Acculturation, Education, Nutrition Education, and Household Composition Are Related to Dietary Practices among Cambodian Refugee Women in Lowell, MA

JERUSHAL NELSON PETERMAN, PhD, RD; LINDA SILKA, PhD; ODILIA I. BERMUDEZ, PhD, MPH; PARKE E. WILDE, PhD; BEATRICE LORGE ROGERS, PhD

ABSTRACT
Refugees in the United States have higher rates of some chronic diseases than US-born residents or other first-generation immigrants. This may be partially a result of dietary practices in the United States. There is limited information about which factors are related to dietary practices in refugee populations, particularly those who have been in the United States for 10 to 20 years. Research with Cambodian communities may be useful for examining the relationship between refugee characteristics and dietary practices. Two focus groups (n = 11) and a survey (n = 150) of Cambodian refugee women were conducted in Lowell, MA, from 2007 to 2008. χ² analyses, t tests, and analysis of variance tests were used to describe differences in dietary practices (24-hour recall and a targeted qualitative food assessment) by group characteristics. Higher acculturation was related to higher likelihood of eating brown rice/whole grains, and to lower likelihood of eating high-sodium Asian sauces. Higher education was related to higher likelihood of eating vegetables and fruits and to eating white rice fewer times. Nutrition education and receiving dietary advice from a health care provider were related to higher likelihood of eating whole grains/brown rice. Having a child at home was related to a higher likelihood of eating fast food. Among Cambodian refugees who have been in the United States for 10 to 20 years, dietary practices appear to have a relationship with acculturation (positive association), the interrupted education common to refugees (negative association), nutrition education from either programs or health care providers (positive association), and having a child at home (negative association).


More than 500,000 refugees have been resettled in the United States since 2000, with tens of thousands more expected each future year (1). Compared with US-born residents and other first-generation immigrants, refugees have high rates of heart disease, hypertension, and type 2 diabetes (2-4). The refugee experience and its associated trauma and stress increase risk of chronic disease (5,6). Postmigration changes in lifestyle might also contribute.

As a subgroup of immigrants, refugees may have postmigration dietary changes similar to those of nonrefugee immigrants. A large body of research documents health-related lifestyle changes among immigrants in the United States, although actual changes differ by ethnic group (7-15). Research using varied measures of acculturation or exposure to US culture has shown that as acculturation increases, dietary practices change in both potentially harmful (9,11,16-20) and beneficial (7,11,16,18,21) ways. Having a child at home can influence family eating through interactions with American-style foods (22,23). Past educational experience may also influence eating (24,25). Nutrition education, whether through a nutrition education class/program (26-28) or as advice from a health care provider (29) may improve dietary practices.

Compared with other immigrants, refugees have distinct experiences and personal characteristics that may influence how they react to the US food environment. Many refugees come from war and trauma (30) and have low education/literacy (18,30,31), which may impact interaction with host culture and food (32-34). To date, there are limited data on refugee dietary practices and
personal characteristics, and most focus on the first few years after resettlement (18,19,32,33,35-38).

Research with Cambodian refugee communities can serve as a refugee model. Cambodian refugees survived trauma, food insecurity, interrupted education, and social upheaval, all common refugee experiences (39,40). Many Cambodian refugees have been in the United States since the mid-1980s (30), allowing an assessment of long-term dietary changes. This article presents a description of dietary practices of Cambodian refugee women nearly 20 years postmigration to the United States, and investigates how acculturation, education, exposure to nutrition information/education, and family composition are associated with specific dietary practices linked to health outcomes.

METHODS

Design
In conjunction with Cambodian Community Health 2010 (a Centers for Disease Control and Prevention program to reduce health disparities [30]), the Cambodian Mutual Assistance Association of Greater Lowell, Inc (a Cambodian Community Health 2010 partner) and the Lowell Community Health Center (the Cambodian Community Health 2010 lead agency) examined dietary practices of Cambodian women aged 35 to 60 years from 2007 to 2008 in Lowell, MA. Because a main goal of the study was a detailed description of foods and because Cambodian women are the primary food preparers, only women were included.

All procedures were approved by the Institutional Review Board of the University of Massachusetts Lowell, to which the Institutional Review Board of Tufts University deferred. Informed consent was obtained from all participants. All materials were made available to participants in English and Cambodian.

Instruments, Sample Selection, and Survey Administration

Two focus groups were conducted to describe general dietary practices. Participants were recruited through community organizations in Lowell.

Results of the focus groups were used to develop questions and wording for a survey, which was administered to a random sample of women from a comprehensive list (estimated 70% to 90%) of Cambodian households in Lowell. Full details on sampling frame construction, sample selection, and survey testing were reported previously (34).

Five female and one male bilingual, biliterate Cambodian Americans administered the survey. Administrators received 40 hours of presurvey training and weekly training throughout survey administration. Administrators contacted households in person and made follow-up visits when eligibility was not determined or an eligible woman was unavailable. They read survey questions to participants and recorded answers. No financial incentive was provided, but all ineligible Cambodian households and, on completion of the survey, all participants, received Cambodian-focused Cambodian Community Health 2010 nutrition education materials.

Dietary Assessment

Culturally important dietary practices were described by focus group participants. In the survey, dietary practices were measured through a targeted qualitative food assessment and a 24-hour dietary recall.

The targeted assessment included foods identified in focus groups and in experiences through Cambodian Community Health 2010 that may be consumed less frequently than one time per week, but which may have health implications when consumed regularly. It was not intended to estimate nutrients. Participants were asked how often they eat foods in eight categories, including fast food, which was then broken down by McDonald’s (Oak Brook, IL), Burger King (Miami, FL), Wendy’s (Dublin, OH), Kentucky Fried Chicken/KFC (Atlanta, GA), and other (described by each participant); chicken and other birds with skin, including cultural examples; foods made with coconut milk; diet soda; regular soda; eggs; meat with fat, including cultural examples; and brown rice. Responses were categorized as never, less than once a month, once a month, two to three times a month, once a week, twice a week, three to four times a week, five to six times a week, every day, and two or more times a day. Participants were also asked to describe the foods within the categories. Results are reported for whether the respondent ate fast food two or more times a month and brown rice one or more times a month because for these foods survey participants reported a frequency of consumption that may have considerable health consequences.

The 24-hour dietary recall included all foods and beverages consumed the day before the survey. Participants estimated ingredient amounts and portion sizes using standard bowls, cups, and measuring cups and spoons provided by survey administrators. To address the concern that dietary recalls may distort amounts through standardized recipes (41), all ingredients were recorded and number of eating instances, rather than amounts eaten, were calculated. Reference day dietary practices were derived from the 24-hour dietary recall. Reference day practices reported are: ate white rice, ate any whole grain, ate an Asian sauce, and ate a vegetable or fruit at least once. Mean ± standard deviation is reported for times eating white rice, times eating an Asian sauce, and times eating a vegetable or fruit.

Personal Characteristics

Acculturation was measured with the 10-question Psychological Acculturation Scale, developed by Tropp and colleagues (42) to measure how cultural identification influences behaviors. It was translated/adapted and validated for use in this population (43). Cronbach’s α was used to test reliability (score of .87, indicating high internal reliability). Validity was assessed through Spearman rho correlations with measures of exposure to US culture that have previously been used to assess acculturation. Measures and correlations were years living in the United States (r = 0.35, P < 0.01), age at immigration (r = −0.30, P < 0.01), whether the participant ever speaks English at home (r = 0.36, P < 0.01), whether the participant reads English easily (r = −0.25, P < 0.01), and whether the participant graduated from high school in the United States (r = 0.24, P < 0.01). On the 5-point scale, 1 represents identifying entirely with Cambodians, 5 represents identifying entirely with Americans, and 3 represents identifying equally with Cambodians and Americans. For analysis, acculturation was divided into low (bottom half, ≤2.11) and high (top half, > 2.11).
Education was divided into ≤1 year, some primary school or some high school (some education), and high school graduate. Some primary and some high school education were combined because of the sporadic nature of education in this population. Some participants received limited primary education in Cambodia or refugee camps, and on arrival in the United States were enrolled in high school but did not graduate. Others attended no school in either Cambodia or refugee camps, then on arrival in the United States were enrolled in high school but did not graduate.

Binary variables were created for whether a participant had attended a nutrition education class and had a child younger than 18 years old living at home. The survey asked whether respondents had been advised to change specific eating practices by a health care provider. For dietary practices reported, relevant advice was to eat more brown rice or whole grains, less white rice, fewer/less Asian sauces/salt, and more vegetables and fruits.

Statistical Analyses
Data were analyzed using Predictive Analytic SoftWare (version 18.0, 2009, IBM Corporation, Somers, NY). Descriptive statistics for dietary practices (outcomes) were estimated for the full sample and separately by population characteristic. For the explanatory variables with two categories (acculturation, nutrition education, receiving medical advice, and having a child younger than 18 years old at home), simple χ² analyses were used to determine differences in percentages of binary outcomes and t tests were used to compare means for continuous outcomes. For the explanatory variable with more than two categories (education), analysis of variance tests with least significant difference post-hoc analyses were used to determine differences for all outcomes.

RESULTS AND DISCUSSION

Focus Groups
The two focus groups had a total of 11 participants (age range mid-30s to mid-60s). Participants placed high cultural value on vegetables and fruits, herbs, white rice, and Asian sauces. They identified a wide variety of Asian vegetables, fruits, and herbs, as healthy, very culturally important, and something that most people would eat daily. White rice was also identified as an everyday staple. High-sodium Asian sauces were considered an integral part of daily dishes, such as stir fry and soups (Figure). Participants noted that amount and type of sauce and vegetables, fruits, and herbs are a family/personal preference.

Some women in focus groups reported making two separate meals for their families, with American-style foods such as hot dogs and chicken nuggets for children, and Cambodian-style foods for adults. This result is consistent with previous reports from relatively recently resettled refugees where adolescents preferred both American and native foods, while parents preferred only native foods (35), and where adolescent dietary preferences where influenced by their American peers (19).

Survey
Surveys were administered to 160 women, 150 of which had responses to all variables examined in this article. The response rate was 81.6%; 27 eligible women refused to participate and no contact was made at nine selected households, despite multiple visits.

Mean age of respondents was 46 ± 7.6 years old (range = 35 to 60 years). Mean time in the United States was 18.7 ± 7.7 years. Acculturation was generally low (mean = 2.1 ± 0.7 years), and 94% had a score ≤ 3, indicating very high identification with Cambodians. Education was generally low, with 23% of participants reporting ≤1 year, 54% reporting some education, and 23% reporting that they were high school graduates. Thirteen percent had attended at least one nutrition education class and 59% had a child younger than 18 years old living at home.

Foods identified as culturally important were consumed by many participants in the reference day (Figure), which is similar to a report that cultural values affect dietary practices for Hmong refugees (32). Almost all participants (93%) ate at least one vegetable or fruit (Figure and Table), and 79% ate at least one herb/spice (Figure) in the reference day. Eighty-nine percent of participants ate white rice at least once and 83% ate at least one Asian sauce (Figure and Table).

By Population Characteristic
Participants in the high acculturation category more commonly reported consuming brown rice one or more times per month than those in the low category, and more commonly reported eating a whole grain in the reference day \( (P = 0.07) \) (Table). This is similar to a study in which US-born Korean-American women (identified as more acculturated by the authors) consumed more whole grains than Korean-born Korean-American women (20). Whole grains are linked to reduced risk of cardiovascular disease, stroke, (44) and diabetes (45), which are outcomes of concern in this Cambodian (30) and other refugee (39,46,47) populations. Because whole-grain consumption was low even among more acculturated respondents, the entire community might benefit from programs promoting whole-grain consumption.

Participants in the high acculturation category less commonly reported eating any Asian sauce in the reference day than those in the low category, and they also ate sauces fewer times (Table). In previous research, more acculturated Vietnamese refugees reported eating fewer salty foods (24). High sodium consumption is linked to high blood pressure (48), and this is a concern among Lowell’s Cambodians, who have high rates of high blood pressure and stroke (30). Using as a guide the information from focus groups that families use different types, numbers, and amounts of Asian sauces in cooking, culturally tailored education might focus on using less of each sauce and layering fewer sauces in traditional Cambodian dishes rather than entirely eliminating these culturally important sauces.

On the reference day, participants with the lowest education least commonly ate any vegetable or fruit, while high school graduates most commonly ate any vegetable or fruit. Participants with ≤1 year of education ate vegetables or fruits fewer times than those with some education and high school graduates (Table). This pattern is similar to reports in Chinese immigrant (23) and Vietnamese refugee (24) populations. High school graduates also consumed white rice the least number of times (Ta-
ble). This is significant because refined grain consumption (including white rice) may be related to increased risk of heart disease and type 2 diabetes (49). Limited education is a shared characteristic of refugees (33,50), whose education is often disrupted. These results emphasize the need to tailor refugee health education to those with lower education/literacy levels.

Respondents who had received nutrition education, whether through a nutrition education class or as advice from a health care provider, were more likely to report consuming whole grains. More respondents who had attended a nutrition education class reported eating brown rice one or more times a month than those who had not attended a class (Table). More respondents who had received medical advice to consume more brown rice or whole grains reported eating brown rice one or more times a month and eating a whole grain in the reference day than those who had not received such advice (Table). These results suggest that nutrition education may be a useful tool for increasing whole-grain consumption in this community.

Almost half (44%) of those with children at home reported eating fast food two or more times per month, compared with only 13% of those without children at home (Table). Fast-food consumption has been linked to increased risk of overweight/obesity (51). Together with focus group member reports that those with children sometimes make American-style meals of hot dogs and chicken nuggets for their children, this result indicates a need to provide education to parents on which American foods are healthy choices, especially for children.

This research contributes information about dietary practices of Cambodian women, for which there is very limited existing information. The comprehensive sampling frame and random sample mean that these results are likely applicable to other Cambodian women aged 35 to 60 years in the United States. They may also potentially be applied to other refugee women with common experiences and characteristics, particularly acculturation status and education, and may be useful in considering long-term health needs of refugees.

<table>
<thead>
<tr>
<th>Foods identified as culturally important in focus groups</th>
<th>Examples</th>
<th>Uses</th>
<th>Reference day consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables and fruits</td>
<td>Asian/Chinese broccoli, Asian/Chinese watercress, Thai eggplant, Onion, Garlic, Scallion, Carrot, Buttercup squash, Bitter melon, Fuzzy melon, Thai and jalapeno pepper, Watermelon, Green papaya, Green mango, Pineapple, Persimmon</td>
<td>Stir fry dishes, Soups, Eating raw and dipping in salt/spicy pepper/sugar mixes</td>
<td>93% ate at least one, 74% ate at least two, 41% ate at least three</td>
</tr>
<tr>
<td>Herbs and spices</td>
<td>Ginger, Galangal, Turmeric, Lemongrass, Kaffir lime leaves, Basil, Mint, Cilantro, Asian herbs with no English equivalent (large variety)</td>
<td>Stir fry dishes, Soups, Pastes, Additions to many foods at the table (1/4-1/2 cup or more per serving of herbs)</td>
<td>79% ate at least one, 52% ate at least two, 37% ate at least three</td>
</tr>
<tr>
<td>Asian sauces</td>
<td>Fish sauce (~1,400 mg sodium/tablespoon), Oyster sauce (~500 mg sodium/tablespoon), Hoisin sauce (250-400 mg sodium/tablespoon), Soy sauce (~900 mg sodium/tablespoon), Sweet soy sauce (~700 mg sodium/tablespoon), Fish paste (sodium content varies; 500+ mg sodium/tablespoon)</td>
<td>Stir fry dishes, Soups, Pastes</td>
<td>83% ate at least once, 48% ate at least twice, 46% ate at least two types</td>
</tr>
</tbody>
</table>

Figure. Culturally important Cambodian refugee dietary practices as identified by focus group members (n=11).
rupted education (33,50) may adversely affect vegetable and outcomes of refugees. The common experience of inter-
ventions, particularly when considering the long-term health should be considered when providing nutrition-related ser-
vice and decreasing Asian sauce consumption.

Future programs could also work toward increasing whole-grain consump-
tion and the focus point of nutrition education. Future programs to promote good health. In this community, a wide variety
of groupings (52), is not able to provide dietary intake, which, although appropriate for estimat-
ing mean daily intake of groups (52), is not able to provide results. We used a single 24-hour recall to estimate usual
dietary intake, which, although appropriate for estimat-
ing mean daily intake of groups (52), is not able to provide

Table. Dietary practices: Overall and by sample characteristics for Cambodian refugee women (n=150)

<table>
<thead>
<tr>
<th>Targeted Food Assessment Practices</th>
<th>24-Hour Dietary Recall Practices (Reference Day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast food ≥2×/month</td>
<td>Brown rice ≥1×/month</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
</tr>
<tr>
<td>Acculturation</td>
<td></td>
</tr>
<tr>
<td>Low (n=78)</td>
<td>25 (32.1)</td>
</tr>
<tr>
<td>High (n=72)</td>
<td>22 (30.6)</td>
</tr>
<tr>
<td>P valueb</td>
<td>0.492</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>≤1 year (n=35)</td>
<td>10 (28.6)</td>
</tr>
<tr>
<td>Some school (n=81)</td>
<td>25 (30.9)</td>
</tr>
<tr>
<td>High school graduate (n=34)</td>
<td>12 (35.3)</td>
</tr>
<tr>
<td>P valueb</td>
<td>0.827</td>
</tr>
<tr>
<td>Nutrition education</td>
<td></td>
</tr>
<tr>
<td>None (n=130)</td>
<td>40 (30.8)</td>
</tr>
<tr>
<td>≥1 class (n=20)</td>
<td>7 (35.0)</td>
</tr>
<tr>
<td>P valueb</td>
<td>0.797</td>
</tr>
<tr>
<td>Advised by health care provider to change eatinga</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4 (30.8)</td>
</tr>
<tr>
<td>P valueb</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Child younger than 18 years old at home</td>
<td></td>
</tr>
<tr>
<td>No (n=62)</td>
<td>8 (12.9)</td>
</tr>
<tr>
<td>Yes (n=88)</td>
<td>39 (44.3)</td>
</tr>
<tr>
<td>P valueb</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*SD—standard deviation.

P values are for one-sided Pearson χ² tests for difference between means.

P values are for the full analysis of variance models.

For advised to eat more brown rice/whole grains, n=137 (no), n=13 (yes); for advised to eat less white rice, n=130 (no), n=20 (yes); for advised to eat less salt/Asian sauces, n=121 (no), n=29 (yes); for advised to eat more fruits and vegetables, n=112 (no), n=38 (yes).

*NA—There was no response category/no indication from respondents that physicians had advised to eat less fast food, so advice from a healthcare provider was not available for comparison.

Percent values with different superscripts are significantly different (P<0.05, least significant difference post hoc tests).

Limitations

Only women 35 to 60 years old participated, so results cannot be assumed to apply to men or to women of dif-
erent ages. The relatively small sample limited the power to detect some relationships. Because this study was cross-sectional, no causation can be implied from results. We used a single 24-hour recall to estimate usual dietary intake, which, although appropriate for estimat-
ing mean daily intake of groups (52), is not able to provide information on individuals’ dietary intakes.

CONCLUSIONS

Program planners working with Cambodians and other refugees can capitalize on existing knowledge and values to promote good health. In this community, a wide variety of vegetables, herbs, and fruits were recognized as both culturally important and healthy, and could be used as the focus point of nutrition education. Future programs could also work toward increasing whole-grain consumption and decreasing Asian sauce consumption.

For refugee populations, this research provides information on how characteristics and experiences of refugees should be considered when providing nutrition-related services, particularly when considering the long-term health outcomes of refugees. The common experience of interrupted education (33,50) may adversely affect vegetable and fruit consumption; low acculturation, which may result from ethnic enclaves (53), increases the need to find ways to reach community members who do not identify with American culture; nutrition education may increase whole-grain consumption; and programs may be needed for adults with children living at home, who may not be aware of the potential health risks of American foods targeted toward children.

STATEMENT OF POTENTIAL CONFLICT OF INTEREST:

No potential conflict of interest was reported by the au-
thors.

FUNDING/SUPPORT: Funding was provided by Camb-
odian Community Health 2010 (CDC Agreement Num-
ber U50/CCU122151), the Blue Cross and Blue Shield of Massachusetts Catalyst Fund, the Feinstein Interna-
tional Center, Project Bread, and the Cambodian Mutual Assistance Association of Greater Lowell, Inc.

ACKNOWLEDGEMENTS: The authors thank Botum Sokhieng, Jeanine Chhoeum, Saman Hing, Chanthyda Hout, Julie Hak, and Sam An Um, who administered the survey; Boroueth Chen and Timothy Mouth who provided written translations and back translations; Ronnie Mouth, Bophamony Vong, and Sengly Kong who translated focus group discussions; and Robin Toof and Sidney Liang for input into the survey design and administration.
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