Household Food Security Is Associated with Agricultural Livelihoods and Diet Quality in a Marginalized Community of Rural Bedouins in Lebanon

Hala Ghattas, Jessica M. Barbour, Mark Nord, Rami Zurayk, and Nadine R. Sahyoun

Abstract

In the context of recent increases in international food prices, it is hypothesized that in rural communities retaining food production practices is important for protection against food insecurity at both the household and community levels, as well as for protection against the development of poor nutritional outcomes. To investigate this hypothesis, a cross-sectional study of household food security and nutritional status was carried out in a rural community of settled Bedouins in Lebanon comprising 84 households with 474 individuals; this tribe’s recent history of settlement in 2 locations that differ by access to land and food production practices provides the context for this study. Food insecurity was found to be highly prevalent (49%) in this Bedouin community and was negatively associated with household food production ($P < 0.05$) and the consumption of fruits, chicken, meat, and fish ($P < 0.05$) and positively associated with consumption of cereal products ($P < 0.01$). This study shows that in small rural communities in a transitional country, sustaining food production may protect from food insecurity. Agricultural livelihood support programs that promote continued involvement in food production at the household and community level, in conjunction with other income-generating activities, may build resilience against food insecurity and improve dietary diversity. J. Nutr. 143: 1666–1671, 2013.

Introduction

Recent increases in global food prices have been shown to compromise the quality and quantity of food consumed by vulnerable populations and hence their food security (1,2). In such a context, novel approaches to enhancing country-level food security include building resilience in at-risk communities (3), some of which, paradoxically, are those living in rural areas without the ability to produce food (4). Smallholder farming has been promoted as a possible approach to improving resilience to income shocks (5–7) by reducing the reliance on food markets, yet there is insufficient empirical evidence that household/community-level food production activities are effective at increasing the food and nutrition security of rural communities (6,8).

The Bedouins of the Middle East originate from tribes of nomadic pastoralists whose livelihoods relied mainly on herding and agricultural activities (9,10). These activities consistently provided Bedouins with a variety of food products, with diets typically high in milk, wheat, barley, lentils, vegetables, and fruits. Since the 1960s, regional policies have forced the Bedouins into settlement. Different areas of settlement have provided varied access to resources for the continued practice of agriculture. The majority have transitioned from self-reliant ways of securing food to more modernized livelihoods based on working outside the home for wages to purchase food from the market (9,10). Such reliance on income to purchase food from food markets can place households at a potential risk of food insecurity in the event of increases in food prices or other emergencies (1,11).

We hypothesized that in rural communities retaining food production practices is important for protection against food insecurity at both the micro (household) and meso (community) levels, as well as for protection against the development of poor nutritional outcomes. The impact of transitioning into more settled ways of life on Bedouins’ nutritional status has been studied in several contexts and has shown conflicting results. Improvements in nutritional status have accompanied the settlement of Bedouins in Saudi Arabia, whereas the opposite was true in the Bekaa, Lebanon (12,13). Baba et al. (13) attributed the difference in impacts of settlement to the intense involvement of the Saudi government in enhancing living conditions and the absence of such governmental involvement in Lebanon (13). A recent study in Jordan showed that urbanization...
negatively affected the health and nutritional status of Bedouin preschool children (14); the authors postulated that this was due to reduced livestock herding, which had previously provided Bedouins with milk and meat, and that their now modest incomes were insufficient for them to purchase these and other nutritious foods from the market (14).

To investigate this hypothesis, we studied a marginalized rural community of settled Bedouins in the Bekaa valley of Lebanon who settled in 2 locations that are <4.8 km apart. This tribe is similar to other settled Bedouin communities in the region who have either continued to practice agriculture or who have diversified into the service sector, and is therefore used as an example of a typical rural Bedouin community settled in the Middle East. The studied community was selected because it is homogeneous in terms of kinship and social, demographic, and cultural characteristics, although it is divided geographically (accessing food to land) and by food production practices. We investigated household food security, the effect of self-production of food on food security, and the dietary and nutritional manifestations of food insecurity in this community.

Participants and Methods

Study area and population. A cross-sectional study of household food security and nutritional status was carried out in a Bedouin community residing in 2 settlements (A and B) in the Bekaa valley during the month of April 2010. The Bedouins of settlement B have greater geographical access to land and therefore rely more on grazing and livestock as a means of living compared with those in settlement A who rely on income generation through employment in the service sector to a greater extent, meaning that most of their food commodities are now purchased rather than self-produced.

Verbal permission was obtained from community leaders to approach households and to explain the aims of the study. All households in both settlements were approached to participate in the study, and all individual members of participating households were asked to participate in the anthropometric survey. Written informed consent and assent were obtained from participating members. Anthropometric data were collected from all household members who were present and who provided written consent to take part in the study. For children under the age of 5 y, parental written consent was obtained to take anthropometric measurements. The study was approved by the American University of Beirut institutional review board on 31 March 2010.

Process. Household data were collected through the administration of a structured questionnaire to the individual mainly responsible for food preparation in the household (household proxy-respondent). In the event that this individual was not available (which was the case in only 1 household), data were collected from another adult in the household. Respondents provided information on all members of the household, which included age, gender, employment, educational attainment, and relation to the household proxy-respondent. Household data collected included responses to 6 food security questions as well as information about income, expenditure on food, household food production, and household frequency of food consumption. The latter listed 14 food groups and asked the respondent to estimate the frequency of consumption of these foods by the household (per day, per week, per month, or never). Additional data on household livestock ownership were extracted from data collected from the same community in 2009 (R. Zurayk, unpublished results, 2009).

Household food security assessment. The food security scale consisted of 6 questions derived from the U.S. food security survey module (15) and the Yemen National Food Security Survey (16) and adapted to the Lebanese context. The questions were face validated by key informants from the surveyed communities and were modified accordingly. The internal validity of the food security scale was assessed by using statistical methods based on the Rasch measurement model. The questions asked of the proxy-respondents included the following: 1) whether there was a time when they were concerned about running out of food for the household for the next month, 2) whether they had enough to eat but not always the kinds of food they wanted, 3) whether there was a time when household members could not afford to eat the kinds of food they should to be healthy, 4) whether any household member ever decreased the size of their meal because there was not enough food, 5) whether any household member ever skipped a meal because there was not enough food, and 6) whether any household member ever did not eat for a whole day or go to bed hungry because there was not enough food. Each positive response to any of the 6 items counted as 1 point in the total score of food insecurity. Households with scores of 0–1 were categorized as food secure, those with scores of 2–4 as moderately food insecure, and those with scores of 5–6 as severely food insecure.

Household food production assessment. A household food production score was derived from 2 questions on self-production of foods by the household. The first question listed 8 food groups (milk, legumes, vegetables, fruits, meat, yogurt, cheese, and bread) and asked whether the household produced any of these from its own agricultural practices (e.g., milk from herding sheep); each positive response was attributed 2 points. The second question listed the same food groups (except for milk) and asked whether the household generated food products (e.g., pickled/dried vegetables, meat preserves, fruit preserves/am, bread, yogurt, or cheese) from purchased foods; each positive response was attributed 1 point. The total household food production score ranged from 0 to 23 points.

Nutritional status assessment. Weight and height were measured for all available individuals in the household. Households were visited up to 3 times each to ensure that we reached all members of the households. Anthropometric measurements were taken by trained individuals according to standard methods (17). Children over 2 y of age and adults were weighed using a calibrated electronic Tanita digital scale. Children <2 y of age were weighed using an infant scale (Detecto model 8440). Heights of children >2 y of age and adults were measured with a measuring tape adhered to the wall, and the recumbent length of children <2 y of age was measured using a wooden calibrated measuring board.

Statistical analyses. All data were entered into Epi Info (Centers for Disease Control and Prevention). Data on weight and height were analyzed with WHO Anthro (WHO version 3.2.2, 2011) for children <5 y of age and with WHO AnthroPlus (WHO version 1.0.4, 2007) for children 5–18 y of age to derive Z-scores for height-for-age, weight-for-height, weight-for-age, and BMI-for-age by gender. Stunting and wasting were defined as height-for-age less than −2 Z-scores and weight-for-height as less than −2 Z-scores, respectively, according to the WHO Child Growth standards (18). Overweight was classified as a BMI-for-age Z-score more than +2 using WHO Child Growth standards. Adult overweight was classified as a BMI ≥25 kg/m² and adult obesity as a BMI ≥30 kg/m².

All data were imported into Stata 11.1 (StataCorp) for statistical analysis. Associations between categorical variables were tested by using Pearson’s χ² tests, and t tests were used to test differences in means of continuous variables and transformed mean consumptions. Because frequencies of food consumption were not normally distributed, in transformation was performed as ln(X + 1), where X was the frequency of consumption of individual food groups, to achieve normality supposition and to account for possible null values in the food-frequency responses. The adjusted mean frequencies of consumption were then back-transformed to the original scale through exponential transformation. Due to the small sample size, households were categorized into 2 levels of food security instead of 3 when testing for associations between food security and other variables. These 2 levels were “food secure” and “food insecure”; the latter included all households with scores between 2 and 6.

Logistic regression models were used to investigate the association between household food insecurity and food production as well as their separate effects on nutritional status outcomes: adult overweight and
Table 1: Gender and age distribution of members of a settled Bedouin tribe in rural Lebanon by household food security status

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Food secure</th>
<th>Food insecure</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>270</td>
<td>51.9</td>
<td>48.9</td>
<td>51.1</td>
</tr>
<tr>
<td>Female</td>
<td>250</td>
<td>48.1</td>
<td>54.4</td>
<td>55.6</td>
</tr>
<tr>
<td>Age²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5 y</td>
<td>66</td>
<td>12.8</td>
<td>51.9</td>
<td>40.9</td>
</tr>
<tr>
<td>5–17 y</td>
<td>146</td>
<td>28.4</td>
<td>40.4</td>
<td>59.6</td>
</tr>
<tr>
<td>18–64 y</td>
<td>282</td>
<td>54.9</td>
<td>47.5</td>
<td>52.5</td>
</tr>
<tr>
<td>≥65 y</td>
<td>20</td>
<td>3.9</td>
<td>30.0</td>
<td>70.0</td>
</tr>
</tbody>
</table>

1 Pearson’s χ²; P ≤ 0.05 was considered to be significant.
2 The mean ± SD age of the population was 24.7 ± 8.2 years.

Results

All households in the 2 settlements (n = 91) were approached to participate in the study; 84 (92.3%) consented to participate and responded to the questionnaire. All individuals who were available in the participating households (n = 522) were invited to take part in the anthropometric survey; 474 provided consent/assent, yielding a response rate of 90.8%. Data on food security status was available for 98.8% (n = 83) of the interviewed households. A total of 50.5% of the participating households were food secure, 37.4% were food insecure, and 12.1% severely food insecure.

The gender and age distribution among food-secure and food-insecure households is shown in Table 1. A higher proportion of children <5 y of age were found in food-secure households than in food-insecure households (P = 0.03).

Household predictors of food insecurity.

Food insecurity was more prevalent in the settlement with less access to land (settlement A; 55%) than in the settlement with greater access (settlement B; 29%). The number of income earners within a household was a significant determinant of food insecurity; food-secure households had a significantly higher mean total of working individuals than the food-secure households (Table 2). There was a trend for increased levels of food security in households with lower mean household size (P = 0.10) and higher education levels (P = 0.09) (Table 2).

Food-secure households had a significantly higher average monthly income per capita and spent, on average, more money on food per person than food-insecure households. However, the food production score was also found to be protective against food insecurity, whereby food-secure households had higher mean food production scores compared with the food-insecure households (P = 0.02) (Table 2). In a logistic regression analysis, the association between food security and the food production score remained significant even after controlling for monthly household income per capita (OR: 0.76; 95% CI: 0.61; 0.93; P < 0.01). Specifically, food-secure households were more likely to produce milk (P = 0.05) and to grow their own vegetables (P = 0.04). No significant differences were found between food-secure and food-insecure households in terms of livestock ownership (Table 2).

Table 3 presents data on demographic information of the head of household and household food security scores. There was a significant positive association between head of household educational attainment and food insecurity (P = 0.01). Head of household educational attainment was not significantly associated with food insecurity, and there were too few women as heads of households to determine associations with food security status.

Overall consumption of meat, chicken, and fish was low in this community. Food-insecure Bedouin households consumed

Table 2: Household characteristics of a settled Bedouin tribe in rural Lebanon by food security status¹

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Overall</th>
<th>Food secure</th>
<th>Food insecure</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All households, %</strong></td>
<td>83</td>
<td>51</td>
<td>49</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Household demographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House size², n</td>
<td>83</td>
<td>6.3 (5.7, 6.9)</td>
<td>5.8 (4.9, 6.7)</td>
<td>6.8 (6.0, 7.5)</td>
<td>0.10</td>
</tr>
<tr>
<td>Children aged &lt;18 y², n</td>
<td>80</td>
<td>2.8 (2.3, 3.2)</td>
<td>2.5 (1.9, 3.2)</td>
<td>3.0 (1.8, 3.2)</td>
<td>0.30</td>
</tr>
<tr>
<td>Total income earners³, n</td>
<td>82</td>
<td>2.2 (1.8, 2.5)</td>
<td>1.8 (1.4, 2.2)</td>
<td>2.6 (2.1, 3.1)</td>
<td>0.02</td>
</tr>
<tr>
<td>Highest level of education³⁴, %</td>
<td>83</td>
<td>0.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>3</td>
<td>3.6</td>
<td>0.0</td>
<td>7.3</td>
<td></td>
</tr>
<tr>
<td>Did not complete intermediate</td>
<td>52</td>
<td>63.9</td>
<td>59.5</td>
<td>68.3</td>
<td></td>
</tr>
<tr>
<td>Completed intermediate or higher</td>
<td>26</td>
<td>31.3</td>
<td>40.5</td>
<td>22.0</td>
<td></td>
</tr>
<tr>
<td>Do not know</td>
<td>1</td>
<td>1.2</td>
<td>0.0</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td><strong>Household socioeconomic factors, US$/mo</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average income per capita²</td>
<td>83</td>
<td>141 (91.2, 192)</td>
<td>205 (111, 299)</td>
<td>76.5 (57.5, 95.6)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Average food expenditure per capita²</td>
<td>83</td>
<td>47.0 (38.1, 55.9)</td>
<td>59.6 (44.5, 74.8)</td>
<td>34.1 (28.6, 41.8)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Household food production score²⁵</td>
<td>83</td>
<td>5.3 (4.7, 5.9)</td>
<td>6.0 (5.1, 7.0)</td>
<td>4.5 (3.8, 5.3)</td>
<td>0.02</td>
</tr>
<tr>
<td>Livestock ownership⁶, n</td>
<td>56</td>
<td>0.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does not own livestock, %</td>
<td>43</td>
<td>78.3</td>
<td>73.9</td>
<td>78.8</td>
<td></td>
</tr>
</tbody>
</table>

1 Values are means (95% CIs) or percentages.
2 t test; P ≤ 0.05 was considered to be significant.
3 Highest level of education among a member of the household.
4 Pearson’s χ²; P ≤ 0.05 was considered to be significant.
5 Derived from 2 questions on self-production of foods by the household. The total household food production score ranged from 0 to 23 points.
these meat products and fruits significantly less often than food-secure households, whereas food-insecure households consumed significantly more “other cereal” (Table 4). There was a trend for reduced vegetable consumption in food-insecure households (P = 0.06). No significant differences were found in frequency of consumption of other food groups (Table 4).

**Coping mechanisms against food insecurity.** Households that reported being concerned about running out of food were asked what coping actions they took in those instances. Overall, more than half (53%) of Bedouin households reported being concerned about running out of food at some stage in the past 12 mo. Of the food insecure, 90% had experienced such concern; more than half of these households coped by reducing the variety of foods consumed (54%) and by borrowing food (57%) and money (68%). Selling assets (8%), accepting gifts (11%), and collecting food from the wild (22%) were also reported by food-insecure households (data not shown). Households that were food secure but reported a single indication of food insecurity (17%) mentioned reducing the variety of foods consumed (57%) and borrowing food (57%); other coping mechanisms were not reported.

**Nutritional status.** Approximately one-third of adult Bedouins surveyed were overweight and an additional 25% were obese (Table 5), leading to a total overweight and obesity burden of 56%. Overall, 35% of the households had at least 1 stunted child, 12% at least 1 overweight child, 86% at least 1 overweight adult, and 54% at least 1 obese adult. The presence of stunted, overweight, or obese individuals within a Bedouin household was not found to differ by household food security status. When associations between nutritional outcomes and food insecurity or household production score were investigated in regression analysis, overweight, obesity, stunting, and child overweight did not differ by household food security status. However, there was a trend toward lower stunting rates in households with higher food production scores, which remained after adjusting for monthly income per capita, age, and gender (OR: 0.87; 95% CI: 0.75, 1.02; P = 0.09). In fact, stunting was negatively associated with household milk production (OR: 0.58; 95% CI: 0.35, 0.97; P = 0.04) and household frequency of milk and dairy consumption (OR: 0.45; 95% CI: 0.23, 0.88; P = 0.02).

**Discussion**

Food insecurity is highly prevalent (49%) in this Bedouin community of the Bekaa, Lebanon. Despite the relatively high proportion of unemployed heads of households among the food insecure (30%), these households had, on average, a higher number of total working members. Increasing the number of income generators may be an attempt to overcome food insecurity in this community, as it is in others (19). However, the negative association found between household food production and food insecurity supports the hypothesis that food production may play a protective role against food insecurity. Although it is possible that food production is a proxy for increased leisure time due to higher income or greater assets or skills, future research to investigate the role of these other factors may be warranted. Whereas diversification of livelihoods out of agriculture has been promoted as a means to overcome rural poverty and food insecurity worldwide (20), evidence suggests that retaining smallholder farming and household agricultural practices plays an essential role in sustaining food security (21) and overcoming unstable work environments (20,22). In this population, household food expenditure per capita was also found to protect from food insecurity; however, this was not correlated with household food production. Food production can, therefore, be an effective complement to food expenditure at the household level in achieving food security.

The most common manifestation of food insecurity in this population is a low frequency of consumption of fresh foods, leading to low dietary diversity in line with other studies from transitional societies (23). Studies in Arab Bedouins in the region have in fact shown recent changes in dietary habits and associated increases in chronic diseases (9,24). The less frequent consumption of fresh foods and more frequent consumption of refined cereals among food-insecure households may potentially lead to lower intakes of protein and several micronutrients and a compensation of energy deficits through refined cereals and processed foods. This implies low dietary diversity, which has been linked in other studies with increased risk of overweight and its related comorbidities (25,26). Despite lower dietary diversity in the food insecure, we did not find associations between food insecurity and adult overweight and obesity. This may be due to the overall high prevalence of overweight and obesity in this population. We also found moderate levels of child stunting.

**TABLE 3** Head of household characteristics of a settled Bedouin tribe in rural Lebanon by food security status

<table>
<thead>
<tr>
<th>Demographic characteristic</th>
<th>Food secure</th>
<th>Food insecure</th>
<th>P value1</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Head of household gender</td>
<td>83</td>
<td>6</td>
<td>0.63</td>
</tr>
<tr>
<td>Female</td>
<td>5</td>
<td>6.0</td>
<td>7.3</td>
</tr>
<tr>
<td>Head of household education</td>
<td>80</td>
<td>6.0</td>
<td>7.3</td>
</tr>
<tr>
<td>Did not complete elementary</td>
<td>58</td>
<td>72.5</td>
<td>65.0</td>
</tr>
<tr>
<td>Head of household employment status</td>
<td>75</td>
<td>14.8</td>
<td>7.7</td>
</tr>
<tr>
<td>Not working</td>
<td>14</td>
<td>18.7</td>
<td>30.6</td>
</tr>
</tbody>
</table>

1 Pearson’s χ²; P ≤ 0.05 was considered to be significant.

**TABLE 4** Household frequency of food group consumption in a settled Bedouin tribe in rural Lebanon by food security status

<table>
<thead>
<tr>
<th>Food</th>
<th>Food secure</th>
<th>Food insecure</th>
<th>P value2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total times/wk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread</td>
<td>83</td>
<td>19.4 (17.2, 21.9)</td>
<td>21.2 (19.6, 23.0)</td>
</tr>
<tr>
<td>Rice</td>
<td>83</td>
<td>1.5 (1.2, 2.0)</td>
<td>1.8 (1.5, 2.1)</td>
</tr>
<tr>
<td>Other cereals</td>
<td>83</td>
<td>1.5 (1.2, 1.8)</td>
<td>2.2 (1.8, 2.6)</td>
</tr>
<tr>
<td>Milk and dairy</td>
<td>83</td>
<td>7.7 (6.7, 8.9)</td>
<td>6.4 (5.2, 7.9)</td>
</tr>
<tr>
<td>Chicken</td>
<td>83</td>
<td>1.1 (0.9, 1.4)</td>
<td>0.6 (0.5, 0.8)</td>
</tr>
<tr>
<td>Meat</td>
<td>83</td>
<td>1.3 (1.0, 1.6)</td>
<td>0.7 (0.6, 0.9)</td>
</tr>
<tr>
<td>Fish</td>
<td>83</td>
<td>0.4 (0.2, 0.6)</td>
<td>0.2 (0.1, 0.3)</td>
</tr>
<tr>
<td>Eggs</td>
<td>45</td>
<td>3.5 (2.4, 4.7)</td>
<td>2.9 (1.9, 4.2)</td>
</tr>
<tr>
<td>Pulses</td>
<td>83</td>
<td>1.3 (1.0, 1.6)</td>
<td>1.2 (1.0, 1.4)</td>
</tr>
<tr>
<td>Vegetables</td>
<td>83</td>
<td>7.8 (6.2, 9.7)</td>
<td>5.6 (4.4, 7.2)</td>
</tr>
<tr>
<td>Fruits</td>
<td>82</td>
<td>6.4 (5.0, 8.0)</td>
<td>4.2 (3.1, 5.6)</td>
</tr>
<tr>
<td>Wild plants</td>
<td>71</td>
<td>0.7 (0.4, 1.1)</td>
<td>1.1 (0.7, 1.8)</td>
</tr>
<tr>
<td>High-energy snacks</td>
<td>80</td>
<td>6.8 (4.7, 9.7)</td>
<td>6.6 (4.7, 9.1)</td>
</tr>
<tr>
<td>Sweetened beverages</td>
<td>48</td>
<td>2.4 (1.1, 4.4)</td>
<td>2.2 (0.9, 4.4)</td>
</tr>
</tbody>
</table>

1 Values are means (95% CIs) unless otherwise indicated. Means of frequency of consumption were back-transformed after using the transformation ln (x + 1) to achieve normality.

2 t tests were performed to test for differences between the transformed mean consumptions; P ≤ 0.05 was considered to be significant.

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indicating the possible presence of the population-level double burden of malnutrition found in transitional societies (27–29).

Similarly, no significant difference existed in the prevalence of stunting between children living in food-secure and food-insecure households; however, there was a trend toward protection from stunting with retention of agricultural practices. This result may be driven by the production and hence consumption of milk, which were found to be independently and negatively associated with stunting, in line with other studies (30,31). We would have expected this finding to be supported by an association between food security and livestock ownership; however, this was not the case, which was probably due to missing data on the livestock ownership variable.

This study found relatively high levels of food insecurity that appeared to be buffered by continued food production practices. Although it is likely that these practices do not entirely reflect those of past nomadic lifestyles, previous studies have found that children of semi-settled Bedouins who engage in livestock herding along with crop production and off-farm income-generating activities have better nutritional status than those of fully settled (32) or fully nomadic (13) communities, probably the result of a more diverse diet. We did not find food insecurity to be associated with worsened anthropometric outcomes, but we did observe a strong association with diet quality; this may derive from intrahousehold differences in food allocation and/or intake (33). Future studies could collect more detailed individual intake data alongside status of household food security to further investigate this possibility. Alternatively, the lack of translation of food insecurity into poorer anthropometric outcomes may be the result of coping mechanisms used by this community. Borrowing food was a common practice among both food-secure and food-insecure households, particularly due to the strong kinship ties between the 2 settlements. This potentially attenuated the impact of food insecurity on anthropometric indicators of nutritional status. Another potential explanation may be that this study is limited by the small number of households in this community and that we did not have sufficient statistical power to detect an association. Finally, because stunting is the result of chronic malnutrition, whereas food insecurity is often experienced episodically, one would not necessarily anticipate a strong association between the 2 conditions in a cross-sectional survey.

Although the results of this study cannot be generalized to all rural Bedouins in Lebanon, this study provides evidence that, all other factors remaining constant, continued food production by small rural communities may protect from food insecurity. In contexts in which rural households are shifting out of agriculture into other sectors, programs to support continued involvement in some food production activities at the household and community level, alongside livelihood diversification, could play a role in building resilience to food insecurity and in improving dietary diversity.

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