

Chapter 9

Food Insecurity



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Abstract Food insecurity is a global problem and has different causes and effects. Usually it is thought that it is exclusively related to poverty as the main cause but other aspects such as violence against women are also reported in the literature; likewise, food insecurity directly impacts the worsening of diseases such as HIV or cancer. A comprehensive approach is necessary to ensure the food security of the population, through multidisciplinary strategies and with approaches based on research results.

Keywords Food · Food insecurity · Food security · Agriculture · FIES

9.1 Introduction

During the World Food Summit held in Rome in 1996, the member countries of the United Nations Organization UN reaffirmed their commitment to eradicate hunger. Four years later, they raised 8 Millennium Development Goals, where the first was to eradicate extreme poverty. Thanks to the commitment of the member countries of the General Assembly of the United States, until 2015, the population suffering from hunger had been halved, yet 800 million people still face malnutrition in the world. Therefore, the UN developed the Sustainable Development Goals (SDG) by 2030, which also included eradicating hunger.

In recent years, the measurement of hunger or food security has been part of many debates among specialists. However, to know the prevalence worldwide, in 2013 the Food and Agriculture Organization of the United Nations (FAO) launched the project “Voices of Hunger” to provide updated information on food insecurity that are relevant to policy and practice. A methodology was developed to measure the severity of food insecurity experienced by individuals or households, so that it could be compared between countries through a direct interview in relationship to

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personal, and as experiences, as a new global standard for measuring the experience of food insecurity validated at the international level and as a global and national monitoring tool. The FIES has been applied in 140 countries since 2014, through the Gallup World Survey applied to a representative sample of adults nationwide. The instrument has managed to determine a similar trend of global food insecurity. The FIES offers reliable information about the severity of people's food insecurity, quickly and at a lower cost, through 8 questions about the access adequacy of adults (15 years of age or older) to food, asking them direct questions about their experiences. Through FIES, FAO plays the role of monitor of the severity of food insecurity in 150 countries, funded by the United Kingdom and Belgium. In addition, FAO offers technical assistance to implement the survey in the countries considering contextual variables associated with food insecurity and the potential causes, consequences, and experiences. In effect, national institutions can use FIES to obtain evidence based on data about the distribution and severity of food insecurity to develop and implement policies that contemplate the right to adequate food.

9.2 Food Insecurity

Poverty is commonly defined as the lack of what is necessary to ensure material well-being, particularly food, but also housing, land, and other assets, which leads to hunger and physical deprivation (World Bank, 2000). It is considered as a determinant of food insecurity (FAO, 2018). Food insecurity is an indicator of social inequity associated with the lack of regular and permanent access to food, in sufficient quantity and quality. It represents a concern for its long-term access (Silva et al., 2017) and its main determinants are poverty (lack of money or other resources) and social inequalities (Sperandio, 2015). Indeed, food insecurity represents a global problem that transgresses the human right to adequate food. According to the last report (FAO, 2018) on the security of food and nutrition in the world, since 2015 there has been an increase in hunger in the world, since people suffering from chronic food deprivation has increased to almost 821 million in 2017, of around 804 million in 2016, mainly due to climatic and economic factors. The experiences of food insecurity are similar around the world, its severity begins when there is a concern for the ability to obtain food, in the case of not having the capacity increases the level with the decrease in the quality and variety of the food, continuing with a decrease in the amount of food consumed and culminate in experiences of hunger (FAO, 2016). During 2017, the percentage of food insecurity worldwide reached 10.7%, in Africa 29.8%, in Asia 6.9%, in Latin America 9.8%, and in North America and Europe 1.4% (FAO, 2018).

9.3 The Measurement of Food Insecurity

Although the right to adequate food was declared in 1949, efforts to measure the severity of food insecurity and hunger began to develop in 1990 in the USA, as a result of a great need for measurement by policymakers at all levels of government (Carlson, Andrews, & Bickel, 1999). In 1996, during the World Food Summit in Rome, discussions on that universal right were resumed (Ballard, Kepple, Cafiero, & Schmidhuber, 2014). In effect, the concepts underlying the measurement of food security based on experience have a long history based on ethnographic studies to understand the experience of hunger. However, research in the USA revealed that the experience of food insecurity is characterized by uncertainty and anxiety regarding access to food and changes in the quality of the diet, such as a less balanced and more monotonous diet; gravity that increases when the amount of food consumed decreases as portion sizes are reduced, the severity when meals are omitted and people stop eating (FAO, 2017).

9.3.1 *The FIES scale*

In September 2015, the 193 Member States of the United Nations (UN) adopted the 2030 Agenda for Sustainable Development, to update the Millennium Development Goals, and, in March 2016, the UN Statistical Commission developed a framework of 230 global indicators, to monitor the objectives and measure progress towards the achievement of the 17 Sustainable Development Goals (SDGs). Of the total indicators, FAO assumed the responsibility of 21 of them, related to the second SDG (2.1 Indicators that measure people's access to food), whereby countries commit themselves to end hunger and guarantee the access of all people, particularly the poor and people in vulnerable situations, including babies, to sufficient safe and nutritious food.

To provide a better information, FAO launched the project “Voices for hunger” and a new methodology called “Scale of Experiences of Food Insecurity” or Food Insecurity Experiences Scale (FIES), adapted from the Latin American and Caribbean Scale of Security Alimentaria (Escala Latinoamericana y Caribeña de Seguridad Alimentaria—ELCSA), whose origins are derived from the United States Household Food Security Survey Module, the Brazilian Food Insecurity Scale, the scale of access to food insecurity in households (HFIAS), and a similar scale adapted for Colombia. Through the FIES, FAO offers information on the prevalence of experiences of food insecurity worldwide, provides technical assistance to countries, and fulfills its role as monitor receiving and communicating the data to the Department of Economic and Social Affairs of the UN (UNDESA).

FIES has become a reliable and valuable tool for determining the prevalence of moderate or severe food security in the population, at the individual and household level, applied in more than 140 countries (see Table 9.1), providing reliability,

Table 9.1 Implementation of FIES worldwide

Status	Countries
Use of its own national scale of food security based on experiences	USA, Bolivia, Brasil, Canada, Colombia, Ecuador, Mexico, Guatemala, Corea del Sur, Filipinas and Sri Lanka
FIES or similar scale already included in national surveys	Bangladesh, Botswana, Burkina Faso, Chile, Dominican Republic, El Salvador, Ethiopia, Ghana, Israel, Lesotho, Malawi, Malaysia, Marshall Islands, Namibia, Palestine, Rwanda, Sierra Leone, St. Lucia, Sudan, Swaziland, Uganda, Vietnam, Zimbabwe, and Cote d'Ivoire
FIES already included in national surveys and government plans to collect data through FIES on a regular basis	Indonesia, Jordan, Kenya, Pakistan, and Seychelles
Plans to include the FIES in national surveys	Afganistán, Benin, Capo Verde, Chad, Guinea, Guinea-Bissau, Kiribati, Mauritania, Mali, Micronesia, Nicaragua, Niger, Nigeria, Samoa, Senegal, Solomon Islands, Togo, Tokelau, Tonga, Vanuatu

Source: (FAO, 2018)

quickness, at low cost, and adapted in more than 200 local languages and dialects. This scale has the capacity to produce results and effects of change according to the level of their progress in relation to the second SDG and subsequent development of governmental policies on food security (FAO, 2016).

9.4 Description of Items

FIES is based on a well-founded concept of the experience of food insecurity structured into three levels: uncertainty/concern, changes in the quality of food, and changes in the amount of food, from which an underlying scale of severity is derived (food insecurity at the family or individual level). The FIES is composed of 8 questions (the first three are subjective and the remaining are objective) (see Table 9.2), with yes/no dichotomous answers, on access to adequate food in a reference period from 30 days to 12 months. It is a scale of statistical measurement designed to calculate a range of the severity of food insecurity and is analyzed together as a scale, not as separate items. Each question refers to a different experience and is associated with a different level of severity of insecurity. Unlike other scales of measurement related to the FIES, the latter not only considers the experiences of food insecurity, but also the quality of the compromised diet and the reduced amount of food and psychosocial elements associated with anxiety or uncertainty with respect to the ability to procure enough food. Table 9.3 describes the conceptual definition of the items of the FIES.

Table 9.2 Survey module on the scale of food insecurity (during the last 12 months)

N°	Standard label	Questions	
		Reference unit—individual	Reference unit—home
1	Worried	Are you worried about not having enough food to eat due to lack of money or other resources?	Are you or someone else in your household worried about not having enough food to eat because of lack of money or other resources?
2	Healthy	Still thinking about the last 12 months, was there ever a time when you were not able to eat healthy and nutritious foods due to lack of money or other resources?	Still thinking about the last 12 months, was there ever a time when you or someone else in your household could not eat healthy and nutritious foods due to lack of money or other resources?
3	Few foods	Was there ever a time when you ate a small variety of foods due to lack of money or other resources?	Was there ever a time when you or someone else in your household ate a small variety of foods due to lack of money or other resources?
4	Skipped	Was there ever a time when you had to stop having breakfast, lunch, or dinner because there was not enough money or other resources to get food?	Was there ever a time when you or someone else in your household had to stop having breakfast, lunch, or dinner because there was not enough money or other resources to get food?
5	Ate less	Still thinking about the last 12 months, was there ever a time when you ate less than you thought you should eat for lack of money or other resources?	Even in the last 12 months, was there ever a time when you or someone else in your household ate less than you thought you should eat for lack of money or other resources?
6	Ran out	Was there ever a time when your home has run out of food due to lack of money or other resources?	Was there ever a time when your home has run out of food due to lack of money or other resources?
7	Hungry	Was there ever a time when you felt hungry but did not eat because there was not enough money or other resources to get food?	Was there ever a time when you or someone else in your household felt hungry but did not eat because there was not enough money or other resources to get food?
8	Whole day	Was there ever a time when you stopped eating all day for lack of money or other resources?	Was there ever a time when you or someone else in your household stopped eating for a day because of a lack of money or other resources?

Source: (FAO, 2018)

In addition, when analyzing the scale jointly, it is considered a quantitative tool to measure the prevalence of moderate and severe levels of food insecurity (see Table 9.4) in a given population, using statistical methods to estimate the error (confidence intervals) around the measurements, and its reliability and validity is formally evaluated and compared between countries.

Among the main features of the estimation of FIES parameters are highlighted (FAO, 2017):

Table 9.3 Conceptual definition of the items of the FIES

Questions	Conceptual definition
You are worried about not having enough food to eat because of lack of money or other resources	The question refers to a state of worry, anxiety, fear, or fear due to the fact that there is not enough food or it is over due to insufficient money or other resources to obtain food, due to circumstances that affect the ability to obtain food. (Loss of employment, insufficient food production, insufficient food availability for hunting and gathering, deterioration of social relationships, loss of usual food or assistance, or environmental or political crises.) It is not necessary that the respondent has lacked sufficient food or has been effectively deprived of them to answer this question positively
You have not been able to eat healthy and nutritious foods for lack of money or other resources	It inquires about the ability to obtain the foods that the respondent or respondent considers healthy or good for him/her, those that allow him/her to enjoy good health, or those that integrate a nutritious and balanced diet (for lack of sufficient money or other resources) to obtain food. The question refers to the quality of the diet and not the amount of food that is eaten
You have eaten little variety of food for lack of money or other resources	Inquire about the quality of the diet and not the amount of food that is eaten. It implies that the lack of money or resources, and not traditional habits or other circumstances (i.e., health or religion), are the reason for limiting the variety of foods
You have had to stop having breakfast, lunch, or dinner because there was not enough money or other resources to obtain food	Find out about the experience of having to skip a main meal (for example, breakfast, lunch, or dinner depending on the norm regarding the number and times of meals in the culture in question) carries out normally (for lack of sufficient money or other resources to obtain food). This question refers to an insufficient amount of food
You have eaten less than you thought you should eat for lack of money or other resources	It refers to a food consumption lower than what should be in the opinion of the respondent, even if a meal has not been skipped (due to the lack of money or other resources to obtain food at home). The answer depends on the respondent's own opinion about how much he thinks he should eat. The question refers to the amount of food consumed and not the quality of the diet
Your home has run out of food due to lack of money or other resources	It refers to experiences of affective lack of food in the home due to lack of money, other resources, or any other means to obtain food
You have felt hungry but did not eat because there was not enough money or other resources to obtain food	This question has as its object the physical experience of suffering from hunger, and, specifically, of being hungry and not being able to eat enough (due to lack of money or resources to obtain food)
You have stopped eating a whole day for lack of money or other resources	This question inquires about a specific behavior: not eating anything all day (due to lack of money and other resources to obtain food)

Note: None of the questions refer to special diets for losing weight or fasting for health or religious reasons.

Source: (FAO, 2015)

Table 9.4 Gravity of food insecurity along a continuous gravity scale

Levels	Definition
Food safety	When there is no food restriction of any nature, not even fear or worry about the lack of future food
Mild food insecurity	When there is concern about the ability to obtain food
Moderate food insecurity	When the quality and variety of foods are compromised
Serious food insecurity	When you reduce the amounts, skip meals and/or go hungry

Source: (FAO, 2017)

- In FIES, the items and respondents (individuals or households) are positioned on the same underlying scale of severity of food insecurity.
- The probability that a respondent answers “yes” to a FIES item depends on the distance along the scale between the severity of the respondent and the severity of the item. The more severe the food insecurity of a respondent, in relation to that of the item, the greater the probability that he will respond affirmatively.
- The relative position of the items and respondents in the severity scale is expressed through their respective parameters. Both the elements and the parameters of the respondent are estimated according to the response patterns given to the eight FIES questions.
- The raw score of a respondent (a whole number with a value between zero and eight) is the sum of the affirmative answers given to the eight FIES questions. For the data that passes the validation tests, the raw score itself is already an ordinal measure of gravity, with lower gross scores corresponding to less severe food insecurity. The raw score is the basis for estimating the respondent’s parameter, which provides a measure of the severity of food insecurity and allows the production of comparable food insecurity measures across countries and contexts.
- The order of the FIES items in terms of the severity they reflect is not constant, but is revealed through an analysis of the specific data collected. The relative severity of a given experience of food insecurity depends on the frequency with which people respond affirmatively to that element, and more severe experiences are reported less frequently. This is similar to a relatively difficult test question that causes a smaller proportion of correct answers than the easier ones.
- In different countries and subpopulations, the same item may be associated with a different level of severity due to nuances in translation or actual differences in the way food insecurity is experienced and managed in diverse cultures and media systems lifetime. The implication of the specificity of the scale is that the parameters cannot be automatically compared through the FIES applications. However, this does not prevent them from being formally compared.
- Comparability can be achieved by calibrating the scales in a common metric, in a process called equalization. This is done by adjusting all the measures obtained at the national level to the global standard, which is a set of parameter values of items based on the results of more than 140 countries covered by Gallup World Poll in 2014, 2015, and 2016.

Table 9.5 Elements of measurement of food insecurity

Definition	Refers to limited access to food, at the level of individuals or households, due to lack of money or other resources
Measuring elements	Criteria
Parameters of severity of the respondent	They are based on the answers to the 8 questions of the FIES. The number of affirmative responses from 0 to 8 is transformed at the gross (ordinal) level (it is not an interval measure, so a linear regression model is not used) The respondent's severity parameter conforms to the VoH global standard metric, so it is intended to represent the same level of severity in all countries
Probability of moderate or severe food insecurity	The values range from 0 to 1 The measurement error is taken into account and can be considered as the proportion of people that represent a true sample of the population with food insecurity, which exceeds the threshold established in the level of severity of the item, and is compared with the global standard of VoH. The value is based on adjusting the respondent's severity parameters to the VoH global standard, so it is intended to be comparable in all countries. The probability of moderate or severe food insecurity for cases with a zero gross score will be presented as zero. The values of the raw score 8 will be based on the standard VoH methods (used to calculate the national prevalence rates).
Probability of severe food insecurity	Values range from 0 to 1 This is similar to the likelihood of moderate or severe food insecurity, except that the threshold is more severe, at the level of severity according to the VoH global reference scale. This element of data will be missing for cases with missing answers to the FIES questions

Source: (FAO, 2015)

9.5 Operational Definition of Characteristics

To calculate internationally comparable estimates of the prevalence of food insecurity, respondents must first be assigned to (in) defined food safety classes by standard thresholds established along the severity scale. Two global standard thresholds are established according to the severity of two specific elements of FIES: ATELESS and WHLDAY, defining the classes of moderate and severe food insecurity, respectively. The matching procedure ensures that these thresholds are mapped to national scales, and respondents are assigned probabilistically to common food insecurity classes, given their gross scores. The prevalence of food insecurity in the population is given by the weighted sum of the specific gross probabilities of the score. Table 9.5 shows the elements of measurement of food insecurity.

9.6 Indicators Based on FIES

Two indicators based on FIES can be used for national and global monitoring purposes (FAO, 2017). The first indicator is an estimate of the sum of the segments of the population with moderate food insecurity and severe food insecurity, and the second only with severe severity.

- FImod + sev: Proportion of the population with moderate or severe food insecurity
- FIsev: Proportion of the population that experiences severe food insecurity.

People who experience moderate levels of food insecurity often consume low quality diets and may have been forced, sometimes during the year, to also reduce the amount of food they would normally eat, while those who experienced severe levels would have spent whole days without eat, due to lack of money or other resources to obtain food. It is expected that the prevalence of severe food insecurity is highly correlated, in all countries, with the prevalence of undernourishment.

9.7 Theory ITR—Rasch model used in FIES

The FIES data is analyzed using item response theory (IRT), a branch of statistics that allows the measurement of unobservable traits through the analysis of responses to surveys and tests, establishing the severity of each. The ITR applies to the FIES due to the intrinsically unobservable characteristic of food security, which can only be measured by examining its observable manifestations (FAO, 2017). The specific IRT model applied to the FIES data is the Rasch model, widely used in health, education, and psychology (Nord, 2014). The Rasch model provides a theoretical basis and a set of statistical tools to assess the suitability of a set of survey questions to build a measurement scale, and compare the performance of a scale in different populations and survey contexts.

The Rasch model postulates that the probability of observing an affirmative response per respondent i to question j is a logistic function of distance, on an underlying severity scale, between the position of the respondent, a_i , and that of the item, b_j .

$$Prob(x_{i,j} = S'i) = \frac{\exp(a_i - b_j)}{1 + \exp(a_i - b_j)}$$

By applying the Rasch model to the FIES data, the probability of food insecurity ($p_{i,L}$) can be estimated at any level of food insecurity severity L , for each respondent i , with $0 < p_{i,L} < 1$.

The severity of an item, then, is the level of severity of households that are barely on the threshold of affirming or denying that question. The probability that a household affirms a fair item in the level of severity of the household is 1, which corresponds to a probability of 0.5. The probability that a household affirms an item with a severity parameter one unit lower than that of the household is 1, or approximately 2.7, which corresponds to a probability of 0.73 [i.e., $1 / (1 + 1 / 2.7)$]. The probability that the household affirms an item with two units lower than its own measure of severity is 0.88, and for an item with three units lower, it is 0.95.

The Rasch model also provides item adjustment statistics, which evaluate how well each item, each household, and the global data fit the assumptions of the measurement model. Two commonly used statistics are “item infit” and “item outfit,” similar to the chi-square statistic that compares the mismatch of each element with the degree of expected maladaptation under the assumptions of the model.

- The “infit” is an adjustment statistic “weighted by information” for each item, so it is sensitive to the responses of households with severity scores in the range close to the severity level of the particular item and calculates are calculated comparing the real answers with the probabilistically expected answers, the acceptable value is between 0.7 and 1.3.
- The “outfit” is sensitive to unexpected responses from households with severities much higher or lower than those of the item, that is, highly unlikely responses (outliers).

Both statistics compare the observed deviations of the responses of the expected deviations according to the assumptions of Rasch, so the expected values of the statistics are 1 and the values above 1.0 indicate items that are less or more consistently related to the underlying condition (food insecurity) measured by the set of items. The analysis of the FIES data includes the following steps:

- Estimation of parameters: calculation of the severity of the food insecurity associated with each item of the survey and each respondent. According to the ITR criteria, the parameters of the FIES respondent range from approximately -1.0 to $+2.5$.
- Statistical validation: the evaluation of whether, according to the quality of the data collected, the measure is valid. Through the Rasch model, the psychometric evaluation is determined through the validation of the theoretical assumptions and once a set of questions has been evaluated in a large sample of a population or subpopulation and the assumptions of the model of measurement, psychometric evaluation in subsequent surveys may not be necessary (Nord, 2014).
- Calculation of food insecurity measures. (1). Individual probabilities: for each individual or household sampled (each case in the data), the probability that the individual/household experiences food insecurity above a given severity level, according to their responses to the FIES items, is calculated. (2). Population prevalence estimates: the probabilities are used to estimate the prevalence of food insecurity at moderate and severe levels in the population.

9.8 Statistical Validation

The statistical validation evaluates the quality of the data collected through the FIES, to test its consistency with the assumptions of the Rasch model. This analysis involves the interpretation of several statistics that reveal if any of the items does not work well in a given context, due to cases with response patterns with a high level

of error, pairs of items that may be redundant, or due to the low proportion of the total variance in the population that is explained by the measurement model. It is possible that the severity of the items varies in countries for various reasons such as the nuances of translation, culture, livelihoods, or the management of food shortages, so the methodology of FIES anticipates this possibility and adjusts these differences, when they exist, so that they do not affect the validity of the prevalence estimates and their comparability between countries, for this it makes use of the item response theory and the Rasch model, which in turn employs other statistical methods.

The FIES analyzes its validity and reliability, according to the criteria of the theory of the response to the item, ITR (Cafiero, Melgar-Quiñonez, Ballard, & Kepple, 2014), where it considers:

- The validity of the FIES considers two conditions: (1) that the severity of food insecurity in fact involves the domains that have been taken into account when creating the elements that make up the scales, and (2) that the occurrence of experiences in those domains it can be reliably detected and linked in a significant way, although in a probabilistic sense, with food insecurity
- Reliability is analyzed through the study of associations between the measures obtained with the scale and the classifications that they produce with those obtained using other variables that theoretically are part of the same construct food in safety and/or that would vary in an expected way in different levels of food insecurity. According to the Gallup World Survey standard in more than 150 countries, where the FIES was included since 2014, the preliminary analysis of the results obtained from 20 countries revealed measures the reliability is between 0.69 and 0.78, with a median of 0.73 (Rasch is a measure of the overall fit of the data to the measurement model, with theoretical values ranging from 0 to 1, and 1 indicates a perfect fit).

9.9 Calculation of Parameter Estimates and Evaluation Statistics

According to Cafiero, Viviani, and Nord (2018) to estimate the single parameter Rasch model for dichotomous and polytomic item responses with a maximum of four responses (partial credit), the maximum conditional likelihood or conditional maximum likelihood (CML) weighted method is used, which allows:

- Estimate the item parameters and gross scores of a Rasch model for binary item responses, where the input data must be a 0/1 matrix (1 = yes), which also informs about the residual correlation, the statistics of adjustment and the corresponding standard errors, Rasch reliability, and individual adjustment statistics.

- Calibrate the measurement derived from a scale applied in a context (for example, country) to the metric of a reference scale, or standard (for example, the scale applied in another country, or in the same country, but through a different survey), or any other standard. The main result is the prevalence rate in the country of interest calculated in specific thresholds along the latent trait. Other different contexts that are also analyzed are geographical, linguistic, cultural, etc.
- Perform a Wald test of independence of sampling in the parameters of severity of the item.

9.10 Calculation of Prevalence

If the objective is to estimate the prevalence at the national level, it is possible to analyze and estimate the data based on the gross scores (zero to eight). While if the objective is to compare between countries, the estimated indices should be compared with the Gallup World Survey data, using the same statistical methodology, equating to the global scale of FIES, and the same severity thresholds used by the Voices of Hunger monitor.

The prevalence of food insecurity at a certain level of severity (FIL) in the population is calculated as the weighted sum of the probability of being severely insecure for all respondents (i) in a sample:

$$FI_L = \sum P_{i,L} W_i$$

where W_i are the post-stratification weights that indicate the proportion of individuals or households in the national population represented by each record in the sample.

9.11 Bibliometric Outcomes

Table 9.6 shows the evaluation of the publications on “food insecurity” that have more citations. Google Scholar is used between 2010 and 2019.

Table 9.7 shows the academic journals that published more studies on “food insecurity”. Scopus is used between 2010 and 2019.

Table 9.8 shows the list of institutions that have published scientific articles on “food insecurity.” You can see only universities of Canada and United States of America appear.

The cocitation analysis allowed obtaining three conglomerates of authors who published studies on “food insecurity,” which were indexed in Scopus (see Figure 9.1).

Each conglomerate is identified by a characteristic color that groups the authors that are part of it and that were obtained from Scopus. Thus, in brown color, Vraig Gundersen of University of Illinois at Urbana-Champaign, whose research is based

Table 9.6 Publications on “food insecurity” most cited in Google Scholar

N°	Title	Author	Year	Cites
1.	Historical warnings of future food insecurity with unprecedented seasonal heat	Battisti & Naylor	2009	1321
2.	Measuring food insecurity	Barrett	2010	869
3.	Food insecurity is associated with chronic disease among low-income NHANES participants	Seligman, Laraia, & Kushel	2009	816
4.	Exploring mediators of food insecurity and obesity: a review of recent literature	Franklin et al.	2012	299
5.	Food insecurity and weight status among US children and families: a review of the literature	Larson & Story	2011	287
6.	The economics of food insecurity in the United States	Gundersen, Kreider, & Pepper	2011	277
7.	Development and validity of a 2-item screen to identify families at risk for food insecurity	Hager et al.	2010	276
8.	Conceptual framework for understanding the bidirectional links between food insecurity and HIV/AIDS	Weiser et al.	2011	257
9.	Food insecurity and health outcomes	Gundersen & Ziliak	2015	237
10.	Food insecurity as a barrier to sustained antiretroviral therapy adherence in Uganda	Weiser et al.	2010	233
11.	Food insecurity and HIV/AIDS: current knowledge, gaps, and research priorities	Anema, Vogenthaler, Frongillo, Kadiyala, & Weiser	2009	228
12.	HIV/AIDS, undernutrition, and food insecurity	Ivers et al.	2009	227
13.	How much does the Supplemental Nutrition Assistance Program reduce food insecurity?	Ratcliffe, McKernan, & Zhang	2011	219
14.	Position of the American Dietetic Association: food insecurity in the United States	Holben	2010	210
15.	Poverty, food insecurity, and the behavior for childhood internalizing and externalizing disorders	Slopen, Fitzmaurice, Williams, & Gilman	2010	203
16.	Food insecurity: special considerations for women	Ivers & Cullen	2011	188

Source: Google Scholar. 01/08/2019

Search command: “food insecurity”

Table 9.7 Academic journals that published more studies on “food insecurity”

N°	Journal	Scopus
1.	Public Health Nutrition	102
2.	Journal Of Nutrition	91
3.	Journal Of Hunger And Environmental Nutrition	80
4.	Plos One	36
5.	Journal Of Nutrition Education And Behavior	33
6.	Social Science And Medicine	27
7.	BMC Public Health	26
8.	AIDS And Behavior	25
9.	Food Security	25
10.	Ecology Of Food And Nutrition	24

Source: Scopus, 28/07/2019.

Search command in Scopus: TITLE (“food insecurity”) OR (food AND insecurity)

Own elaboration

Table 9.8 Institutions that published more studies on “food insecurity”

N°	Institution	Scopus
1.	University of California, San Francisco	96
2.	University of Toronto	70
3.	University of South Carolina	69
4.	Cornell University	53
5.	Harvard Medical School	51
6.	McGill University	49
7.	San Francisco General Hospital and Trauma Center	47
8.	Yale University	41
9.	Massachusetts General Hospital	40
10.	Emory University	39

Source: Scopus, 28/07/2019. Search command in Scopus: TITLE(“food insecurity”)

Own elaboration

on programs in food insecurity. The celestial node represents Edward Frongillo of University of South Carolina, with research oriented to food insecurity and women. The authors around the main author share similar contents and approach.

Closing Remarks

FIES is a measurement tool that completes the existing set of food and nutrition security indicators and has the capacity to provide updated information on the prevalence of people who struggle every day to have access to a safe and nutritious diet (FAO, 2016), so that national institutions can use the FIES to know the prevalence and severity of food insecurity in different sectors or geographical areas of their population, the causes and consequences for formulating more specific policies, and

the Demographic and Health Surveys (DHS), to determine the prevalence of children living in households characterized by food insecurity, as an important step to know data associated with context and culture. As it has been possible to review, food insecurity is a global problem, independent of the socio-economic level of a country, involving the death of many people and a subhuman living condition. For this reason, this chapter has sought to show the available evidence for its measurement but mainly its real conceptual understanding and to see the different areas of impact. Thus, food insecurity is a consequence of violence against women, climate change, and informality, especially which associated with mass migration. However, these same reasons are consequences of food insecurity because it generates violence against women, promotes survival by carrying out productive activities that pollute the environment and promote migration due to lack of food. The authors are committed to the investigation of causes and effects of food insecurity in order to generate management models that allow a correct and complete understanding of the concept, know the causes, and mechanisms involved and their consequences in order to generate successful local, national, regional, and global programs that contribute to the reduction of food insecurity, especially among the most vulnerable populations.

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