



Food security in selected Middle East and North Africa (MENA) countries: an inter-country comparison

Nasrin Omidvar¹ · Davod Ahmadi² · Kate Sinclair² · Hugo Melgar-Quiñonez²

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Abstract

This study aims to assess and compare food security and its socio-demographic correlates in 18 Middle East and North African (MENA) countries that fall under the auspices of the World Health Organization Regional Office of the Eastern Mediterranean (EMRO). This cross-sectional study is based on data from the 2016 Gallup World Poll. The study sample included an average of 1000 individuals per country ($n = 18,079$). Food security status of individuals was measured using the Food Insecurity Experience Scale (FIES). Various statistical analyses such as descriptive, bivariate, and binary logistic regression were conducted. Countries were categorized into three clusters based on frequency of moderate to severe food insecurity, as well as political stability index and per capita income. The frequency of severe food insecurity was significantly lower in countries in cluster 1 (rich, stable) (5.0%) compared to the second (middle-low income, less stable) (13.6%), and third (middle-low income, unstable) (26.7%) clusters ($P < 0.001$). Based on logistic regression analyses, income quintile per capita, personal health index and education levels were the main predictors of food insecurity in all three clusters. The results provide insight into the diversity of the MENA countries studied and the different policy options needed to improve their food security.

Keywords Food insecurity · EMRO countries · Socio-economic status

1 Introduction

Despite international efforts, there are still 795 million people worldwide who do not have access to sufficient quantity and quality of food to ensure good nutritional outcomes; 780 million

of them reside in developing regions. Food insecurity, which comprises both physical and economic access to food, is being experienced in a political, social, and economic context. Based on a recent report, good governance, political stability, and the absence of conflict and civil strife, weather-related shocks and excessive food price volatility are conducive to all achieving and maintaining food security (FAO, IFAD, WFP 2015).

Among these factors economic growth plays a central role (Timmer 2004). In addition, when analyzing the status of food security, it is necessary to distinguish between chronic and transitory food insecurity (Brinkman and Hendrix 2010; Burchi and De Muro 2016; Chambers 1995). These two types of food insecurity differ by duration. The former is a long-term inability to meet minimum food consumption requirements, while the latter is a short-term food deficit, which can be caused by a variety of factors some of which include conflict, political turmoil, high prices, breakdowns in delivery systems, economic recessions, volatile derivative markets, natural disasters, and extreme weather events, such as drought and flooding (Devereux 2006).

Moreover, risks, shocks, adverse trends and seasonality are all factors that can lead to increased vulnerability to food insecurity (Barrett 2010). Also, as highlighted by sustainable livelihood approaches, geographic location has been

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✉ Davod Ahmadi
davod.ahmadi@mail.mcgill.ca; ahmadigheidarii@gmail.com

Nasrin Omidvar
omidvar.nasrin@gmail.com

Kate Sinclair
kate.sinclair@mail.mcgill.ca

Hugo Melgar-Quiñonez
hugo.melgar-quinonez@mcgill.ca

¹ Department of Community Nutrition, National Nutrition and Food Technology Research Institute, Faculty of Nutrition Sciences and Food Technology, Shahid Beheshti University of Medical Sciences, Tehran, Iran

² McGill Institute for Global Food Security, Montreal, Quebec, Canada

suggested as an important cause of vulnerability (Devereux et al. 2004). This paper is concerned with countries in Middle East and North Africa (that fall under the auspices of the World Health Organization Regional Office of the Eastern Mediterranean). They are Afghanistan, Bahrain, Djibouti, Egypt, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, and Yemen.

The Middle East and North African countries listed above are facing unprecedented challenges to their food security due to political turmoil, social upheaval, unparalleled mass immigration and water scarcity (Sun et al. 2017). This study provides a description of the status of food security and its socio-demographic correlates in these countries.

2 Methodology

2.1 Data

This study used weighted data from the 2016 Gallup World Poll (GWP). The GWP collects data from 150 countries around the world, with an average sample size of 1000 individuals per country. Data were collected from 18 of the countries mentioned above, using face-to-face and telephone interviews. The samples were intended to be nationally representative of the non-institutionalized population 15 years of age and older (Nord et al. 2016). Countries were then categorized into three principal clusters based on the prevalence of moderate to severe food insecurity, GDP and political stability.¹

2.2 Outcome variable

The outcome variable in this study is the food security status of individuals. This was measured by GWP using the Food Insecurity Experience Scale (FIES). FIES was introduced and validated by the FAO's Voices of Hungry project in 2014 (Ballard et al. 2014). It is comprised of eight questions relating to the experiences of food insecurity. Questions asked are about individuals' uncertainty regarding their ability to obtain food, the quality and quantity of their food, and whether a whole day has passed without eating. Dichotomous responses (1 = Yes and 0 = No) were used and responses to the eight questions were summed. Each individual was assigned a food security score from zero to eight. In this study, based on FAO recommendations (Ballard et al. 2014), a score of zero was classified as "food secure", one to three as "mild food insecurity", four to six as "moderate food insecurity" and

seven and eight as "severe food insecurity". Finally, for analysis, four separate dummy variables for food security status were created.²

2.3 Exposure variable(s)

Several factors were used as explanatory variables, including sociodemographic factors such as, sex,³ age, marital status,⁴ education,⁵ employment status,⁶ household size⁷ and area of residence.⁸

Additionally, to assess health status, the *Personal Health Index* was used. This measures an individual's perceptions of their own health; it includes questions regarding incidence of pain, sadness, and worry. Self-reported quality of healthcare was also measured.⁹ In addition, two indices, the *Optimism Index*¹⁰ and the *Life Evaluation Index*¹¹ were included in this study.

Economic condition was evaluated using the following question: "How would you rate the economic conditions in this country today?"¹² Additionally, having enough money to afford shelter was also included.

An individual's social support was measured using the following question: "If you were in trouble, do you have relatives or friends you can count on to help you whenever you need them, or not?" Finally, to measure an individual's social network the following question was used: "In the city or area where you live, are you satisfied or dissatisfied with the opportunities to meet people and make friends?"

2.4 Data analysis

Different statistical analyses form the basis of this study. Descriptive statistics (percentages) were applied to explore the frequencies of dependent, as well as explanatory variables. To explore the association between explanatory factors and food security status crosstab analyses were carried out. Finally, for each of the three clusters of the countries studied, various unadjusted and adjusted logistic regression analyses

¹ Cluster 1: countries with less than 8% severe food insecurity; cluster 2: between 8 and 16% severe food insecurity; and cluster 3: above 16% severe food insecurity

² Food secure (0 = no; 1 = yes); Mild FIS (Food Insecurity 0 = no; 1 = yes); Moderate FIS (0 = no; 1 = yes); Severe FIS (0 = no; 1 = yes)

³ Female and Male

⁴ Single/never married; Separated/divorced and widowed.

⁵ Less (up to 8 years of basic education); secondary-3 year/tertiary secondary education and some education beyond secondary education (9–15 years of education); and completed 4 years of education beyond 'high school' and/or received a 4-year college degree.

⁶ Unemployed; Out of workforce; Part-time work; and Full-time work.

⁷ 1 to 3; 4 to 6; 7 and more persons.

⁸ Rural; Urban areas.

⁹ Dissatisfied; Satisfied.

¹⁰ Respondent's positive attitude for the future and specifically respondents' certain aspects of their life which are getting better or getting worse.

¹¹ Respondents' perceptions of where they stand now and in the future.

¹² Poor; only fair; and good/excellent.

were conducted to assess the associations among each estimate of food (in)security (secure, mild, moderate, and severe) and with explanatory variables.

3 Results

Table 1 categorizes the countries into three clusters based on their frequencies of moderate and severe food insecurity, and presents their corresponding political stability index (TWB 2017a) and per capita GDP (as a proxy of economic growth) (TWB 2017b). Within these clusters several trends emerge. For instance, countries with the lowest frequency of moderate to severe food insecurity (cluster 1) were countries with no major conflict or overt political instability, with the exception of Lebanon; they also had the highest GDPs per capita (above \$7000). Countries making up cluster 2 were countries with some political instability but no overt conflict (with the

exception of Pakistan which has political instability). These were also countries with middle per capita income. Finally, the highest frequencies of food insecurity (cluster 3) were observed among countries presently affected by conflict and with the lowest GDPs in the region.

Characteristics of the sample by cluster are presented in Table 2. Individuals in cluster 1 were significantly more likely to have higher education levels (40.2%), be employed full-time (56.3%), live in urban areas (75.2%), have household size of less than 4 (33.8%) compared to clusters 2 and 3. They were also more likely to report being in excellent personal health (38.1%), having better quality of healthcare (79.6%), and living in a good economic condition (55.5%).

Frequency of severe food insecurity was lower in countries in cluster 1 (5.0%) (Fig. 1) compared to the second (13.6%), and the third (26.7%) clusters ($P < 0.001$). In terms of the other factors, individuals living in cluster 1 had excellent optimism index (48.5%), better evaluation of life (40.4%), using

Table 1 Countries clustered by the frequency of food security, political instability index and GDP per capita, 2016

		Country	Food insecurity status %	Mod & severe (FIS)	Political stability index*	GDP \$ per capita** 2016 (\$)
Cluster 1	Rich, stable	Lebanon	87.1	5.2	-1.72	7914
		Emirates	71.3	12.0	0.76	37,622
		Kuwait	71.3	11.2	-0.11	28,957
		Saudi Arabia	69.4	16.8	-0.54	20,028
		Bahrain	65.1	19.2	-1.08	22,354
		Lower than 8.0% severe food insecurity		More than -1.1 (High stability)	More than \$7000	
Cluster 2	Middle-low income, low stability	Libya	39.3	30.3	-2.20	5602
		Morocco	51.9	24.2	-0.34	2832
		Pakistan	37.2	29.7	-2.54	1468
		Jordan	62.5	27.3	-0.58	4080
		Iran	27.9	47.4	-0.91	4957
		Egypt	52.2	29.8	-1.34	3514
		Tunisia	60.3	24.9	-0.87	3688
		Between 8 and 16.0% severe food insecurity		Between -1.1 and -2.28	Between \$1450 and \$7000	
Cluster 3	Middle-low income, unstable	Afghanistan	33.4	39.4	-2.50	561
		Iraq	27.4	47.9	-2.29	4609
		Yemen	26.6	43.2	-2.63	990
		Syria	15.4	54.8	-2.94	2079
		Somalia	33.2	57.2	-2.47	434
				More than 16.0% severe food insecurity		Equal or less than -2.29 (Low stability)

*The index of Political Stability and Absence of Violence/Terrorism: perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism

The index is an average of several other indexes from the Economist Intelligence Unit, the World Economic Forum, and the Political Risk Services, among others. (http://www.theglobaleconomy.com/rankings/wb_political_stability).

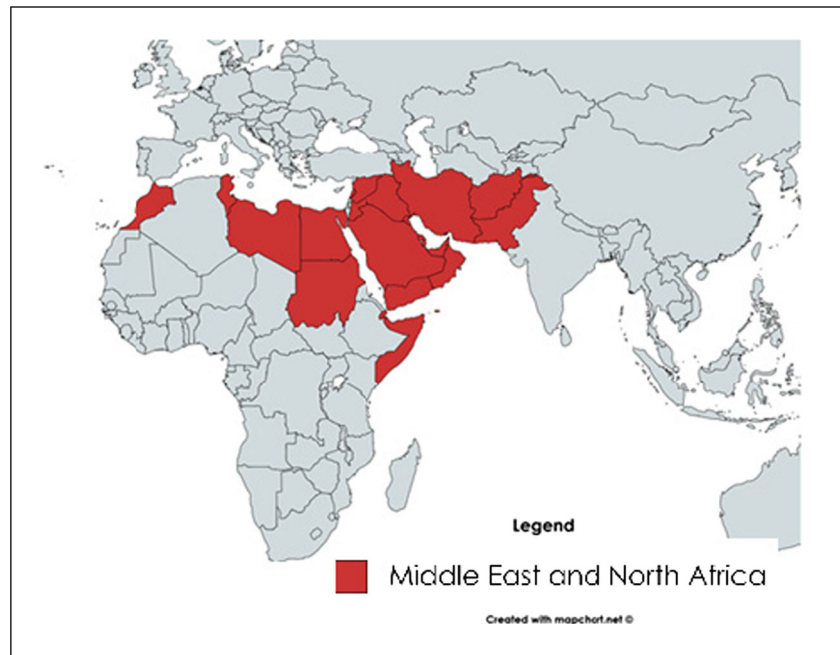
**Gross domestic product (GDP) per capita: Levels of GDP per capita were obtained by dividing GDP at current market prices by the population. A variation of the indicator could be the growth in real GDP per capita, which is derived as the percentage change in real GDP divided by the population. (World Bank. List of countries by GDP. 2016. (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>))

Table 2 Socio-demographic characteristics of the three clusters in the selected countries

	Cluster 1	Cluster 2	Cluster 3
Sex			
Female	37.4	49.3	49.6
Male	62.6	50.7	50.4
Age			
13–25	23.0	30.8	38.5
26–49	63.0	48.0	45.3
50–99	13.9	21.3	16.3
Marital status			
Single/never married	34.7	36.7	30.1
Separated/widowed/divorced	44	6.3	7.7
Married/domestic partner	60.9	57.1	62.2
Education			
Completed elementary	10.2	44.4	70.6
Secondary-3-year Tertiary	49.6	45.0	24.5
Four years of high school and above	40.2	10.6	4.9
Employment Status			
Unemployed	6.5	8.9	16.6
Out of workforce	30.3	49.9	50.0
Employed- part time	6.9	9.0	12.7
Employed- full time	56.3	32.2	20.6
Per-capita-income quintiles			
Poorest 20%	19.7	19.9	19.9
Second 20%	19.9	19.9	20.0
Middle 20%	20.3	20.0	20.0
Fourth 20%	20.3	20.2	20.0
Richest 20%	20.1	20.1	20.0
Area of residence			
Rural	24.8	47.9	62.1
Urban	75.2	52.1	37.9
HH size			
7 and more	21.9	29.7	61.7
4–6	44.4	51.5	29.9
1–3	33.8	18.9	8.4
Personal Health Index			
Poor	36.8	49.5	57.4
Moderate	25.1	22.2	19.5
Excellent	38.1	28.3	23.0
Quality of healthcare			
Dissatisfied	20.4	55.1	58.4
Satisfied	79.6	44.9	41.6
Optimism Index			
Low (0–25)	16.2	37.3	46.7
Only fair (26–50)	13.8	19.8	19.8
Good (51–75)	21.5	19.7	15.4
Excellent (76–100)	48.5	23.2	18.1
Life Evaluation Index			
Suffering	6.4	15.1	27.7
Struggling	53.2	64.8	63.0
Thriving	40.4	20.1	9.3
People count on help			
No	14.6	27.8	37.2
Yes	85.4	72.2	62.8
Ability to make friend			
No	17.6	26.2	30.0
Yes	82.4	73.8	70.0
Self-reported economic-condition			
Poor	18.1	37.9	58.7
Only fair	26.4	36.5	17.2
Good	55.5	25.7	24.0
Not enough money for shelter			
Yes	21.0	22.2	45.1
No	79.0	77.8	54.9
Communication Use Index-(phone, internet)			
Low (0)	0.8	11.6	22.0
Only fair (50)	10.4	42.2	53.8
Good (100)	4.2	7.3	4.0
Excellent (150)	84.6	38.8	20.2
<i>n</i> =	(5865)	(7010)	(5204)

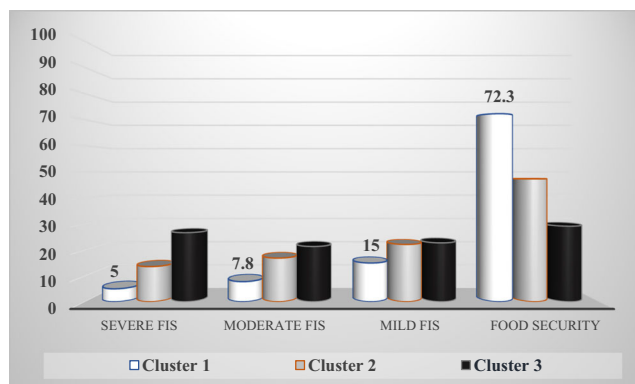
Source: Micro-data analysis of Gallup survey, 2016; Countries in cluster 1: Lebanon, Emirate, Kuwait, Saudi Arabia and Bahrain; Countries in cluster 2: Libya, Morocco, Pakistan, Jordan, Iran, Egypt and Tunisia; Countries in cluster 3: Afghanistan, Iraq, Yemen, Syria, Somalia

Fig. 1 Map showing the countries discussed in this paper in red



better communication instruments (84.6%), having relatives or friends to count on when they need help (85.4%), and were able to make friends (82.4%; Table 2) (Fig. 2).

Findings from crosstab analyses are presented in Table 3. According to Gamma and Cramer’s V coefficients, most of the independent factors were significantly associated with food security status, regardless of cluster. However, this relationship was only found to be strong among some of the factors (i.e., education levels, per capita income quintile, personal health index, life evaluation index, not enough money for shelter, and communication index). Notably, findings from crosstab analyses indicated that, regardless of region, male respondents were more likely to be food secure than their female counterparts. Surprisingly, age groups and marital status were positively associated with food security in cluster 1 (Table 3).



Source: Micro-data analysis of Gallup survey, 2016

Fig. 2 Food security status (FIES) in selected Middle East and North Africa countries. Source: Micro-data analysis of Gallup survey, 2016

Findings from the adjusted binary logistic regression analyses are presented in Table 4.

Cluster 1 Results from the regression model revealed that the probability of food insecurity was less among females (OR = 0.786; $P < 0.01$), as well as those living in rural areas (OR = 0.843; $P < 0.001$). On the other hand, the odds of being food insecure increased among individuals between 13 and 25 years of age (OR = 1.858; $P < 0.001$), living in the poorest quintile (OR = 4.317; $P < 0.001$), and with low education attainment (OR = 1.354; $P < 0.001$). Furthermore, personal health (OR = 2.958; $P < 0.001$), social capital (OR = 1.899; $P < 0.001$), and not enough money for shelter (OR = 4.859; $P < 0.001$) were all found significantly associated with food insecurity.

Cluster 2 No significant difference was observed between food insecurity and sex of respondents in cluster 2 and unlike cluster 1, the probability of being food insecure was greater among people living in rural areas (OR = 1.197; $P < 0.01$). In terms of other socio-demographic factors, individuals between 26 and 49 years old (OR = 1.346; $P < 0.001$), with poor education (OR = 2.024; $P < 0.001$) and living in the poorest quintile (OR = 3.614; $P < 0.001$) were more likely to report food insecurity.

Cluster 3 No significant associations were found between sex or age and food insecurity status. Findings from the regression model showed that income quintiles were strongly associated with food insecurity in cluster 3. According to the findings, compared to the richest quintile, individuals in the poorest quintile were 10 times more likely to report food insecurity (OR = 10.02; $P < 0.001$). Similar to other clusters, individuals

Table 3 Bivariate analyses of food security status and independent variables in the three clusters of the selected countries

		Cluster 1	Cluster 2	Cluster 3
Sex	(Cramer's V)	0.049**	0.089***	0.061**
Age	(Gamma)	0.079**	-0.097***	-0.065**
Marital status	(Gamma)	0.010	-0.195***	-0.067**
Education	(Gamma)	0.217***	0.284***	0.312***
Employment	(Gamma)	0.043	0.118***	0.213***
Per capita income quintiles	(Gamma)	0.380***	0.391***	0.437***
Area of residence	(Cramer's V)	0.043*	0.099***	0.125***
Household size	(Gamma)	0.113***	0.080***	0.065
Personal Health Index	(Gamma)	0.245***	0.293***	0.277***
Quality of healthcare	(Cramer's V)	0.019	0.124***	0.121***
Optimism Index	(Gamma)	0.099***	0.316***	0.178***
Life Evaluation Index	(Gamma)	0.300***	0.449***	0.305***
People count on help	(Cramer's V)	0.148***	0.224***	0.219***
Ability to make friend	(Cramer's V)	0.067***	0.124***	0.083***
Self-reported economic condition	(Gamma)	-0.048	0.159***	0.110***
Not enough money for shelter	(Cramer's V)	-0.385***	-0.364***	-0.335***
Communication index	(Gamma)	0.279***	0.297***	0.172***
	<i>n</i> =	(5865)	(7010)	(5204)

Food security status based on FIES in four levels (Food secure, Mild FIS, Moderate FIS and Severe FIS)

Chi-square significance: * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$.

Self-calculation of data from Gallup, 2016

living in rural areas (OR = 1.666; $P < 0.001$), with low education attainment (OR = 1.885; $P < 0.001$), poor health status (OR = 2.304; $P < 0.001$), no social capital (OR = 2.078; $P < 0.001$) and no money for shelter (OR = 2.578; $P < 0.001$) were significantly more likely to be food insecure.

(See supplementary materials for the unadjusted binary logistic regression analyses: FS/FIS and independent variables in Table 5, Moderate Food Insecurity and independent variables in Table 6, and Severe Food Insecurity and independent variables in Table 7).

4 Discussion

To our knowledge, this is the first study that provides an estimate of the food security status in the selected countries, using a validated individual-experienced-based measurement tool. Furthermore, categorization of the countries into three main clusters, based on their food insecurity and political and economic status, provided an additional strength for analysis. Notably, the discussion includes two levels of analyses: (1) macro-level (based on political stability, economic growth (GDP)), and (2) household/individual level (based on socio-economic factors). Food insecurity is certainly an issue that affects most of the countries, although in the majority, malnutrition and mass starvation are not endemic features (Babar and Mirgani 2014). The high prevalence of FI in this region

has been attributed to low agricultural production, heavy dependence on food imports, social inequities, economic instabilities and unstable political situations (Jomaa et al. 2019). Results highlight the fact that countries with the highest political instability and lowest GDP per capita (cluster 3) are experiencing the highest level of severe food insecurity.

In most of the Middle East and North African countries studied, the presence of ongoing armed conflict since 2010 has dramatically affected people's lives (De Waal 2015). Specifically, conflicts in Syria, Yemen, South Sudan, and Somalia are causing enormous social and economic devastation and contribute to high levels of food insecurity. Based on the Global Hunger Index, these countries are classified as "extremely alarming"; with Yemen being the most vulnerable country to food insecurity in the region (Garduño-Díaz and Garduño-Díaz 2015). In the case of Yemen, very little food production, high dependence on food imports and an already weak economy affecting household food availability and access have led to food insecurity and starvation (Yaseen and Hillier 2019). Based on the present study, Syria and Somalia were the countries with the highest prevalence of severe and moderate food insecurity in the region in 2016. In Syria, Somalia and Yemen, political instability, climate change-related crises and their possible interactions (Selby et al. 2017) have affected community livelihoods and seem to be essential contributing factors to food insecurity.

Table 4 Adjusted binary logistic regression analysis (Odds and CI) of FS/FIS and independent variables in the three clusters of the selected countries

	Cluster 1 (<i>n</i> = 5865)			Cluster 2 (<i>n</i> = 7010)			Cluster 3 (<i>n</i> = 5204)		
	CI Odds ratio	Low	High	CI Odds ratio	Low	High	CI Odds ratio	Low	High
Sex									
Female	0.786**	0.682	0.905	1.078	0.966	1.203	1.045	0.872	1.253
Male (Ref)									
Age									
13–25	1.858***	1.447	2.388	1.084	0.923	1.272	0.988	0.749	1.303
26–49	1.752***	1.400	2.192	1.346***	1.162	1.559	1.043	0.799	1.361
50–99 (Ref)									
Education									
Completed elementary	1.354*	1.055	1.738	2.024***	1.669	2.498	1.885**	1.266	2.807
Secondary-3-year Tertiary	1.499***	1.288	1.745	1.435***	1.180	1.745	1.755**	1.158	2.661
Four years of over high school (Ref)									
Income quintile									
Poorest 20%	4.317***	3.395	5.489	3.614***	3.002	4.350	10.02***	7.004	14.351
Second 20%	2.743***	2.158	3.486	2.889***	2.419	3.451	5.070***	3.817	6.733
Middle 20%	2.352***	1.846	2.998	2.186***	1.836	2.603	2.919***	2.272	3.750
Fourth 20%	1.656***	1.286	2.133	1.531***	1.286	1.822	2.448***	1.915	3.129
Richest 20% (Ref)									
Area of residence									
Rural	0.843***	0.721	0.985	1.197**	1.071	1.338	1.666***	1.390	1.997
Urban (Ref)									
Personal health index									
Low	2.958***	2.516	3.477	2.488***	2.179	2.841	2.304***	1.855	2.861
Moderate	1.674***	1.395	2.009	1.531***	1.316	1.781	1.083	0.851	1.378
High (Ref)									
People count on help									
No	1.899***	1.589	2.271	1.415***	1.011	1.298	2.078***	1.675	2.578
Yes (Ref)									
Ability to make friend									
No	1.031	0.866	1.227	1.145*	1.011	1.298	1.139	0.904	1.436
Yes (Ref)									
Not enough money for shelter									
Yes	4.859***	4.182	5.644	4.176***	3.593	4.853	2.578***	2.131	3.119

In this regression model, FIES in two levels ((0 = FS) (1 = Mild+Mod+Severe FIS)) were used

Due to collinearity, only 9 variables were entered in the model

Chi-square significance: * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$.

Data from Gallup, 2016

As described by the World Food Program, stability is the fourth dimension of food security and implies not only food price stability but also economic, political and social stability (WFP 2010). Although it is relatively accepted that food security can be affected by all of these factors, the relationships are complicated and not necessarily direct or causal (Maxwell 2012).

In general, cluster 1 includes rich, oil producing countries with the exception of Lebanon. Lebanon, unlike other countries in this cluster, has a high rate of immigration from

conflict-affected countries and an average, rather than high, GDP per capita. Nonetheless, it was found to have the highest food security prevalence in the region. This is likely due in part to a moderate climate, rich soil, and reasonable water supply (Harrigan 2012), all of which allow for a greater diversity of food production compared to other countries in the region (El-Asmar 2011). For years, Lebanon struggled with water shortages in the summer and fall: however, in 2014, the combination of a particularly severe drought and the arrival of

more than a million Syrian refugees placed a particular strain on Lebanon's infrastructure, making the consequences more acute (WB 2014).

Additionally, although Lebanon's moderate and severe food security prevalence classifies it as a cluster 1 country, its per capita GDP is much lower than other countries in cluster, nonetheless, it is notably higher than countries in cluster 2, probably owing to greater investment in tourism (Tang and Abosedra 2014), as well as extra income through remittances and foreign investment (Abosedra and Fakhri 2017).

The absence of food insecurity in cluster 1, endorses the idea that generating sufficient foreign exchange from exports can facilitate sufficient access to food imports from world markets, thus facilitating food security (Breisinger et al. 2012). In Cluster 2, which includes middle-income countries with some economic or political instability, trends are not as consistent and further consideration is needed. On one hand, there are lower middle-income countries with comparably lower food insecurity, as in the case of Morocco, where improvements in food security have largely been attributed to national policies and programs, notably "Plan for Green Morocco"¹³ (Badraoui and Dahan 2011). On the other hand, there are higher income countries including Iran, Jordan and Tunisia, which have a relatively higher prevalence of severe to moderate food insecurity (FI). Based on a recent analysis, agriculture and rural development strategies, as well as weaknesses in import, and export policies may influence the low availability and access to food in these countries (Breisinger et al. 2012; Ardakani et al. 2017), despite relatively high levels of food and fuel subsidies in the region, as major pro-poor strategies aiming at reducing poverty (Breisinger et al. 2012).

It is widely accepted that poverty is one of the strongest predictors of food insecurity world-wide. Nevertheless, not all population groups experience the same vulnerability to poverty. For instance, available data on income poverty, as well as the global Multidimensional Poverty Index (MPI), highlight that poverty worldwide is concentrated in rural areas; however, the composition of poverty and type of deprivation in urban and rural areas across all countries differ (Christiaensen and Todo 2013). Results from the present study show that in Clusters 2 and 3, residents of rural areas were significantly more food insecure than their urban counterparts. However, in Cluster 1, the rural population was less likely to experience food insecurity than their urban counterparts.

A potential explanation for this is that worldwide we are witnessing dramatic increases in urban populations. The increase in rural-urban migration has resulted in rapid relocation of poverty from rural to urban areas and higher prevalence of food insecurity and malnutrition in all its forms among urban dwellers (Ruel et al. 2017). Verifying whether

this is the case for the countries of the present paper requires further investigation. Yet, there have been recommendations regarding shifting policies and investments in agriculture and related rural activities through targeted "green box" measures in order to improve rural livelihoods as well as the macro economy in such countries (Minot et al. 2010).

For clusters 2 and 3, the present analysis re-emphasizes the higher vulnerability of women to food insecurity. Several factors contribute to this, including poor educational status, unemployment and low income, as well as the possibility of experiencing discrimination in food distribution within the household (Bennett (1987). However, surprisingly, in cluster 1 countries, the trend did not hold true; female respondents had a lower probability of food insecurity. Although they themselves are unlikely to be included in the labour market, women living in rich Islamic countries, such as Lebanon, Emirates, Kuwait, among others, may be protected against food insecurity as a result of the high economic support they receive from male family members (McKee et al. 2017).

Additionally, this paper shows that regardless of the country cluster, a significant positive relationship exists between food security status and personal health index (self-perceived personal health). This relationship was particularly strong in the richest and the most politically stable countries (Cluster 1) and confirms previous studies demonstrating that food insecure individuals report higher levels of depression, stress, anxiety, are more prone to impaired health, and often feel powerless in taking care of themselves (Silverman et al. 2015; Hjelm et al. 2017). However, in many cases, it is likely that those who live in higher income, more stable countries, have better self-care, increased access to health care and more opportunities for better health.

Moreover, this study found social capital to be significantly associated with food security across the board. Martin et al. (2004) found that trust, reciprocity and social networks were positively related to food security. In particular, they stressed that reciprocity among neighbours increased the probability of food security.

In contrast, lack of housing, or a respondents' inability to pay for shelter, was a strong predictor of food insecurity. This has consequences that can extend beyond food insecurity. For instance, a study by Bailey et al. (2016) indicated that availability of housing and ability to pay for shelter contributed not only to households' food security but also impacted young children's health and development outcomes.

In evaluating the study results, several limitations need to be taken into account. First, the cross-sectional nature of the study does not allow for causality to be inferred, nor were we able to assess changes over time. Additionally, due to lack of data, four Middle East countries were not included in the study. The study is limited to variables only included in the GWP and therefore there are no data on dietary intake or clinical health status. Overall, the findings suggest that due

¹³ The ambitious Green Morocco Plan (GMP) aims to make the agricultural sector a priority boost to the socio-economic development in the country.

to the diversity of the countries studied, policies and interventions designed to improve food security may differ. Future research is needed to further explore the role of individual and social factors in food security status both at the country and the regional level.

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Compliance with ethical standards

Conflict of interest The authors declared that they have no conflict of interest.

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Nasrin Omidvar is a professor in the Department of Community Nutrition, National Nutrition and Food Technology Research Institute, Faculty of Nutrition Sciences and Food Technology, Shahid Beheshti University of Medical Sciences, Tehran, Iran. She teaches food security and nutrition status in Iran.



Davod Ahmadi is a research assistant at the McGill Institute for Global Food Security, Montreal, QC, Canada. He is working on the association between time fetching water and nutritional status.



Kate Sinclair PhD Human Nutrition candidate in the school of Human Nutrition, Montreal, QC, Canada. Her current research aims to explore issues related to food insecurity and women's autonomy in Colombia.



Hugo Melgar-Quinonez is professor in the school of human nutrition, McGill University, and director of the McGill Institute for Global Food Security, Montreal, QC, Canada.