Nutrition Program for Women, Infants, and Children (WIC), which provides both food assistance and nutrition education, is another important way to improve food security in low-income women. A study reported that pregnant WIC participants with higher level educational levels were more likely to become food-secure, as a result of receiving WIC services, than less-educated participants²⁵. To improve food insecurity among low-income women with less education and/or limited English proficiency, more nutrition education contacts and greater coordination among USDA programmes may be needed.

Our findings also indicate that food-insecure women report more mental, physical and emotional problems than those who are food-secure. A cross-sectional study cannot determine the direction of causation. However, it is clear that these issues are present and need to be addressed to make public health and economic interventions more effective in improving food security.

In summary, the present study has identified important factors that social services and public health agencies should consider in developing outreach and educational interventions to improve food security.

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