

Assessment of households' food insecurity through use of a USDA questionnaire

Abstract

The objective of this study was to measure the extent of food insecurity, and identify key socio-economic factors associated with this condition among households in the Alborz Province, Iran. Survey data was collected from a random sample of 166 urban and peri-urban households using the Household Food Security Survey Module of the U.S. Department of Agriculture, translated and adapted to the local context. A context-specific categorization of household Food Security status was applied to distinguish the various levels of severity with which the phenomenon of food insecurity may be experienced by Iranian households. Results showed that more than half of the sample population suffers from food insecurity. Food insecurity was found to be significantly associated with lower education and income levels. Findings also showed that food insecurity is common among households that have lived in Karaj suburbs for more than 20 years. Food insecurity is a multi-dimensional phenomenon, and remains a cause of concern for vulnerable households in Iran. This study confirms that unemployment, low income, and lack of education may expose families to the risk of food insecurity, thus intensifying poverty-related problems.

Keywords: food insecurity, USDA questionnaire, household food security survey module

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Introduction

Having doubled during the last few decades, the global population continues to grow. It is estimated that the world population will reach between 8 and 9 billion people by 2050.²⁻⁴ One of the pressing challenges facing the global population of both today and the future is food insecurity, which currently impacts between five and twenty five percent of the population in both developed and developing countries.⁵ Further, it is estimated that approximately one billion people currently lack adequate access to food,^{6,7} and statistics show that in spite of the dramatic progress made in the area of nutrition, approximately 842 million people (12 percent of the world's population), experienced chronic hunger in 2011-2013.⁷

Food security was defined by the Food and Agriculture Organization of the United Nations (FAO) in 1996 as "a condition that exists when all people, at all times, have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (Declaration on world food security.⁸ According to this definition, to eliminate food insecurity, food must first be available and accessible.^{9,10} Social, economic and environmental issues cause numerous people worldwide to suffer regularly from food insecurity.¹¹ thus subjugating them to limited or uncertain access to nutritionally adequate and safe food, and/or limited or uncertain ability to gain acceptable food in socially acceptable ways.¹² Food insecurity is also considered to be a threat to health, quality of life, and nutritional status.¹³ The severity of food insecurity occurs in different ranges; the least severe form experienced is the uncertainty in obtaining food in socially acceptable ways. The most severe form is experienced when people simply cannot get enough to eat as a result of insufficient resources, and as a result suffer the physical and psychological consequences of hunger.¹⁴ Thus,

hunger is considered to be a potential consequence of severe food insecurity.¹⁵ Hunger and food insecurity have been identified as core indicators of an individual's nutritional state that should be assessed in nutrition surveillance activities.¹⁶ Food insecurity is closely related to other widely discussed concepts like food insufficiency and hunger, but has the important distinction that one can be food insecure but still consuming sufficient energy and meeting micronutrient demands. In context, a household can experience food insecurity if members are concerned about accessing food in the near future. This is critical, as the thought of having insufficient food tomorrow can impact the behaviors of today. It stands to reason that if one is food insecure for a period of time, their dietary quality and/or quantity will be compromised and malnutrition may be induced.¹⁷ The concept of household food insecurity also includes problems with the quantity of available food, uncertainty about food supply, and experience of hunger in life.^{5,15} One of the main contributing factors to households' food insecurity is the socio-economic status of the household. Low income levels often cause people to restrict the number and quality of meals they eat, reducing the dietary variety, and causing them looking for inexpensively processed foods; these options are often low in essential nutrients and high in fats and empty calories.¹⁸ Food insecurity may compromise both dietary intakes and health outcomes.¹⁹ Previous studies have affirmed that a variety and balance of foods from all food groups and moderate consumption of all food items is very important in order to maintain a healthy diet.¹⁸ Consuming a variety of nutritious and safe foods is key to reducing malnutrition, including those forms caused by micronutrient deficiency. It is generally accepted that food insecurity has considerable impacts on the physical, social and psychological status of individuals in communities. It may also impact a household's quality of life.^{5,15}

The measurement of food insecurity allows governmental and development agencies to estimate the prevalence of this phenomenon, better target high risk populations, and monitor and evaluate the impact of their programs at the household level.¹¹ Thus, the monitoring of community food security is necessary for planning appropriate programs. Such measures can serve to monitor and evaluate the effectiveness of relief programs, such as food subsidies, and to facilitate planning and targeting decisions. In this regard, myriad studies have been conducted both in Iran and throughout the world concerning food security.²⁰ In Iran, about one-fifth of the population suffers from a lack of energy, protein insufficiency and micronutrient deficiency. This problem can lead to a suboptimal quality of, as well as reduced physical, social and mental well-being.^{21,22} One study conducted in northwest Iran concluded that food insecurity affects approximately 36.6 percent of all households.²³ The issue of food security in some parts of Iran, such as the Alborz province, has yet to be investigated, as these areas are relatively new developments in Iran. However, both the Alborz province, and especially the city of Karaj itself, are important economic contributors to Iran. Due to its proximity to Tehran, the capital of Iran, this region has many sources of income (i.e. tourism). The Alborz province suburbs and rural areas are also very closely connected to the larger cities, and therefore presents distinctive aspects to be considered in the context

of food security research (Figure 1). Although the multi-factorial nature of household food security has provided a wealth of analytical insight in earlier studies, it remains difficult to measure. With regards to household food security in Iran, the current absence of a regular monitoring system combined with the lack of suitable, simple, low-cost and accurate assessment tools has resulted in the use of several indirect determinants being used to measure food insecurity, including monthly households expenditures, family income, feeding patterns, family consumption model, energy sufficiency income (i.e. income sufficient to pay for consumable energy), food intake, and nutritional status. However, evaluation using these indirect indicators may lack specificity, and may lead to unreliable and less than valid measures and assessments of the food insecurity experience. The lack of food security and hunger data at the household level calls for a more direct method of assessment, such as that provided in the 18-statement USDA derived questionnaire used in this study, as it is a complex tool that measures characteristics, experiences and behavioral patterns emergent in food insecure households.²⁴ Specifically, the purpose of this study was to identify vulnerable households by determining the extent of a household's food insecurity in the Alborz province of Iran. Findings may provide evidence-based support to decision-making processes, and enable a move towards more inclusive national food security policies in Iran.



Figure 1 The position of the Karaj city.

The aim of this research was to assess the food security situation over the 12 months before the study among urban households in Karaj and its suburbs, and specifically to investigate the link between household food security and key influencing variables, namely

household income level and residence history. Also based on other studies, the relationships between age, education and gender of the heads of household and household food insecurity levels were also explored.

Methodology

This cross-sectional survey study was conducted in the Alborz province of Iran from June to August 2013. Data was collected from 166 urban households randomly selected from all sectors of the Karaj city using the probability-proportional-to-size sampling method (N=477,000 households). The 18-item USDA household food security questionnaire, which contains questions that underlie the 12-month food security scale in survey-instrument form,¹ was adapted to the local context (based on Persian papers such as^{25,26}). The survey module was translated into Farsi and back-translated into English in order to examine its consistency with the original. The translation of the questionnaire was done with attention to the conditions in Iran while maintaining methodological adherence with the original questionnaire. Questions aimed at capturing situations or events, related to food security, including both qualitative and quantitative aspects of the household's food supply, as well as household members' psychological and behavioral responses. The questionnaires items are provided in Table 1. Demographic and socioeconomic characteristics were collected, including age, gender, dwelling experience, monthly income, educational level.

Data collection was conducted through the use of individual interviews; this was done in response to the low literacy level of head of households. Respondents were asked to choose a frequency defined as "often true," "sometimes true," or "never true" to describe their responses to the aforementioned questions regarding the food they bought for their household. Responses were scored in the following manner: "often true" and "sometimes true" were coded as affirmative (value=1), "never true" was coded as negative (value=0). Each of these variables were scored with a "1" if the response indicated food insecurity and "0" if it did not. Based on the production unit head's

responses to the questionnaire, each household was classified in terms of its household's food security. The sum of all scores provided the basis for categorizing the food insecurity status of households, as shown in Table 2. The scale value applied for the categorization of household food security status builds upon previous Persian literature; specifically, on previous studies that documented household food insecurity and hunger using the same USDA questionnaire.^{25,26} This system classified production units into the following three categories based on their total scores for the 18 variables:

Category 1: Food secure. In this category production units reported no experience of food insecurity.

Category 2: Food insecure without hunger. Production units were classified as moderately food insecure if they expressed concern with food provisioning and discussed having to purchase food and reduced food portion sizes.

Category 3: Food insecure with mild hunger. Production units were classified as food insecure if they expressed experiencing more severe food insecurity, such as a reduction in the total quantity of food they consumed and eating lower quality foods (i.e., foods they considered less desirable).

Category 4: Food insecure with severe hunger. This last category represented production units that qualified as severely food insecure in terms of food intake.

This food insecurity status categorization is represented in Table 2 with associated codes and scoring parameters. Data analysis was conducted using the Statistical Package for Social Sciences (SPSS) for Windows version 20. Chi-square, F-tests and Duncan tests were constituted to determine the affecting factors of food insecurity, and significance was set at $P < 0.05$. All tests for significance were two-tailed.

Table 1 Food insecurity questionnaire items: English back-translation from Farsi

Items (during the last 12month)	
1	I worry whether my food will run out before I get money to buy more.
2	I worry about where the next day's food is going to come from.
3	We eat the same thing for several days in a row because we only have a few different kinds of food in hand and don't have money to buy more.
4	The food that I bought didn't last and I didn't have money to buy more.
5	I ran out of the foods that I needed to put together a meal and I didn't have money to get more.
6	I can't afford to eat the way I should, because I do not have enough money.
7	I can't afford to eat properly, because I can't afford enough food.
8	I'm often hungry but I don't eat because I can't afford enough food.
9	I eat less than I think I should because I don't have enough money for food.
10	I cannot afford to feed my child(ren) the way I think I should.
11	I cannot give a balanced meal because I can't afford that.
12	My child(ren) are not eating enough because I just can't afford enough food.
13	I know my child(ren) are hungry sometimes, but I just can't afford more food.
14	I can't make any food I want, because raw materials I bought are ran out and I didn't have enough money to buy more.
15	I made only cheaper foods and I couldn't make varied foods, because I didn't have enough money.
16	It has occurred during the current year that due to the lack of sufficient funds you have reduced or removed meals from your diet.
17	It has occurred during the current year that you were hungry but you didn't eat because you didn't have enough money.
18	It has occurred during the current year that due to the lack of sufficient funds you have reduced from your essential meals.

Table 2 Categorizing of household food insecurity status according to the scores

Food Insecurity Status	Code	Numbers of Positive Answer
Food secure	1	0-2
Food insecure without hunger	2	7-Mar
Food insecure with middle hunger	3	12-Aug
Food insecure with intense hunger	4	13-18

Results

Demographic and socio-economic characteristics of respondents in this cross-sectional study are summarized in Table 3. The study's sample consisted of 79 men (47.6%) and 87 women (52.4%). Baseline survey results showed that about one-tenth (11.4%) of the sample population were illiterate, mostly concentrated among the older people residing in Karaj suburbs. Results also showed that 21.7% of the respondents held an elementary education, 34.3% held a high school diploma, and 32.6% had higher education. More than half (63.9%) of the households sampled indicated an average monthly income of \$340 USD or lesser. More than half of the respondents (66.9%) have lived at least 20 years in the region. About half of the respondents (54.8%) were 43 years old and less.

As seen in Table 4, more than half of households (59.1%) experience food insecurity (total of the three groups of food insecurity), with less than half (41%) indicating that they are food secure. About one-fifth of the respondents (20.5%) experienced food insecurity without hunger, while about one-fifth of the respondents (19.3%) suffered food insecurity with hunger ranging from mild to intense hunger. These results are illustrated in Figure 2.

The results of the Chi square analysis are provided in Table 5. As seen in Table 6, no significant difference in food insecurity classification by gender was found, suggesting that gender aspects are not related to food insecurity in this population. However, there was a positive relationship between education and food security status ($P=0.01$). Households with high educational levels were found to

experience greater food security. Illiteracy was found to be strongly linked to food insecurity, as none of the households reporting illiteracy were found to be food secure; on the contrary, four of the households with illiterate heads of household suffered food insecurity without hunger, 4 with mild hunger and 11 with severe hunger. Among with the respondents with high school diplomas, 30 households were food secure, 10 suffered food insecurity without hunger, 10 were food insecure with mild hunger, and 7 were food insecure with severe hunger. Among households reporting higher education, 31 were food secure, 13 were food insecure without hunger, 6 were food insecure with mild hunger and 4 were food insecure with severe hunger. As the Chi-square test was significant, it can be concluded that household food security is strongly correlated to the educational level of the respondents. The results can be seen in Figure 3.

The F test has been performed to investigate the relationship between residence history, households' income, and food security. Results are provided in Table 6. As seen in Table 6, results indicate a significant mean difference in income and dwelling history of the respondents ($P=0.01$) related to levels of food insecurity. The results of the "Duncan test" showed that households with high income are food secure. Results also revealed that households with the highest number of years spent in the same residence (residence history) are more prone to food insecurity with high hunger. Households with longer residence history were insecure with severe hunger, generally concentrated among old-aged residing in Karaj suburbs. F testing also indicated no significant mean difference regarding age of the respondents and food security levels.

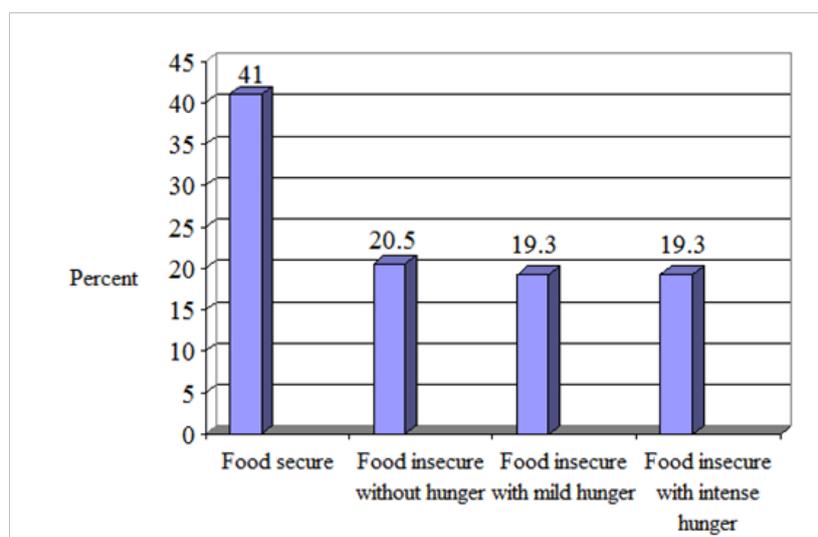
**Figure 2** Food security status of the respondents (percent).

Table 3 Demographic information of the respondents

Demographic Characteristics	Category	Frequency	Percent
Gender	Male	79	47.6
	Female	87	52.4
Education	No formal education	19	11.4
	Primary	36	21.7
	High school	57	34.3
	Higher education	54	32.6
Income (Average per month over the past 12 months)*	≤340 US \$	106	63.9
	>340 US \$	60	36.1
Residence history*	≤ 20 years	111	66.9
	> 20 years	55	33.1
Age*	≤ 43 years	91	54.8
	> 43 years	75	45.2

*Categorized by mean score.

Table 4 Frequency distribution of food insecurity status

Food insecurity Status	Frequency	Percent	Cumulative Percent
Food secure	68	41	41
Food insecure without hunger	34	20.5	61.4
Food insecure with mild hunger	32	19.3	80.7
Food insecure with intense hunger	32	19.3	100

Table 5 Chi square analysis of food security status by demographic characteristics

Food security status		Food secure	Food insecure without hunger	Food insecure with mild hunger	Food insecure with severe hunger	Chi square value	Sig(2-sided)
Gender	Male	30	18	18	13	2.304	0.512
	Female	38	16	14	19		
Education	No formal education	0	4	4	11	45.03	0.000**
	Primary	7	7	12	10		
	High school	30	10	10	7		
	Higher education	31	13	6	4		

**P≤0.01

Table 6 Comparison between means of income and dwelling history, by household food security status

Food security status		Food secure (68)	Food insecure without hunger (34)	Food insecure with middle hunger (32)	Food insecure with high hunger (32)	F value	Sig (2-tailed)
Income¥		506.53b	271.33a	262.27a	120.35a	5.4	0.001**
Residence history		16.04a	20.64a	17.06a	33.50b	8.85	0.000**
Age		42.5	43.5	42.25	49.03	1.566	0.2

¥ US \$ per month

**P≤0.01

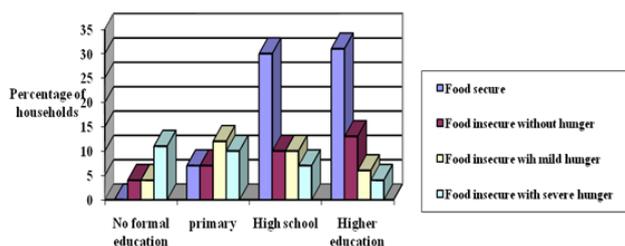


Figure 3 The association of food security status and respondents' education.

Discussion

The food security scale represents the condition of household members as a group, and not necessarily the condition of any particular household member. In general, conditions of food insecurity are believed to affect all household members, although not necessarily in the same way. By contrast, hunger is a uniquely individual phenomenon - some members of the household may be hungry while others are not. Consequently, when the scale measure classifies a household in the more severe range (food insecure with hunger), what it tells us is that at least some member, or members, of the household are experiencing hunger due to insufficiency of household resources, but not necessarily all members.¹

The severity of food insecurity varies across geographical settings, especially at the regional level, but a recent USDA report did not find a simple disparity between urban and rural settings. Instead, both large cities and rural settings were the most food insecure and suburban and other areas immediately surrounding large cities were more food secure.⁹ Globally, data on trends in urban nutritional status are scarce and little research has been done on urban poverty, food insecurity, and malnutrition. This can be attributed mainly to the fact that most projects were undertaken in rural areas because poverty was mainly found in the rural areas of the developing world.²⁷ Accordingly, this study was conducted to determine household food insecurity and the affecting factors in the urban context of Karaj and its suburbs.

Findings revealed that in the Alborz province more than half of the households who took part in this study were experiencing food insecurity (20.5% without hunger, 19.3% mild, 7.2% intense). Results indicated that food insecurity was not significantly related to gender, showing consistency with the results of Najibi et al.,²⁵ & Dean et al.⁹ These results, however, did not comply with the findings of Ghazi Tabatabaai et al.,²⁸ who reported that women were more food insecure than men, nor with those of Simsek et al.,¹³ who stated that among elderly persons, women are at a higher risk of food insecurity in Turkey. Other previous studies of food insecurity, such as Daneshi et al.¹² Sharafkhani et al.,²² Dastgiri et al.,²³ Ramesh et al.,²⁶ Tabatabaai et al.,²⁸ Pyab et al.²⁹ suggested a negative relationship between food insecurity and household income; this proposition was not supported by the findings of this study. Daneshi et al.,¹² also indicated that older populations are more vulnerable to food insecurity. The results of this study revealed food insecurity with severe hunger among older people residing in Karaj suburbs which can be attributed to the seasonal nature of their job (i.e. mostly farmers), and the higher concentration of illiteracy and crowded households/large families. However, no

statistically significant mean difference was found associated with age and food insecurity, which is consistent with the findings of Najibi et al.,²⁵ Education appears to be a key factor for food security, and was significantly related to food security, with relevant decrease in food insecurity in households with higher levels of education. This finding may suggest that education increases the awareness and knowledge surrounding more positive food choices and dietary diversity. This result is supported by the findings of Dean et al.,⁹ but not by those of Simsek et al.,¹³ which stated that there is no relationship between educational status and food security.

Residence history was another substantial factor of food insecurity that has not been considered in previous studies in Iran. A household that experienced food insecurity at some time during the past year, and therefore considered food insecure, may in fact be food secure at the time of the interview. With regards to all the obtained data from this study, history of residence at determined districts had a significant and direct relationship with conditions of food insecurity. Respondents with a long history of residence (over 33.5 years located in one district, the average history of residence of study participants) were predominantly classified as food insecure with intense hunger; this portion of respondents were also often illiterate and elderly, living in suburbs of Karaj with low income, and were unwilling to change their place of residency. It can be reasonably concluded that the lack of access to food stores, local markets, health centers, knowledge, information, and other essential facilities might intensify the vulnerability to food insecurity in this region. The agricultural based economy in this region is also influenced by seasonal variations, with consequences of income instability.

Most of the people in Iran, especially rural people, receive subsidies monthly from the government and it is an extremely important source of income for them because most of them do not have consistent income; the subsidies are income they know they will receive every month. Fear and anxiety about not being qualified for government subsidies may cause participants to avoid sharing the truth about their actual income conditions. For this reason some participants provided responses that classified them into one of the food insecurity categories, despite high income, education, and employment. Simply put, some participants may have incorrectly answered questions due to a lack of knowledge of food insecurity, but some may have done so due to a lack of willingness to declare the truth.

Conclusion

One of the major contributions of this study is the premier investigation of food security in the Karaj district and its suburban areas in the Alborz province especially from a socio-economic perspective. Other studies have proceeded with the aim of researching food insecurity by looking at nutritional and medical aspects. The aim of this study was not to refute or deny the impact of nutrition on food insecurity, but instead to explore social and cultural aspects, and to understand their impacts on food insecurity within a community, thus building upon the nutritional and medical findings of previous study findings. This study aims to profile food security more comprehensively by examining urban and suburban households (relying mostly on small-scale agriculture), from a social, cultural and economic investigation, with the use of the aforementioned USDA questionnaire. This study outlines an economic, social and cultural profile of vulnerable households, as well as key factors that may negatively affect food security and hunger in given geographical areas in Iran. These findings may serve as an evidence-based starting point to support the government towards programming targeted food

security interventions, which may consist of providing vulnerable communities with necessary aides, facilities, and infrastructures to mitigate food insecurity.

It is important to address the underlying causes of food insecurity, through coordinated multi-sectorial approaches that promote key sectors, such as agriculture, health, education, urban planning and infrastructure involvement, and forge synergies to address food insecurity. Results from this study may offer a basis for planning and implementing sustainable community -based multi-sectorial interventions, particularly targeting those with long residence history and low levels of education. This may be done by strengthening urban food systems, enhancing job opportunities in vulnerable districts, and increasing agricultural productivity through the implementation of home gardening (as land and water are available in this community). Small-scale agriculture in Iran could play a critical role in supporting livelihoods and improving household nutrition in both urban and peri-urban areas, where socio-economic vulnerabilities are concentrated. Home-gardening can encourage and motivate people in selected communities to produce and consume diversified food options while enhancing learning potential, increasing community knowledge of the added value of local foods, and preventing nutritional disorders. Nutrition education programs targeting caregivers and mothers can be specifically designed to promote 'better' food choices and healthier lifestyles for the prevention of health problems later in life, given the multiple roles that women and mothers fulfill in this community; these may also reach all family and community members. Results and suggestions from this study will also be disseminated to the local authorities, including the Department of Health, so that public health measures can be promoted at clinics in vulnerable areas to target those who are most in need, promoting necessary information and skills to improve childcare through awareness creation of good health and hygiene practices.

Limitations and future research

This study is not without limitations. Specifically, the results of this study must be acknowledged as the outcome of a case study, and can only be extended to represent the area of central part of Iran. Further extensions to other regions are needed to be studied separately. Another limitation of this study is its cross-sectional design, which may lead to misevaluation of the affecting factors of malnutrition. While interpreting the results, reverse causality must be kept in mind. In determination of causality between the affecting factors and food insecurity, prospective studies would be valuable in terms of evidence.

Informed consent

Informed consent was obtained from all individual participants included in the study.

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Conflict of interest

The author declares no conflict of interest.

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