

# Exploring gender-based disparities with the FAO Food Insecurity Experience Scale

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## Abstract

The Food Insecurity Experience Scale is a survey-based measure of the severity of food insecurity. Methodology for the scale was adapted from earlier experiential food security measures and applied by FAO to nationally representative samples through the Voices of the Hungry (VoH) project."

The FIES relies on people's direct responses to a set of questions regarding their actual experiences in accessing food. While it builds upon established tools (the *U.S. Household Food Security Scale*, *USHFSSM*, and the *Escala Latino Americana y Caribeña de Seguridad Alimentaria*, *ELCSA*) the FIES introduces some key innovative elements. The ability to use the individual as unit of analysis and making reference to experienced behaviors are some of those.

Since the information is collected from individuals' experiences rather than at household level, proper investigation into possible gender disparities in food access in the population is feasible. Indeed, VoH is the first project that allows characterizing the profile of food security separately for men and for women in low-income and middle-income countries.

Pilot studies in four sub-Saharan countries (Angola, Ethiopia, Malawi, and Niger) were carried out in 2013 and an extensive linguistic adaptation was done for the major national languages and dialects to ensure that translations of the FIES were culturally appropriate and well understood.

In 2014, FAO contracted Gallup, Inc. to include the FIES in their annual Gallup World Poll<sup>®</sup>, with a plan to extend the collaboration over the next five years. This will allow FAO to collect cross-culturally comparable, real time information on how individuals experience food insecurity, at a relatively limited cost. The FIES data will be used to generate estimates of the prevalence of mild, moderate, and severe food insecurity at the national level. The analytics for processing the data and computing the scores are based on Item Response Theory Models.

The first gender differentiated food security profiles from the FIES will be available in October 2014, followed by a global dataset for over 150 countries in March/April 2015.

In showing preliminary results from selected countries, the authors will:

1. Report on gender-based differences on item severity, in order to show the extent to which men and women attributed the same severity to the items of the scale.
2. Show the main differences in food insecurity prevalence between men and women in the same country.

**Key Words:** Food Security; Experience-based Scales; Sex-disaggregated Data; Gender

## 1. Introduction

The 1996 World Food Summit recognized the basic human right of everyone to be free from hunger and have access to safe and nutrition food. The importance of fighting against hunger has been reaffirmed by the Millennium Declaration with the resolution to halve, by the 2015, the proportion of the world's people who suffer from hunger (FAO, 1996; FAO, 2001).

In the context of the fight against hunger and food insecurity, the international community has mandated FAO to monitor the progress towards achievement of the targets set by the World Food Summit and the UN Millennium Development Goals. FAO reacted with the production of figures on the prevalence and number of undernourished people in the developing world. The first release was done with the 1985 Fifth World Food Survey; since 1999 with the annual "State of Food Insecurity" (SOFI) report (Cafiero, 2012).

The Prevalence of Undernourishment (PoU) used by FAO to monitor hunger is an estimate of the proportion of people below the individual caloric requirement for an active and healthy life. The PoU is based on national estimates of total food energy available for human consumption<sup>1</sup>; the minimum dietary energy requirements of the population<sup>2</sup>; and the distribution of energy consumption in the population<sup>3</sup>.

This indicator works well to monitor trends in undernutrition at national, regional and global level, but it cannot be disaggregated at subnational level, nor does it take into account biases due to intra-household distribution of foods because the PoU is based on a combination of country-, household- and individual-level parameters. From a gender perspective, this means that the PoU cannot be used to investigate if women are more likely to be undernourished than men and under which conditions this happens (FAO, 2014).

On the contrary, one of the major advantages of the Food Insecurity Experience Scale (FIES) promoted by FAO through the Voices of the Hungry (VoH) project is found in its capability to compare food security across population groups, including gender. The FIES should not be seen as an alternative to the PoU but rather a complementary tool that is based on the actual experiences associated with food insecurity.

This paper focuses on the capability of the FIES to provide comparable sex-disaggregated statistics on food insecurity. Sections 2 and 3 describe the underlying theoretical construct of the experience-based measures of food insecurity, give an overview of the main applications of this approach, and explain why it can be used as a global standard. Section 4 focuses on the gender implications of FIES and VoH, highlighting that the FIES is the first individual experience-based scale in the field of food security that has been applied in a large number of countries following a standardized procedure.

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<sup>1</sup> FAO has traditionally used the Food Balance Sheets (FBS) to estimate the dietary energy supply (DES, expressed in kcal/person/day) available for human consumption. During the methodological revision conducted in 2012, a parameter that captures food losses occurring during the distribution at the retail level was introduced, in the attempt to obtain more accurate values of per capita consumption. The DES is available only at national level (FAO, 2014).

<sup>2</sup> The minimum dietary energy requirements (MDER) are based on the normative energy requirement standards from the joint FAO/WHO/UNU expert consultation (FAO/WHO/UNU, 2004). The country-specific data needed to estimate the MDER include the median heights by sex and age groups; the sex and age structure of the population; the birth rate; and the infant mortality rate.

<sup>3</sup> Variability (ie., the Coefficient of Variation, CV) and skewness parameters are derived from Household Income and Expenditure Surveys, wherever they are available and reliable. Where this is not the case, CV is indirectly estimated using the observed relationship of the CV with other macroeconomic variables (FAO, 2014).

Finally, a case study from Malawi is presented in Section 5, with the objective to show how the FIES data collected with the Gallup World Poll (GWP) can be used for investigating gender-related gaps in food security.

## 2. The tradition of experience-based measures of food insecurity

The FAO Food Insecurity Experience Scale (FIES) leans on the tradition of experience-based measures on food insecurity; in particular it is the global version of the adult referenced questions of the *Escala Latinoamericana y Caribeña de Seguridad Alimentaria*, ie., an experience-based food insecurity scale adopted in Latin America and the Caribbean.

Experience-based measures of food insecurity consist of asking people about lived experiences, such as having to compromise the quality and quantity of food consumption due to limited resources. These measures are based on the theoretical construct according to which the experience of food insecurity is usually characterized by a sequence of events: anxiety surrounding food access, leading to changes in the quality of the diet and eventually a decrease in the quantity of food consumed.

The ultimate purpose of these scales is to classify respondents according to their food insecurity level. One of the unique contributions of experience-based food insecurity scales is their ability to also capture some psychological consequences determined by food insecurity, in particular those related to the uncertainty regarding the possibility to get enough food (Ballard, T.J., Kepple, A.W. and Cafiero, C. 2013).

One of the first applications of this approach can be found in the U.S. Household Food Security Survey Module (US HFSSM), which has been applied annually in the United States since 1995 to monitor the food security situation in the United States (Hamilton *et al.*, 1997; Coleman-Jensen *et al.*, 2014).<sup>4</sup> At the international level, the Food and Nutrition Technical Assistance III (FANTA) project proposed the Household Food Insecurity Access Scale (HFIAS) and the Household Hunger Scale (HHS). The first was presented as a user-friendly approach for measuring the *access* component of household food insecurity (Coates, Swindale and Bilinsky, 2007)<sup>5</sup>; the second was an attempt to adapt the US HFSSM for developing countries and to develop a tool for cross cultural use<sup>6</sup> (Ballard T., Coates J., Swindale A., Deitchler M., 2011) (see Annex 1 for a detailed account of the US HFSSM questions).

At the same time, some Latin American countries adapted experience-based food insecurity scales for their own contexts. This effort resulted into the *Escala Latinoamericana y Caribeña de Seguridad Alimentaria* (ELCSA) (Pérez-Escamilla *et al.*, 2007; FAO, 2012a)<sup>7</sup>. The country consultation process formally began in 2007 to promote the development of a single instrument capable of measuring household food insecurity in diverse contexts (Pérez-Escamilla *et al.*, 2007). At the end of the process, a harmonized version of the ELCSA was approved and since then it has been applied in national surveys in Guatemala and Mexico and in pilot studies in several Latin American countries

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<sup>4</sup> Details can be found at: <http://www.fns.usda.gov/fsec/>.

<sup>5</sup> Details can be found at: <http://www.fantaproject.org/monitoring-and-evaluation/household-food-insecurity-access-scale-hfi-as>

<sup>6</sup> Details can be found at: <http://www.fantaproject.org/monitoring-and-evaluation/household-hunger-scale-hhs>

<sup>7</sup> Brazil and Colombia were the first countries that tried to develop their own scale. The Brazilian scale is rooted in the US HFSSM, while the Colombian scale was derived from a precursor to the US HFSSM (Pérez-Escamilla *et al.*, 2004; Wehler, Scott and Anderson, 1992; Lorenzana and Sanjur, 1999; Álvarez *et al.*, 2006; Hackett, Melgar-Quinonez and Álvarez, 2008).

(Ballard, T.J., Kepple, A.W. and Cafiero, C. 2013) (see Annex 1 for a detailed account of the ELCSA questions).

The testing of the ELCSA in various countries in Latin America and the Caribbean and its sporadic use outside the region strongly supported the potential validity and reliability of this type of tool in diverse contexts. In addition, the need for cross-country experience-based food insecurity measures has been recognized at different levels. The 2002 *International Scientific Symposium on the Measurement and Assessment of Food Deprivation and Undernutrition*, for instance, emphasized the usefulness of such scales; recognizing the progress made in their use and refinement and pointing out one of the main challenges of these scales – i.e., the lack of internationally validated tools. On these premises FAO has developed, tested and refined a Food Insecurity Experience Scale (FIES) for global use through the Voices of the Hungry project (VoH) (Ballard, T.J., Kepple, A.W. and Cafiero, C. 2013).

### 3. The Voices of the Hungry Project: Towards a Global Standard for Food Insecurity Measurement

Building upon the previous experience-based measures of food insecurity, the VoH project proposes the FIES scale, which provides timely and valid data on the severity of food insecurity in populations world-wide. By taking the individual as a reference, it offers the ability to examine differences in the experience of food insecurity between men and women. *The cross-country comparability and the possibility to generate sex-disaggregated data on food insecurity are two key innovative elements of this project* (Ballard, T.J., Kepple, A.W. and Cafiero, C. 2013).

In recent years many studies have sustained the cross-cultural validity and applicability of scales similar to the FIES (Derrickson, Fisher and Anderson, 2000; Álvarez et al., 2008; Hromi-Fiedler et al., 2009; Melgar-Quiñonez, 2010; Segall-Corrêa et al., 2008; Segall-Corrêa, Marín-León and Pérez-Escamilla, 2010). Additionally, the exploration of “cross-cultural commonalities” across twenty-two food insecurity scales and ethnographic studies carried out by Coates et al (2006a) confirmed that *uncertainty and worry about food, inadequate food quality, and insufficient food quantity* are common domains.

Scale items	Domains of the food insecurity construct	Assumed severity of food insecurity
You were worried you would run out of food because of a lack of money or other resources?	Uncertainty and worry about food	Mild
You were unable to eat healthy and nutritious food because of a lack of money or other resources?	Inadequate food quality	Mild
You ate only a few kinds of foods because of a lack of money or other resources?	Inadequate food quality	Mild
You had to skip a meal because there was not enough money or other resources to get food?	Insufficient food quantity	Moderate
You ate less than you thought you should because of a lack of money or other resources?	Insufficient food quantity	Moderate
Your household ran out of food because of a lack of money or other resources?	Insufficient food quantity	Moderate
You were hungry but did not eat because there was not enough money or other resources for food?	Insufficient food quantity	Severe
You went without eating for a whole day because of a lack of money or other resources?	Insufficient food quantity	Severe

(source: Ballard, T.J., Kepple, A.W. & Cafiero, C. 2013)

**Figure 1: The FIES items by domain of theoretical construct of food insecurity and assumed level of severity**

The VoH project stems from research such as this and the items of the FIES cover the domains mentioned above, as shown in figure 1, where each item in the FIES is linked to the domain of the underlying construct to which it is assumed to correspond (Ballard, T.J., Kepple, A.W. and Cafiero, C. 2013).

Since the purpose of VoH is a global use of the FIES, an extensive linguistic adaptation was carried out as part of the 2013 pilot studies,<sup>8</sup> following a methodology similar to the one used successfully in other settings (Derrickson and Anderson, 2000; Melgar-Quiñonez et al., 2003; Segall-Corrêa et al., 2008; Segall-Corrêa, Marín-León and Pérez-Escamilla, 2010) (see box 1). Of course, it was logistically and financially impractical to

**Box 1: the linguistic adaptation methodology applied in the 4 pilot studies**

1. An extensive explanation of the intended meaning was attached to each item.
2. Based on the explanations, preliminary translations of the FIES items were made by independent translators, in collaboration with expert professionals.
3. Preliminary translations were discussed and modified by expert panels.
4. Focus groups discussions and key informant interviews further discussed the modified translations and generated the final linguistically adapted FIES items.
5. The final linguistically adapted versions of the FIES were pre-tested by Gallup in preparation for the World Poll Surveys to be conducted in each country during 2013. This produced minor refinements in wording of few items.

conduct such in-depth adaptation work in every country and national language. However, the adaptation work carried out in the pilot countries suggested approaches for an accurate, albeit less intense, adaptation of the scale for the other countries<sup>9</sup> (Ballard, T.J., Kepple, A.W. and Cafiero, C. 2013).

Linguistic adaptation allows increasing the probability for the questions to be understood similarly in different cultural environments. However, in the analytic phase, this feature is properly tested and eventually adjusted to ensure cross-countries comparability. In order to collect cross-culturally comparable, real time information on how individuals experience food insecurity at a relatively limited cost, FAO contracted Gallup, Inc. to include the FIES in the 2014 Gallup World Poll® (GWP), with a plan to extend the collaboration over the next five years. The FIES data will be used to generate estimates of the prevalence of mild, moderate, and severe food insecurity at a national level.<sup>10</sup>

### 3.1. The analytics: Rasch Model

Following the experience of the US HFSSM, VoH bases the analytics of the FIES on the Item Response Theory (IRT) commonly used in the educational and psychological tests.

According to the modern IRT, the position of an individual on an unobservable construct (ie., *latent trait*) can be inferred from the answers to a set of dichotomous questions (ie., *items*)<sup>11</sup>. The key

<sup>8</sup> Pilot studies were carried out in Angola, Ethiopia, Malawi and Niger.

<sup>9</sup> Each module of the GWP questionnaire is translated and pilot tested by country survey teams before the survey is rolled out. Gallup country partners used the extensive explanations of the intended meanings of the items to translate, adapt and test the FIES questions in all languages used for administering the World Poll.

<sup>10</sup> The GWP is conducted annually in about 150 countries. The samples range from 1,000 to 5,000 of randomly selected adult individuals (15 years or above). Interviews are conducted face-to-face in 112 countries and by telephone in the remaining countries. The 2014 GWP takes place between March and November 2014, and the first data on the FIES arrived to FAO in August.

<sup>11</sup> 1/0 corresponds to positive/negative, correct/incorrect, or affirmed/denied.

assumption of the theory is that the probability of answering positively to an item with a certain level of difficulty depends on the unobservable latent trait of the individual. Examining the responses of many respondents on the same set of items, it is possible first to estimate the severity associated to each item (ie., *item severity parameter*), then to establish the location of each respondent on the unobservable construct (Ballard, T.J., Kepple, A.W. and Cafiero, C. 2013).

Among the models based on the IRT, the VoH uses the One Parameter Logistics Model (ie., *Rasch Model*). When the model is applied to food insecurity measurement, the probability that an individual with food insecurity  $b_h$  responds positively to an item characterized by severity level  $a_i$  is modelled as a logistic function of the distance between  $b_h$  and  $a_i$ :

$$\text{Prob}(x_{h,i} = 1 | b_h, a_i) = F(b_h - a_i) = \frac{e^{b_h - a_i}}{1 + e^{b_h - a_i}}$$

Once the function is optimized, individuals' food insecurity level and items' severity are measured on the same scale (Ballard, T.J., Kepple, A.W. and Cafiero, C. 2013).

#### 4. From Households to Individuals: Implications for Gender Analysis

Most of the food insecurity measures based on people's experiences, behaviors and opinions use the household as unit of analysis. This distinctive approach applies to experience-based scales as well as other food security measures. Several attempts have been made to develop, refine and use individual level measures, but they are not mainstreamed in the field of food security measurement.

Household-level food security measures certainly prevail over individual measures for cost and feasibility; but they have previously provided justification in the principle that food uncertainty and food insufficiency are household level experiences. This position was adopted, for instance, by the US Committee on National Statistics of the National Academies in its review of the USDA approach of measuring food insecurity (Coates, 2013; National Research Council, 2005).

However in recent years, emergent research on individual food insecurity has challenged this belief. Some studies investigated the applicability of experience-based tools for measuring or conceptualizing food insecurity in elderly and children (Wolfe et al., 1996; Fram et al., 2011; Bernal et al., 2012) while others used individual-level measures to analyze intra-household differences in food security. We can mention, for instance, the analysis conducted on the National Health and Nutrition Examination Survey (NHANES) by Nord (2011) using data from 2001 to 2008. Results proved that American women are more likely to experience food insecurity than American men of similar age in households with the same food insecurity and income. More generally, the findings support the idea that the number of individuals in food insecure households should not be used to represent the number of food insecure people. This is also seen in the study conducted by Hadley et al. (2007), analyzing the relationship between household and individual level food insecurity among adolescents in Southwestern Ethiopia. The study concluded that girls are more likely than boys to experience food insecurity in food insecure households, probably because of the differential opportunities in time use and privileges for boys and girls.

According to these and other studies (Alderman et al. 1995; Quisumbing et al. 2000a,b; Lundberg et al. 1997) the model of the household as unitary entity "*does not hold either in developing countries or US populations*". The empiric evidence rather suggests "*a conceptualization that differs from that of the US Review Panel [...] the picture painted [...] indicates that males and females in the household*

*also differ relative to one another, in their ability to command food for their own consumption”* (Coates et al., 2010, p.92). This perspective debunks the usefulness of the concept of household food insecurity, emphasizes the role of individual food insecurity and pushes for investing in individual food security measures where people are asked to report on their own experience.

As mentioned above, the adoption of the individual as unit of analysis is one of the main innovative elements of the FIES promoted by the VoH<sup>12</sup>. Although the FIES is not the first individual experience-based scale in the field of food security, it is the first individual-level measure that has been applied into a large number of countries in a standardized manner. *Therefore it will be the first tool able to generate comparable sex disaggregated data on food security on a large number of countries.* The choice of taking the individual as unit of analysis has been driven by the recognition that households do not necessarily distribute resources equitably and should not be conceived as a unique entity. Such a choice has been further simplified by the fact that the GWP collects data on the individuals.

The implementation of a cross-country individual-level measure brings some obvious advantages:

- The possibility to generate comparable sex-disaggregated food insecurity statistics;
- The possibility to estimate the effect of sex on food insecurity controlling for other relevant variables. Since the GWP collects very few information on the households; the multivariate analysis conducted on the GWP data can control only for individual characteristics. If included into a national household survey, the individual food insecurity status could be controlled also for household level variables.

Since the GWP samples are relatively small and data are collected only on one (randomly chosen) household member, the GWP data do not allow exploring intra-household differences between men and women in the same households. However, this option could be put in practice depending on the sampling design.

## **5. Gender Differentiated Results: the case of Malawi**

One of the four pilot studies was carried out in Malawi in 2013. The GWP nationally representative sample in Malawi consisted of 1,000 individuals and has been obtained through a three stage sampling procedure:

- Stage 1: selection of primary sampling units (PSU) based on probability proportional to population size;
- Stage 2: selection of households within each PSU through the random walking method;
- Stage 3: random selection of one individual within each household.

The sample stratification was quite unbalanced in terms of sex. Post-hoc expansion factors were calculated by Gallup based on the country’s population to project the sample’s results at national level. The sample composition by age, sex, area of residence and education before and after the application of the expansion factors is reported in table 1.

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<sup>12</sup> All the items are at the individual level. Only the item “Your household ran out of food because of a lack of money or other resources?” makes reference to the household as a whole.



	Un-weighted		Weighted	
	<30	>=30	<30	>=30
Age	488	512	491.18	508.82
Education	<= Elementary	>= Secondary	<= Elementary	>= Secondary
	652	348	774.36	225.64
Urban/Rural	Rural	Urban	Rural	Urban
	576	424	578.44	421.56
Gender	Male	Female	Male	Female
	363	637	486.80	513.20

**Table 1: Sample description – Malawi**

### 5.1. Psychometric assessment

To assess the scale performance in Malawi we fit the one parameter logistic model (Rasch model). Table 2 shows item severity parameter estimates, together with corresponding standard errors and fit statistics.

Item label	Severity	Standard error	Infit <sup>13</sup>
WORRIED	-0.492	0.132	1.110
HEALTHY	-0.365	0.130	1.164
FEWFOOD	-0.997	0.143	0.837
SKIPPED	0.223	0.122	0.966
ATELESS	-0.702	0.136	0.943
RUNOUT	0.124	0.123	0.900
HUNGRY	0.537	0.120	1.030
WHLDAY	1.673	0.121	1.041

**Table 2: Item parameters and corresponding severity, standard errors and fit statistics - Malawi.**

Overall, we observe that the scale performed well. Fit statistics are all in the range of 0.8 - 1.2, which is suggested by psychometric guidelines to adequately meet the assumption of equal discrimination<sup>14</sup>. The Rasch reliability, which describes the proportion of total variance accounted by the model, is 0.63, and can be considered acceptable.

### 5.2. Gender Analysis of the Item Parameter Estimates

A second step of the analysis is to explore whether or not the items have worked similarly in the sub-sample of men and women.

Significant discrepancies in item severity between men and women may imply the existence of a gender-based difference in the interpretation of such items; this is of interest because would tell us that men and women assign different level of severity to a given food security experience. More

<sup>13</sup> The infit statistic compares observed deviations of responses from the deviations expected under Rasch assumptions, so the expected values of the statistics are 1. Values above 1.0 indicate items that are less strongly or consistently related to the underlying condition (food insecurity) measured by the set of items. Such an item will have a disproportionate share of “out-of-order” responses (i.e., affirmative responses by households with severity scores below that of the item or denials by households with severity scores above that of the item). Values of infit below 1.0 indicate items that are more strongly and consistently related to food insecurity than the average item.

<sup>14</sup> The one-parameter logistic model (Rasch model) assumes that all items have equal discrimination power (capacity to discriminate among different levels of the latent variable).

importantly, a discrepancy in the item severity would make prevalence comparison between men and women less straightforward. As a consequence, an item parameter adjustment may be required before comparing prevalence of food insecurity among men and women.

A Wald-type test has been performed to check whether or not item severities are the same in the two sub-samples. Figure 2 shows item severities of women plotted against the ones of men. Severities have been reported to the same standard deviation.

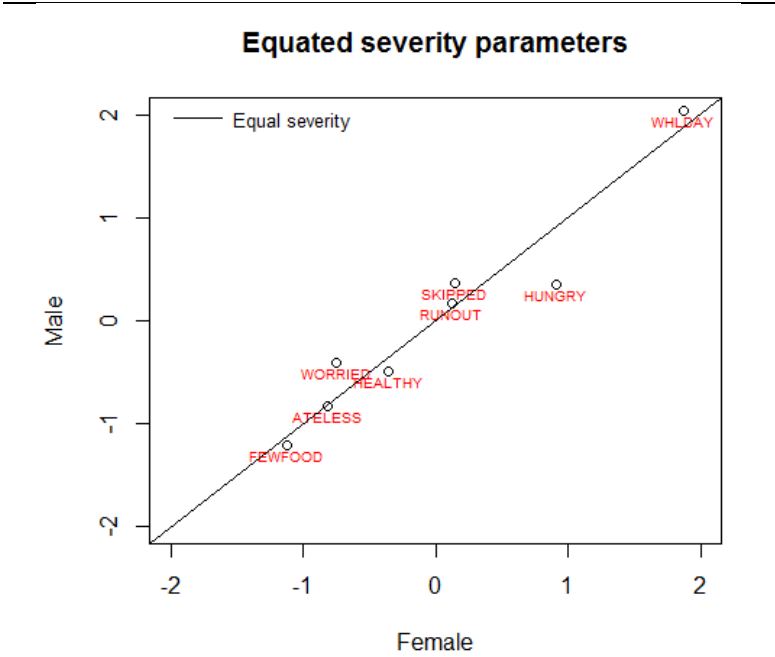


Figure 2: Item severities differentiated by men and women - Malawi.

Table 3 reports the Wald test p-values. In this case, the null hypothesis implies the equality of item parameters in the two sub-groups.

ITEMS	Wald test p-values
WORRIED	0.262
HEALTHY	0.676
FEWFOOD	0.794
SKIPPED	0.449
ATELESS	0.977
RUNOUT	0.866
HUNGRY	0.047
WHLDAY	0.556

Table 3: Wald test applied on item parameters for the gender disaggregation – Malawi.

It can be observed that only one item (hungry) differs for a statistically meaningful amount between men and women. This difference can be considered to be small enough not to introduce substantial bias in the prevalence comparison.

### 5.3. Gender Analysis of Food Insecurity

This paragraph looks at gender-based disparities on food insecurity and investigates the impact of gender on food insecurity controlling for relevant socio-demographic and economic variables.

Table 4 below shows the distribution of the food insecurity classes by area of residence, sex, age and level of education, while Figure 3 (bold lines) reports the full food insecurity prevalence profile disaggregated by sex.

		% of severely food insecure (raw score $\geq 7$ )	% of moderately food insecure ( $3 \leq$ raw score $< 7$ )	% of mildly food insecure ( $1 \leq$ raw score $< 3$ )	% of food secure (Raw score = 0)
Area of residence	Urban	44%	25%	8%	23%
	Rural	62%	20%	6%	12%
Sex	Male	52%	22%	8%	18%
	Female	57%	22%	5%	15%
Age	Less than 30	48%	26%	7%	20%
	30 -59	58%	20%	6%	16%
	More than 59	72%	13%	9%	6%
education	No education/elementary	60%	21%	6%	14%
	Secondary or more	36%	27%	10%	27%

Table 4: Weighted sample distribution across classes of food insecurity – Malawi

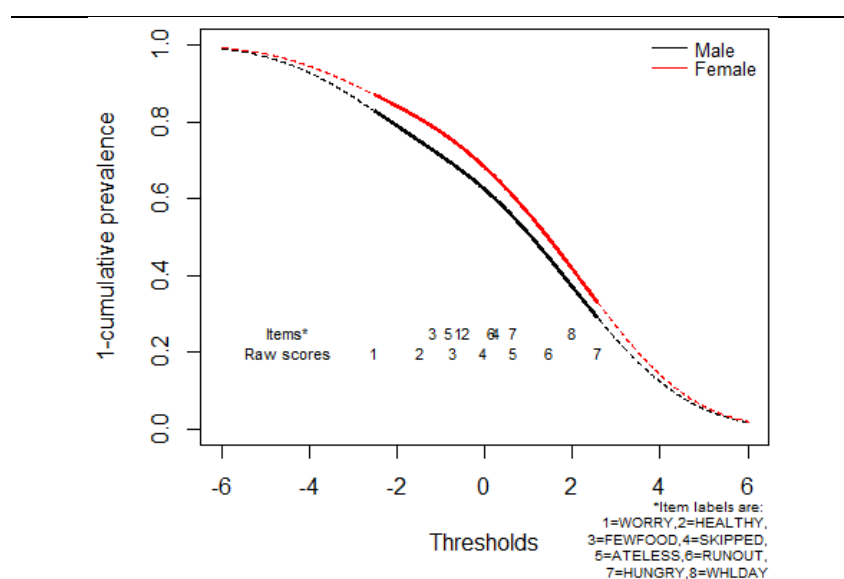


Figure 3: Prevalence profiles of food insecurity disaggregated by sex – Malawi<sup>15</sup>

The data confirm that, in Malawi, food insecurity affects mainly rural communities, the elderly and the less educated people. Regarding gender, overall women are more food insecure than men; such difference is more evident in the less severe food insecurity situation (left-hand side of the distribution), and less marked in the more severe range (right-hand side of the distribution).

On this basis, we tested the impact of gender on food insecurity with two logistic regression models<sup>16</sup>:

<sup>15</sup> The chart shows that the items' severity and the individual raw scores are measured on the same scale (in logit).

- **Model 1** whose purpose is to explore the effects of gender on the probability to experience a moderately or severely high level of food insecurity. For this reason, the dependent variable (0/1) is a dichotomous variable where 0 corresponds to “food secure or mildly food insecure” and 1 means “moderately or severely food insecure”.
- **Model 2** whose purpose is to explore the effects of gender on the probability to experience a severely high level of food insecurity. As a consequence, the dependent variable (0/1) is a dichotomous variable where 0 corresponds to “food secure, mildly or moderately food insecure” and 1 means “severely food insecure”.

In both cases, first we observed the association between gender and the dependent variable, and then we progressively introduced meaningful controlling variables collected through the GWP<sup>17</sup>. Initially we added only the age of the individual (less than 30 years/30 years or more); finally we included level of education (none/primary education versus secondary or more), the area of residence (urban/rural), and individual income.

Table 5 below summarizes the output of the full regression models while table 6 gives an account of the degree of significance of the variable ‘sex’ in the earlier steps .

<b>Model 1: dependent variable is “being moderately or severely food insecure”</b>					
	coefficient	SE	z	p	Degree of significance
(Intercept)	1.1735	0.2131	5.508	<0.001	***
Sex= Female	0.2774	0.1565	1.772	0.07636	.
Age= 30 or more	0.196	0.1591	1.232	0.21809	
Education= Secondary or more	-0.7655	0.1767	-4.333	<0.001	***
Area of residence= Urban	-0.7283	0.1719	-4.238	<0.001	***
Income quintile = second 20%	0.3979	0.2483	1.602	0.10907	***
Income quintile = middle 20%	0.326	0.2496	1.306	0.19152	
Income quintile = fourth 20%	0.6927	0.2496	2.775	0.00551	**
Income quintile = richest 20%	0.2604	0.24	1.085	0.27797	
<b>Model 2: dependent variable is “being severely food insecure”</b>					
	Coefficient	SE	z	p	Degree of significance
(Intercept)	0.3031	0.1859	1.63	0.10306	
Sex= Female	0.1216	0.1347	0.903	0.36673	
Age= 30 or more	0.3909	0.1361	2.872	0.00408	**
Education= Secondary or more	-0.7876	0.1665	-4.729	<0.001	***
Area of residence= Urban	-0.6932	0.1486	-4.666	<0.001	***
Income quintile = second 20%	0.1042	0.2234	0.466	0.64087	
Income quintile = middle 20%	-0.3074	0.2186	-1.406	0.15965	
Income quintile = fourth 20%	0.3476	0.2099	1.656	0.09777	.
Income quintile = richest 20%	0.2509	0.2079	1.207	0.2274	

**Table 5: Regression models for low and high food insecurity response - Malawi**

<sup>16</sup> The regression analysis used the sampling weights.

<sup>17</sup> The GWP questionnaire is available at: [http://media.gallup.com/dataviz/www/WP\\_Questions\\_WHITE.pdf](http://media.gallup.com/dataviz/www/WP_Questions_WHITE.pdf).

	Impact of Gender on food insecurity (Degree of significance)		
	Step 1 (regressor: sex)	Step 2 (regressors: sex, age)	Step 3 (regressors: sex, age, area of residence, education, income)
<b>Model 1</b>	p= 0.0345 *	p = 0.0253 *	p = 0.07636
<b>Model 2</b>	p = 0.186	p = 0.124	p = 0.36673

**Table 6: Association between and food insecurity - degree of significance**

*Gender doesn't show a statistically significant ( $p < 0.05$ ) association with the probability to be severely food insecure, but it has an interesting association with the probability to report at least a moderate food insecurity level. In particular, when we simply compare men and women (controlling or not for age), being female is associated with a higher likelihood of moderate or severe food insecurity ( $p = 0.034$  and  $p = 0.0253$  respectively). However, when we control for crucial socio-economic variables – such as area of residence, education, income – the association between gender and food insecurity is only weakly statistically significant ( $p = 0.076$ ), although, within the sample, female disadvantage in the full model is quite strong (coefficient = 0.28).*

We can therefore conclude that, in Malawi, when women have the same educational and income level than men, the probability that they experience at least a moderate food insecurity level is the same than men. The fact that women are more likely than men to be food insecure results from their lower economic and human capital which translates into lower income and education.

In this paper we used the Malawi data to show what kind of multivariate gender sensitive analysis can be conducted with the FIES data. The inclusion of the FAO Food Insecurity Scale in the GWP allows investigating the association between gender and food insecurity into a large number of countries and compare the dynamics.<sup>18</sup> This would result into a cross-country analysis where the food insecurity difference between men and women is analyzed at global level.

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<sup>18</sup> See footnote 10.

## Annex 1

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### US Household Food Security Survey Module (US HFSSM)

#### Optional Preliminary Screen

*Now I'm going to read you several statements that people have made about their food situation. Please tell me whether the statement was often, sometimes, or never true in the last 12 months.*

Q2 "I worried whether our food would run out before we got money to buy more." Was that often, sometimes, or never true for you in the last 12 months?

Q3 "The food that we bought just didn't last, and we didn't have money to get more." Was that often, sometimes, or never true for you in the last 12 months?

Q4 "We couldn't afford to eat balanced meals." Was that often, sometimes, or never true for you in the last 12 months?

Q5\*\* "We relied on only a few kinds of low-cost food to feed the children because we were running out of money to buy food." Was that often, sometimes, or never true for you in the last 12 months?

Q6\*\* "We couldn't feed the children a balanced meal because we couldn't afford that." Was that often, sometimes, or never true for you in the last 12 months?

#### 1st-Level Internal Screen

Q7\*\* "The children were not eating enough because we just couldn't afford enough food." Was that often, sometimes, or never true for you in the last 12 months?

Q8, In the last 12 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

Q8a How often did this happen — almost every month, some months but not every month, or in only one or two months?

Q9 In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?

Q10 In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?

Q11 Sometimes people lose weight because they don't have enough to eat. In the last 12 months, did you lose weight because there wasn't enough food?

#### 2nd-Level Internal Screen

Q12 In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?

Q12a How often did this happen — almost every month, some months but not every month, or in only one or two months?

Q13\*\* In the last 12 months, did you ever cut the size of any of the children's meals because there wasn't enough money for food?

Q14,\*\* In the last 12 months, did any of the children ever skip meals because there wasn't enough money for food?

Q14a\*\* How often did this happen — almost every month, some months but not every month, or in only one or two months?

Q15\*\* In the last 12 months, were the children ever hungry but you just couldn't afford more food?

Q16\*\* In the last 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food?

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### Household Food Insecurity Scale, FANTA

In the past four weeks...

Q1 did you worry that your household would not have enough food? (Y/N). If yes, how frequently did it happen?

Q2. were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources? (Y/N). If yes, how frequently did it happen?

Q3. did you or any household member have to eat a limited variety of foods due to a lack of resources? (Y/N). If yes, how frequently did it happen?

Q4. did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food? (Y/N). If yes, how frequently did it happen?

Q5. did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food? (Y/N). If yes, how frequently did it happen?

Q6. did you or any household member have to eat fewer meals in a day because there was not enough food? (Y/N). If yes, how frequently did it happen?

Q7. was there ever no food to eat of any kind in your household because of lack of resources to get food? (Y/N). If yes, how

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frequently did it happen?

Q8. did you or any household member go to sleep at night hungry because there was not enough food? (Y/N). If yes, how frequently did it happen?

Q9. did you or any household member go a whole day and night without eating anything because there was not enough food? (Y/N). If yes, how frequently did it happen?

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### **Household Hunger Scale, FANTA**

In the past [4 weeks/30 days]...

Q1. Was there ever no food to eat of any kind in your house because of lack of resources to get food? (Y/N). If yes, how frequently did it happen?

Q2. Did you or any household member go to sleep at night hungry because there was not enough food? (Y/N). If yes, how frequently did it happen?

Q3. Did you or any household member go a whole day and night without eating anything at all because there was no enough food? (Y/N). If yes, how frequently did it happen?

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### **Escala Latinoamericana y Caribeña de Seguridad Alimentaria**

En los últimos 3 meses...

P1. Por falta de dinero u otros recursos, ¿alguna vez usted se preocupó porque los alimentos se acabaran en su hogar?

P2. Por falta de dinero u otros recursos, ¿alguna vez en su hogar se quedaron sin alimentos

P3. Por falta de dinero u otros recursos, ¿alguna vez en su hogar dejaron de tener una alimentación saludable\*?

P4. Por falta de dinero u otros recursos, ¿alguna vez usted o algún adulto en su hogar tuvo una alimentación basada en poca variedad de alimentos?

P5. Por falta de dinero u otros recursos, ¿alguna vez usted o algún adulto en su hogar dejó de desayunar, almorzar o cenar?

P6. Por falta de dinero u otros recursos, ¿alguna vez usted o algún adulto en su hogar comió menos de lo que debía comer?

P7. Por falta de dinero u otros recursos, ¿alguna vez usted o algún adulto en su hogar sintió hambre pero no comió?

P8. Por falta de dinero u otros recursos, ¿alguna vez usted o algún adulto en su hogar solo comió una vez al día o dejó de comer durante todo un día?

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