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ORIGINAL PAPER

Changes in food security in Latin America from 2014 to 2017

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Abstract

Ending hunger and achieving food security is Goal 2 of the Sustainable Development Goals but will be difficult to achieve as many countries experience financial and political shocks. This study assesses changes in the status of food security in Latin America (LA) during the region's recent economic recession (2014 to 2017). This cross-sectional study used Gallup World Poll data from 18 LA countries ($n = 65{,}146$) from 2014 to 2017. Food security status was measured by the Food Insecurity Experience Scale. Descriptive statistics were performed to analyze the changes in food security and logistic regression was applied to investigate associations between food security and socioeconomic and individual factors. Findings showed that LA suffered a significant decrease in food security (from 51% to 43%) and an increase in moderate (13% to 16%) and severe food insecurity (14% to 19%). However, El Salvador and Honduras, which are benefiting from long-term political and financial stability presented an opposite trend. Although food security decreased in Chile and Uruguay, they still had the two highest prevalences of food security in 2017 (67% and 62%, respectively). As seen in other regions, food insecurity was strongly associated with poverty, low education, having three or more children in the household, lack of social support and poor wellbeing. Women were more likely to report food insecurity, but the elderly (60+) were less likely. Findings highlight that economic and social policies are needed to tackle this progressive deterioration of food security and guarantee the right to food if LA is to achieve 2030 targets.

Keywords Food security · Latin America · Food insecurity experience scale · Sustainable development goals · Epidemiology

1 Introduction

Latin America has been widely recognized as one of the world's leaders in the fight against hunger. Over the period 1990 to 2014, the Food and Agriculture Organization (FAO) recognized that the region was the first in the world to reduce by half the proportion of undernourished people (FAO 2015). This undernourishment indicator is defined as "the estimated proportion of the population that fails to meet their minimum dietary energy requirements for healthy life" (FAO and PAHO 2017). This social political and economic improvement seen through declining undernourishment has been attributed to the many national government commitments in Latin America taken towards achieving food security, known as the stable access to adequate food, during a period of economic and political stability (FAO 2015; 2016). The region saw other gains during this period that included, reductions in poverty and indigence, and achieving the hunger target of the Millennium Development Goals, which was to halve the proportion of people who suffer from hunger (FAO 2015).

While these gains have been celebrated, there are concerns that with recent economic and political declines in the region, that they may be pushed back. Recently in the region, there have been noted increases in the number of undernourished persons from 2014 to 2016, which has been attributed to the region's recent economic downturn (FAO and PAHO 2017). Data published by the Economic Commission for Latin America and the Caribbean (ECLAC) have shown that, while total and per capita Gross Domestic Product (GDP) of the region increased steadily from 2009 to 2014, since then they have been in decline (ECLAC 2017). This economic downturn is partially influenced by declines in the prices of energy commodities, but may also be attributed to political and economic instability faced by some major Latin American economies, such as those of Argentina and Brazil (IMF 2017; Thomas and Cachanosky 2016; Paula and Pires 2017). There have been similar signs of economic

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recession in other macroeconomic factors of the region which include increases in inflation, unemployment and poverty (World Bank 2018; ECLAC 2017).

It is a cause for concern and a matter for research on how these declines may be affecting noted food security gains in the region, since researchers have shown that food security is strongly associated with the political and economic environment (FAO and PAHO 2017; Van Hal 2015; Brinkman et al. 2010). According to the literature, stagnating growth, and the development of high food prices, low income and unemployment can rapidly jeopardize food access, leading to increases in food insecurity (Davis and Geiger 2017; Brinkman et al. 2010). In addition to economic factors, political instability affects food security, since the political environment directly affects the economy and government commitments and the types of policies employed in the area of food security (FAO et al. 2017). For these reasons, it is understood that economic growth and political stability are macro determinants of food security (Timmer 2005).

Economic and political shocks affect food security differently across the globe. In 2008, increases in food prices associated with the Global Financial Crisis resulted in over 40 million new hungry people in 2008 and increased food insecurity (FI) in both developing and developed countries (Mittal 2009; Davis and Geiger 2017; Brinkman et al. 2010; Vilar-Compte et al. 2015). Using a number of proxy measures, the World Food Programme found that the 2008 economic crisis reduced food consumption among poor households with these reductions assessed at 8% and 26% in Nicaragua and Honduras respectively; and in Liberia, severe food insecurity doubled (Brinkman et al. 2010). In Egypt, 1/5 of the population was unable to consume the required daily dietary requirements because of lack of financial resources (Ahmed 2014). In Europe, the percentage of households reporting not being able to afford protein (meat/chicken/fish) increased significantly. Across countries there was some diversity in the effect on households, with the largest being in the UK, ranging from 4 to 9% (Davis and Geiger 2017). In France, the percentage ranged from 3 to 7%, Spain (2 to 6%), Austria (2 to 4%), and was lowest in the Netherlands where it ranged from 0 to 2% (Davis and Geiger 2017). While these results indicate that financial and political shocks are a threat to food security in any region or country, the magnitude of the deterioration in food security varies according to a number of factors that include the functioning of the national welfare regime, intractability of existing policies and social protection systems (Davis and Geiger 2017).

While current global efforts are focused on the Sustainable Development Goals (SDGs) and the devising of policies to realize the 2030 Agenda, research is needed to guide actions that strengthen existing policies and frames new ones. In the case of food security in the context of the SDGs, which build on many of the MDG targets, the 2nd Goal targets the achievement of "food security for all" (UN 2017). The Latin America region experienced successful achievement of the MDGs as it was underpinned by macroeconomic and political stability. In contrast, launching of the Sustainable Development Goals (SDGs) in 2016 took place amidst unfavorable economic conditions (FAO 2015; FAO and PAHO 2017). The plan of action for the region as it moves towards achieving the SDGs by 2030 should be informed by evidence-based research in order to assess how the region has fared in the area of food security since the crisis, and the magnitude of the deterioration if any. In order to fill this research gap, this study assessed the changes in food security status in Latin America, looking at region and country levels during the region's current economic recession (2014 to 2017) and exploring its association with socioeconomic and individual factors.

1.1 Measuring food security

The concept of food security has evolved over time and so too, the tools that measure its various dimensions. Initially described as the availability of food at the World Food Conference in 1974, adequacy of world food supplies was evaluated. This understanding led to the development of indicators focused on food availability, such as the prevalence of undernourishment and household food expenditure (UN 1975). These two measures have been used widely to assess food availability at national and household levels (Pérez-Escamilla et al. 2017a; Cafiero et al. 2014). However, they are unable to detect unequal food distribution, at the national and intra-household levels (Perez-Escamilla et al. 2017a; Cafiero et al. 2014).

In the mid − 1970s, the concept further evolved when scholars and practitioners questioned the claim that availability of food at the national level ensured food access (Pinstrup-Andersen 2009). At the World Food Summit in 1996, the food security definition was broadened to include: "the physical and economic access to sufficient, safe and nutritious food" (FAO 1996). This widely recognized definition emphasizes its multidimensional nature and four pillars: food availability, access, utilization and stability (FAO 1996).

In parallel, other measures were developed to assess these new dimensions. The dietary intake measure assesses individual food consumption and covers the dimension of access. Dietary assessments, such as 24-h food recall and frequency of food consumption provide highly detailed information on food items consumed but rely heavily upon respondents' memories. Owing to high cost, such assessments are rarely included in national surveys (Pérez-Escamilla et al. 2017a; Cafiero et al. 2014). Anthropometric indicators, such as the prevalence of child underweight, wasting and stunting, which have historically been used to evaluate food security status, measure nutritional status which is the outcome of food consumption and utilization (Pérez-Escamilla et al. 2017a; Cafiero et al. 2014). It is important to mention that anthropometric indicators have been used historically to measure food security because they are seen as golden

measures. However, anthropometric measures are proxies for the food utilization dimension and not really a food security indicator, as many factors can interfere with outcomes of nutritional status (such as disease).

Over time, it was recognized that quick and easy measures were needed to capture the "food access" dimension. Access was considered the most important dimension of food security, since it acts as a "bridging dimension" between those of availability and utilization. This concept created the context within which experience-based food insecurity scales (EBFSS) emerged (Cafiero et al. 2014). Ethnographic studies, starting in the 1970s showed that food insecurity, caused by the lack of financial resources, followed progressive stages. They began with concerns of not having enough food, and progressed to decreases in food at home, decreases in quality and quantity of diet, and finally to hunger experiences, such as not eating for a whole day (Radimer et al. 1990).

Leroy et al. 2015 conducted a critical review of indicators covering the access dimension and identified nine indicators categorized into: experience-based coping strategies, and dietary diversity. Authors confirmed that experience-based tools such as the Household Food Security Survey Module (HFSSM) developed in the US were a relatively simple and inexpensive method, with high predictive validity and reliability (Cafiero et al. 2014). Efforts to fine tune EBFSS resulted in many countries and regions developing their own scales based on the HFSSM, such as the Brazilian Food Insecurity Scale, the Mexican Food Security Scale and the *Latin American* and Caribbean *Food Security Scale* (Pérez-Escamilla et al. 2017a; Cafiero et al. 2014; Segall-Corrêa et al. 2007). These tools have been extensively validated nationally and regionally, leading to the recognition that EBFSS are the best measure to assess "resource-constraint food insecurity" (Pérez-Escamilla et al. 2017a; Cafiero et al. 2014; Segall-Corrêa et al. 2007).

More recently, in an effort to provide comparative data on food security across the world, the FAO, through the project Voices of the Hungry, developed the eight-item international Food Insecurity Experience Scale (FIES) (FAO 2016). In 2014, a validation study using Rasch modeling, showed an outstanding performance of the FIES in 20 countries across Latin America, Africa and Asia (FAO 2014). As a result, the FIES was included in the annual Gallup World Poll (GWP) surveys to monitor food security in more than 140 countries (FAO 2016).

2 Methodology

2.1 Data and design

In order to capture the changes in food security in Latin America during the current economic recession, a cross-sectional study was conducted based on data from the GWP. These data covered the past four years: 2014 ($n = 17{,}144$), 2015 ($n = 16{,}636$), 2016 (n = 16,649) and 2017 ($n = 14{,}717$). The GWP conducts an annual survey in more than 140 countries with an average sample of 1000 households per country (Gallup 2017). The sample of each country was selected through a multiple-stage cluster design, covering the entirety of each country. In Latin America, Gallup conducted face-to-face interviews with respondents aged 15 and older (Gallup 2017). In order to ensure national representativeness, data were weighted by age, gender, education and socioeconomic status for each country based on population statistics (Gallup 2017).

2.2 Outcome and exposure variables

Food security status, measured by the FIES, was the outcome (dependent) variable. FIES is a psychometric scale that measures an individual's food security status by asking direct questions on the experiences and behaviours associated with changes to quality and quantity of their diet, as well as hunger experiences, such as skipping meals and not eating for an entire day because of the lack of resources (FAO 2016). Questions of the FIES, shown in (Table 1), use the reference period of twelve-months prior to the interview and require "yes" or "no" responses (FAO 2016). Each positive answer receives one point and the total points for the eight questions are used to classify the food security status of respondents. Thresholds are based on the following categories: 0 "Food Secure"; 1 to 3 "Mild Food Insecurity"; 4 to 5 "Moderate Food Insecurity"; and 6 to 8 "Severe Food Insecurity" (FAO 2016).

In the case of Brazil, the food security status of respondents was measured using the first eight questions of the Brazilian

Table 1 Eight questions of the Food Insecurity Experience Scale

During the last 12 MONTHS, was there a time when…

1. …you were worried you would not have enough food to eat because of a lack of money or other resources?
2. …you were unable to eat healthy and nutritious food because of a lack of money or other resources?
3. …you ate only a few kinds of foods because of a lack of money or other resources?
4. …you had to skip a meal because there was not enough money or other resources to get food?
5. …you ate less than you thought you should because of a lack of money or other resources?
6. …your household ran out of food because of a lack of money or other resources?
7. …you were hungry but did not eat because there was not enough money or other resources for food?
8. …you went without eating for a whole day because of a lack of money or other resources?

Adapted from: FAO. (2016). *Methods for estimating comparable rates of food insecurity experienced by adults throughout the world.* Rome, FAO

Food Insecurity Scale (EBIA). These first questions of EBIA are almost the same as the FIES questions, with only three differences: 1) EBIA's questions incorporate both questions for the individual respondent and the rest of the household since it is based on a household level analysis; 2) EBIA uses a reference period of three-months prior to the interview unlike FIES which uses a 12-month reference period; and, 3) EBIA's food security thresholds for moderate and severe FI are also differently assessed from FIES. In order to allow comparison of the Brazilian data (based on EBIA) with data from others LA countries (based on FIES), we used FIES thresholds to classify food security status of respondents in Brazil (FAO 2016).

Socioeconomic characteristics were used as exposure (independent) variables: income, education, age, gender, number of children in the household, social support and wellbeing. Income was measured by household income per capita and classified into quintiles, from the poorest 20% to the richest 20%. Educational level was based on degrees of completion: elementary, secondary (i.e., high school) and college/university degree. Age was analyzed in three categories: youth (15 to 29 years), adult (30 to 59 years) and elderly (60 years and more). The number of children in the household was categorized as 0, 1, 2 and 3 or more children. Social support was addressed by the Social Life Index, which assesses the structural (i.e., interaction with friends and integration in the community) and functional (i.e., perceived emotional support) dimensions of social support using the questions: 1) If you were in trouble, do you have relatives or friends you can count on to help you?; 2) Are you satisfied with the opportunities to meet people and make friends where you live? (Gallup 2017). This index classifies individuals as having low (if respondents answered "no" to both questions), moderate (if answered "yes" to only one question) or high social support (if answered "yes" to both questions) (Gallup 2017). Wellbeing was analyzed by the component of life satisfaction, which was measured by the Life Evaluation Index (Gallup 2017). This index uses two questions: 1) From 0 to 10, where 10 represents the best possible life for you, on which step would you say you personally felt you stand at this time?; 2) Now, from 0 to 10, on which step do you think you will stand in the future, say about five years from now? (Gallup 2017). Individuals who rate their current life as "7" or higher and their future as "8" or higher are classified as "thriving", those who rated their current and future lives as "4" or lower are classified as "suffering", and all other individual are classified as "struggling" (Gallup 2017).

2.3 Statistical analysis

Descriptive analyses were used to assess the changes in food security status over the period, using z-tests to verify significant differences among proportions and linear-by-linear tests to examine associations between variables. Based on the overall change in food security, the Latin America countries were organized into three groups: improving, stagnating and worsening. Finally, a multiple logistic regression analysis was performed to verify associations between food security status and socioeconomic factors (independent variables). Independent variables were checked for high collinearity ($r \geq 0.7$) before including in the regression model. SPSS (version 23) was used to conduct these analyses.

3 Results

Distribution of the sample size per country and year is shown in Table 2. As Belize's population size is around 374 thousand people, its sample size is much smaller than the other countries, which have between 3 and 209 million citizens (World Bank 2018). As a result, Gallup only collected data for Belize in 2014 and the data was not available for the three additional years during our study period.

Changes in the food security status in Latin America region are presented in Fig. 1. There was a significant decline in food security from 2014 (51%) to 2017 (43%), along with significant increases in the two most extreme categories of food insecurity: moderate (13% to 16%) and severe food insecurity (14% to 19%).

Changes in the prevalence of food security for each Latin America country are shown in Table 3. While Paraguay, El Salvador and Honduras showed an increase in food security,

Table 2 Distribution of the sample (n)

	2014	2015	2016	2017	Total
Latin America Region	17,144	16,636	16,649	14,717	65,146
Argentina	996	997	941	968	3902
Belize	481	-[1]	–	–	481
Bolivia	992	990	994	984	3960
Brazil	1006	964	988	966	3924
Chile	986	1002	968	1026	3982
Colombia	990	984	991	996	3961
Costa Rica	985	977	972	986	3920
Ecuador	992	985	983	990	3950
El Salvador	990	985	982	973	3930
Guatemala	990	974	976	987	3927
Honduras	978	981	993	987	3939
Mexico	931	951	972	956	3810
Nicaragua	979	991	972	964	3906
Panama	961	963	983	975	3882
Paraguay	999	966	997	-[1]	2962
Peru	948	980	967	977	3872
Uruguay	994	986	992	981	3953
Venezuela	946	957	979	-[1]	2882

[1] Missing data

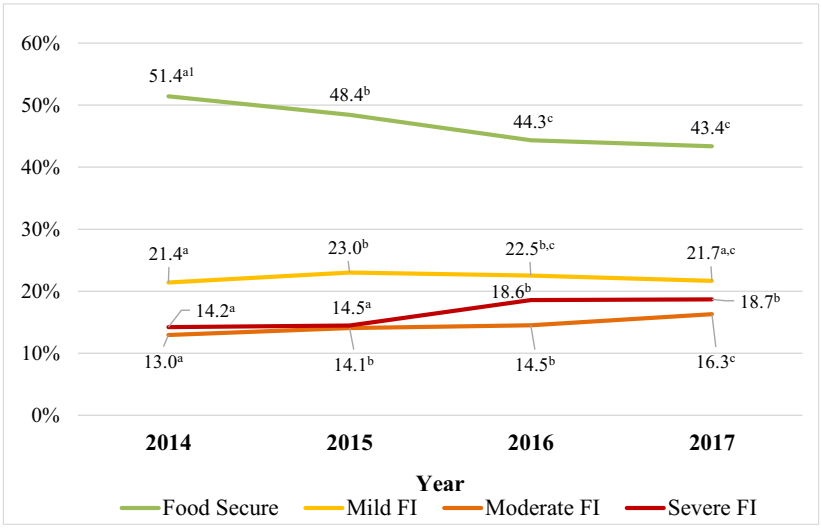

Fig. 1 Food security status in LA from 2014 to 2017. [1]Different superscript letters denote differences at the 0.05 level among years of each of the four measures of food security status

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Argentina and Brazil had a 25% and 24% decrease in food security, respectively, over the same period. Although the prevalence of food security remained stable in Costa Rica during this period, the country showed the region's third highest prevalence (56%) of food security in 2017.

Wellbeing and household income per capita had the greatest association with food security status (Table 4). People in the poorest stratum were three times (OR = 2.99) more likely to be food insecure and those with the poorest life evaluation (i.e.: classified as "suffering") were almost five times more likely to be food insecure (OR = 4.60). Further, those with low social support (OR = 1.90) and the lowest educational level (OR = 2.11) were twice as likely to be food insecure. On the other hand, the elderly were more protected against food insecurity, as they were 33% more likely to be food secure.

4 Discussion

After years of improvement in the fight against hunger (FAO 2015), this study, using population-representative data from

Table 3 Food security prevalence (%) in LA countries[1], measured by FIES, from 2014 to 2107

Overall Trend	Country	2014	2015	2016	2017	Overall change
Improving	Paraguay	43.5 [a2]	59.5[b]	65.9[c]	- [3]	+ 22.4
	El Salvador	34.7[a,b]	37.7[b]	33.3[a]	46.1[c]	+ 11.4
	Honduras	23.2[a]	15.9[b]	30.9[c]	26.6[a]	+ 3.4
Stagnation	Costa Rica	60.4[a]	55.5[b]	59.7[a,b]	56.3[a,b]	0
	Panama	45.2[a,b]	46.5[b]	45.1[a,b]	41.3[a]	0
	Nicaragua	32.7[a]	30.7[a]	30.1[a]	34.1[a]	0
	Argentina	72.7[a]	71.0[a]	55.8[b]	47.3 [c]	- 25.4
Worsening	Brazil	73.0[a]	53.2[b]	43.8[c]	48.6[d]	- 24.4
	Ecuador	56.9[a]	46.1[b]	34.3[c]	34.1[c]	- 22.8
	Colombia	58.8[a]	55.8[a]	47.2[b]	42.6[c]	- 16.2
	Peru	46.9[a]	41.5[b]	42.2[b]	33.5[c]	- 13.4
	Bolivia	46.4[a]	50.6[a]	37.0[b]	35.9[b]	- 10.5
	Chile	75.4[a]	65.9[b]	73.3[a]	66.7[b]	- 8.7
	Uruguay	70.1[a]	67.5[a]	56.9[b]	61.5[c]	- 8.6
	Mexico	45.1[a]	46.0[a]	57.1[b]	41.8[a]	- 3.3
	Guatemala	35.2[a,b]	36.9[b]	32.4[a]	32.9[a,b]	- 2.3

[1] Belize is not shown due to the missing data for 2015 to 2017 but data for 2014 was included in the regression analysis; Venezuela is not shown as the GWP does not have the country's authorization, although its was included in the regression analysis. [2] Different superscript letters denote differences in food security at the 0.05 level among years of each country. [3] Missing data

Table 4 Odds ratios (OR) for food insecurity from logistic regression analysis[1], for LA from 2014 to 2017

Variables		95% CI	
	OR	Low	High
Per capita income quintiles			
Poorest 20%	2.99*	2.81	3.19
Second 20%	2.26*	2.13	2.39
Middle 20%	1.74*	1.64	1.84
Fourth 20%	1.36*	1.29	1.44
Richest 20% (Ref.)[2]			
Education level			
Elementary or less	2.11*	1.98	2.25
Secondary/high school	1.30*	1.23	1.38
College/ university (Ref.)			
Age categories			
Seniors (60 years or more)	0.67*	0.63	0.71
Adults (30 to 59 years)	1.02	0.98	1.06
Youth (15 to 29 years) (Ref.)			
Gender			
Women	1.13*	1.09	1.17
Men (Ref.)			
Children (< 15 years) in the household			
3 or more	1.61*	1.52	1.71
1 to 2	1.26*	1.22	1.32
None (Ref.)			
Social support			
Low	1.90*	1.72	2.10
Moderate	1.37*	1.32	1.43
High (Ref.)			
Life evaluation			
Suffering	4.60*	4.23	5.00
Struggling	2.08*	2.00	2.16
Thriving (Ref.)			

*p-value <0.001; [1] Independent variable did not show high collinearity ($r \leq 0.7$); [2] Ref.: category of reference

18 Latin America countries showed a significant decline in food security (51% to 43%) with increases in moderate food insecurity (13% to 16%) and severe food insecurity (14% to 19%) during the most recent economic recession (2014 to 2017).

4.1 Increasing and stable food security

While it was expected that there would be worsening food security status in the region, there were some surprises: in some countries food security increased (Paraguay, El Salvador and Honduras) and in others food security or food insecurity remained stable (Costa Rica, Panama and Nicaragua). One explanation may be that these countries are benefiting from long-term political and financial stability, such as Paraguay, El Salvador and Honduras (World Bank 2018; ENEP 2018). From 2014 to 2017, these countries showed stable and positive economic growth, with increases in remittances (IMF 2017; ENEP 2018).

Paraguay showed the highest increase in food security from 2014 to 2016 (44% to 66%), an almost 22% increase. During the same period, Paraguay realized pronounced reduction in social inequality, measured by the Gini Index (ranges between 0 and 1, with 1 being the maximum inequality), with an annual reduction rate of −2.4%. This increase may be explained by sustained economic growth, around 4% a year, and its stable employment rates for almost 10 years (World Bank 2018, CEPAL 2018). El Salvador and Honduras also presented a significant reduction in inequality, although lower in magnitude, with a Gini Index reduction rate of −1.5% and − 0.1% per year, respectively in 2014 to 2016 (CEPAL 2018). During this same period, both countries experienced steady economic growth, with an annual average of 2.3% for El Salvador and 3.8% for Honduras. Expectedly, the prevalence of food security increased by 33% in El Salvador (35% to 46%) and by 15% in Honduras (23% to 27%).

In the stagnation category **(**Table 3**),** Costa Rica, Panama and Nicaragua showed no significant changes in the prevalence of food security. This is also expected because these countries are part of the Mesoamerica region, in which economic growth remained stable over the selected period (IMF 2017). According to the FAO (2017), countries from Mesoamerica faced less exposure to the global economic crisis, given their trade connections with the United States and the low prices of the commodities for which they are primary exporters, such as coffee, fruits and sugar.

4.2 Decreasing food security and increasing food insecurity in the region

Across the region, the countries of Argentina, Brazil and Ecuador showed the highest declines in food security over the period under investigation. These findings align with other studies in the literature, which show that economic downturn leads to deterioration in food security (Davis and Geiger 2017; Brinkman et al. 2010). Since these three countries showed the worst declines in economic growth and macroeconomic factors during this period in Latin America **(**World Bank 2018**)**, the negative impact on food security status was expected to be greatest among countries in which food security worsened **(**Table 3**).**

Argentina's economy has gained attention since 2001, with the beginning of a major political, financial and debt crisis (Thomas and Cachanosky 2016). The peak of the coungtry's economic shock was in 2002, when the GDP growth rate contracted by −10.8% in 2002 and unemployment reached

almost 20% of the population (World Bank 2018; Thomas and Cachanosky 2016). Although a rapid period of economic recovery began after 2002, with increases in employment rate and economic growth, in 2011 the economy went into decline again, leading to a default on national public debt repayment in 2014 (World Bank 2018; Thomas and Cachanosky 2016). As a result of the 2014 payment crisis, inflation has accelerated in the country and unemployment is on the increase again (World Bank 2018; Thomas and Cachanosky 2016). This prolonged and long-term economic instability may partially explain the 25.4% decline in food security in Argentina from 72.7% in 2014 to 47.3% in 2017 **(**Table 3**).**

Similar to the deteriorating situation in Argentina, results from respondents in Brazil recorded a 24.4% decline, from 73.0% in 2014 to 48.6% in 2017 (Table 3). This deterioration of food security in Brazil may be explained by the country's major economic crisis, which started in 2014 along with many corruption charges that have been levelled at major political figures in the country's political leadership (Sousa et al. 2019). This situation has compromised the political stability of the country, leading to a presidential impeachment in 2015 (Paula and Pires 2017; Gimenez 2017; Rossi and Mello 2017). The Brazilian economic and political instability has caused a worsening of many social indicators, such as income and unemployment, which reached 12% of the population in 2016 (Paula and Pires 2017; Gimenez 2017; Rossi and Mello 2017). Inflation affected the national food prices, which increased by 82% from 2010 to 2016, mostly affecting staple foods (rice, beans), vegetables, fruits and meat (IPEA 2016). In light of these economic shocks and increasing food prices, the Brazilian government responded with austerity measures and reduced the funding allocated to major social policies, such as the highly regarded food security support programs (Paula and Pires 2017; Rossi and Mello 2017).

Ecuador experienced the third largest decline among LA countries in food security, with the prevalence of food security decreasing by 22.8% between 2014 and 2017 **(**Table 3**)**. During this period, the country experienced an economic recession associated with large declines in crude oil prices. Countries in the region whose economies are directly affected by oil and natural gas commodities, such as Ecuador, Bolivia and Colombia, were also suffering from large declines (as much as 70%) in oil prices between 2014 and 2016 (World Bank Group 2018). This commodity shock has caused major reductions in private consumption and investments in these countries. In Ecuador, the GDP growth rate decreased from 4.9% in 2013 to −1.6% in 2016 and some authors suggest that the dollarization regime, adopted by the country in 2000, has reduced the country's ability to cope with external shocks (Paredes 2017; World Bank 2018). Although Colombia and Bolivia have also been affected by the decline in the price of energy commodities, it has been suggested that their domestic financial adjustments, which benefit from a flexible exchange rate, prevented some of the damage to their economies (IMF 2017; World Bank 2018). Still, in Colombia and Bolivia food security declined by 16.2% and 10.5%. respectively between 2014 to 2017.

4.3 Determinants of food insecurity in LA

Findings on determinants of food insecurity in the Latin American region over the period of study align with those expected. Overall, being poor and poorly educated increased the chances of being food insecure by factors of 3 and 2, respectively. This corroborates findings from previous studies, which indicated that political and financial crises disproportionately affected people's food security through their effect on income and educational levels (FAO and PAHO 2017; Vilar-Compte et al. 2015; Rosa et al. 2012).

While the impact of social support on food security access is only starting to be investigated, our findings give support to its importance. Respondents with low social support were also twice as likely to be food insecure. This was expected since Miller (2015) showed the association between functional and structural social support and food security in a study involving 107 countries. She found that social support improved food security by facilitating the loan of money or food in cases of shocks, providing help to produce and prepare food, and also to form connections in finding employment (Miller 2015). According to Silva and Harpham (2007), mothers receiving greater social support had children (1-year old) with better nutritional status. These findings highlight the protective factors of social support and the importance of the availability of relatives and/or friends who could be counted on to help respondents. This is an area of research that could be used to inform the design of public health and wellbeing policies. These could highlight the benefit of delivery of services using group-based modalities that bring together community members and less socially active demographic groups, providing opportunities for social interaction and stimulation of friendship-making among members.

Surprisingly, our findings showed that increased age for those over 60 had a protective effect for food security in the Latin America region with the elderly being 33% less likely to be food insecure. This may be explained by a previous study conducted in Brazil in 2008, which showed in half of the households with elderly persons, the income of the elderly, mainly coming from their retirement income, was the greater part of the household income. This suggested that the elderly contribute to the economic stability of the household and overall food security of its members (Rosa et al. 2012).

Respondents classified as "suffering" in life evaluation were almost five times more likely to be food insecure. This association between food security and wellbeing has been explored in the past (Hadley and Crooks 2012). Researchers explained that apprehension, stress, and anxiety caused by the

lack of access or the worry about not having enough food, accompanied by the loss of social value attached to eating, also negatively affect mental health and wellbeing: this has been found to affect the emotional state of the food insecure and/or the currently food secure who are worrying about upcoming change in their living conditions (Hadley and Crooks 2012). More specifically, researchers found among adults associations between food insecurity and feelings of shame, isolation, low mood and poor sleep (Hadley and Crooks 2012; Bermúdez-Millán et al. 2016). These feelings not only affect adults in the household but also children and adolescents living there, who were more likely to have behavioral, mental, academic and emotional disorders (Shankar et al. 2017). A negative association between food insecurity and wellbeing, as well as physical problems, was also found in a large sample involving 138 countries (Frongillo et al. 2017). For these reasons, food-insecure people are more likely to use mental health care services (Tarasuk et al. 2018).

The causal mechanisms of the association of food insecurity with low education, poverty, lack of social support and poor wellbeing found in this study can be seen in both directions (Pérez-Escamilla et al. 2017b). In other words, these socioeconomic determinants can also result from food insecurity. For example, a poor diet comprises children's learning ability, and a lower level of education leads to poor job opportunities and lower income, which in turn reduces financial access to food. In addition, food insecurity leads to lower productivity, which affects the performance of people at work and can result in job loss (Pérez-Escamilla et al. 2017b). Lack of social support can be the cause and consequence of depression and poor mental health, which also compromises people's productivity and learning ability, resulting in lower income and level of education, and thus greater risk of food insecurity (Pérez-Escamilla et al. 2017b; Miller 2015).

4.4 Policy contributions

This study of changes in food security in the Latin American region makes an important contribution to the global discussion on devising food security policies and may contribute to efforts for building upon MDGs gains and forwarding the SDG agenda of ending hunger by 2030. The region is well placed to contribute to policy discussion because it is widely recognized as a world leader in the fight against hunger. This research, by providing a rapid appraisal of food security changes during a period of political and economic instability, serves to highlight how quickly achievements in food security may be thwarted and the importance of ongoing monitoring.

Clearly, a key condition that must be met for improving the governance of food security is the capacity to measure and respond to individual food security issues directly and reliably. FIES measures the understudied access dimension of food security rather than macro-level country measures such as production/trade or proxy food utilization measures such as anthropometrics. While there are no gold-standards in measuring multidimensional food security, FIES stands out as a unique, validated and internationally comparable tool. This study provides a working example on the use of FIES to provide data on national and also regional level food security in a timely manner.

Such measures have been noted as having indicator properties likely to contribute towards improved food security governance for a number of reasons (Pérez-Escamilla et al. 2017b). Authors suggest that food security measures can improve policy development by facilitating clear, participatory and responsive planning, decision-making and implementation by policymakers at national and regional levels. These real-time findings as generated in this study can be used to galvanize regional, national and community-level stakeholders to devise responses to quickly deteriorating gains in food security. Second, authors suggest that measures like the FIES can help develop/oversee efficient, effective, transparent, and accountable institutions. This is of particular importance in developing countries where resources are scarce and efficient use of them is essential.

Third, measures like FIES and other EBFSSs can facilitate state actors being held accountable in upholding the rule of law through equity in resource allocation and service delivery. This is of particular importance when regions and demographic sub-groups are at greater risk than others, to ensure that these vulnerable groups are identified so that they can be targeted and results of interventions assessed. Last, they can help develop/ sustain coherent and coordinated policies, institutions, and actions.

An important policy lesson from the LA region relevant to other developing regions, relates to the time in which a region's longstanding food security gains have been undermined. Countries of the region have won global acclaim for political and economic commitments towards food security (Pérez-Escamilla et al. 2017b). In the case of Brazil, the country has been long noted for its successful food security policies. These include the Zero Hunger Program, School Feeding Program, Popular Restaurants and Food Acquisition Program (Rocha 2016; Paula and Pires 2017; Rossi and Mello 2017). Most noteworthy is that these food security policies have been strengthened by a legal framework which has been copied across the region, and by developing countries across the world (Rocha 2016; Paula and Pires 2017; Rossi and Mello 2017; Pérez-Escamilla et al. 2017b). Additionally, financial resources to support these programs have been allocated by a large proportion of national budget spending that has been established (CAISAN 2013).

An emerging research question from this study on the LA region could be related to the impact of various programs in the area of food security. Since the onset of the region's crisis, many of the funds previously dedicated to these legislated

programs have been cut drastically (Rocha 2016; Paula and Pires 2017; Rossi and Mello 2017). While many Brazilian food security programs persist because they are mandated by key legislation, declines in national budgetary allocations may explain the decrease in the prevalence of food security in Brazil during the recent political and financial crisis (Sousa et al. 2019). This might suggest that while aggressive social policies and institutional arrangements are necessary, dedicated budgets are needed to support the policies which should also be mandated by legislation. Future research looking at participation in various food and social assistance programs could help identify their impact.

Regarding study limitations, the sample did not cover the homeless and institutionalized, who may be the most vulnerable groups during economic downturns. This research would also benefit from the inclusion of more socioeconomic variables, such as ethnicity and area of residence (urban and rural). However, the GWP did not evaluate ethnicity and the methodology to classify the rural and urban areas differs greatly from the parameters used in most Latin American countries. Consequently these were not deemed suitable for this study. Finally, the results cannot imply causal inference, given the cross-sectional design of this study.

5 Conclusions

Latin America has been widely recognized as one of the world leaders in the fight against hunger. Much of these gains have been supported by political and economic stability in the region over the past 15 years. While these gains have been celebrated, there are concerns that, with recent economic and political crises, declines in food insecurity in the region may be pushed back. In order to capture the changes in food security in Latin America during the current economic recession, this cross-sectional study used data from the Gallup World Poll from 18 LA countries ($n = 65{,}146$), from 2014 to 2017. The study shows that, after years of improvement in the fight against hunger, there has been a significant decline in food security (51% to 43%) with increases in moderate (13% to 16%) and severe (14% to 19%) food insecurity over the period 2014 to 2017. However, countries such as El Salvador and Honduras, benefiting from long-term political and financial stability, presented an opposite trend. Although food security decreased in Chile and Uruguay over the past four years, they still had the highest prevalence of food security in 2017 (66.7% and 61.5%, respectively). As seen in other regions, food insecurity was strongly associated with poverty, low education, having three or more children in the household, lack of social support and poor wellbeing. Women were more likely to report food insecurity, but the elderly (60+) were found to be more food secure.

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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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