

# **Measuring Food Insecurity in Guatemala**

A Senior Honors Thesis

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*This thesis is an internal and criterion validation study on the Latin America and Caribbean Food Security scale (Escala Latinoamericana y Caribena de Seguridad Alimentaria - ELCSA) conducted in over 200,000 households in Guatemala. A fifteen-question survey was distributed in eight of the thirteen departments of Guatemala; from the indigenous western region, to the forested, impoverished northwest region. The eastern region was excluded. This study demonstrated the efficacy of the survey in measuring the severity of household food insecurity. The data were received from the Guatemala National Institute of Statistics and analyzed using the Rasch model to determine the survey's internal validity, through use of a severity scale and infit values. The criterion validity was supported through use of 1-way ANOVA and chi square statistics and demonstrated statistically-significantly correlations between the food insecurity status found in this study and other previously identified food insecurity factors. This study further documented the Latin American and Caribbean Food Security scale as an internally and externally valid instrument recommended for use in national representative surveys to measure household food insecurity. A valid and reliable tool to measure food insecurity is necessary to successfully target at-risk and high-risk populations and to efficiently implement and monitor interventions.*

## **Introduction**

Food insecurity is defined as, “not having adequate physical, economical, or social access to nutritious food that meets dietary needs for an active and healthy life<sup>1</sup>.” In 1974 at the World Food Conference, for the first time, adequate food supply was examined on an individual basis, rather than a country basis. At the national level, many countries seemed to have adequate food supply, deeming inhabitants “food secure.”

However, when these countries were examined more closely on an individual basis, widespread and intense hunger was discovered among millions of people worldwide, in addition to the “hidden hunger” experienced by one-third of the world’s vitamin and mineral deficient inhabitants<sup>2</sup>. Hunger is measured by an energy intake below that which is required to maintain body weight, body composition, and levels of physical activity for long-term good health<sup>2</sup>. In an effort to reduce the number of suffering citizens, the 1996 Rome World Food Security re-evaluated the meaning of food security and revisited the Universal Declaration of Human Rights, which proclaimed meeting nutritional needs as a right, rather than a privilege, for all (Article 25 Adopted and proclaimed by the General Assembly of the United Nations resolution 217 A (III) of 10 December 1948). The committee set the goal to reduce by 50 percent the number of hungry people by 2015 when benchmarked by the 1990 level (World Food Summit Plan, Millennium Development Goal- MDG)<sup>1</sup>. The World Food Summit Plan of Action vowed to “implement policies aimed at eradicating poverty and inequality and improving physical and economic access by all, at all times, to sufficient, nutritionally adequate and safe food and its effective utilization<sup>1</sup>.” Regrettably, in 2010 the number of hungry people has instead more than doubled, and there are over 945 million hungry people around the world, as opposed to the projected 412 million come 2015<sup>1</sup>.

Food insecurity occurs for a variety of reasons and has multiple dimensions. Geographic and socioeconomic factors contribute to food security because they can limit access and supply of food<sup>3</sup>. USAID’s Mesoamerican Food Security Early Warning System reports that 15,000 Guatemalans will be food insecure in 2011 as a result of climatic events<sup>4</sup>. Another 486,000 individuals will need food assistance due to loss of crops and livelihoods in the eastern, steeper regions of Guatemala<sup>4</sup>. Other crises include

natural disasters, human disasters, or a combination of both<sup>3</sup>. From 2006-2009 there was a sharp increase of hunger throughout the world due to high food prices and the global economic crisis<sup>1</sup>.

Improper or inadequate nutrition from a young age can result in protein and energy deficiency (as found in one-quarter of the world's children) that results in stunting, wasting, and underweight children<sup>5</sup>. Malnutrition can weaken the immune system, increasing the risk for infection, and can delay the growth and cognitive development of children<sup>2</sup>. Micronutrient deficiencies can lead to large range of diseases and other health deformities. Vitamin A, iron, and iodine are micronutrients with the most harmful consequences<sup>2</sup>. The lack of essential vitamins and minerals are often not visible to the eye, contributing to the name "hidden hunger" used to describe this critical issue<sup>2</sup>. After targeting food insecure households, further analysis of these deficiencies can be explored, helping accomplish the MGDs' goal of reducing infant and maternal mortality, and the prevalence of HIV-AIDS, malaria, and other life threatening diseases<sup>1</sup>. Physiologic and social stresses, including anxiety, volatility, sadness, and depression, are often additional consequences of not having enough food<sup>6</sup>. Aside from the severe health issues that can result from food insecurity, the disparity felt by individuals can cause conflict and political unsteadiness<sup>6</sup>.

The world population and food system also can contribute to food insecurity. In a study predicting the future of the global food system, it is predicted that the world population will reach nine billion by 2050<sup>9</sup>. With this increased demand in food, it is critical to determine how to feed this rising population, while still trying to assist the current population. Policy makers must be aware of the "nutrition transition" occurring around the world, especially in developing countries. This phenomenon pertains to the replacement of native foods with an increased consumption of imported highly processed, high-fat, or high-sugar foods<sup>10</sup>. The fast food and large supermarket environment that is

prevalent in the United States today, developed over a period of 50 years. What took a developed nation half a decade to occur, has taken only 10 years in Latin America<sup>9</sup>.

Guatemala continues to have the highest rate of chronic malnutrition in the western hemisphere, reporting 49% of the nation being malnourished<sup>4</sup>. Child chronic malnutrition is even more devastating, plaguing 69% of the indigenous Guatemalan children. Since little progress has been made on these statistics since 1995, at this rate, it would take 83 years to eliminate stunting within the indigenous population<sup>4</sup>.

Measuring household food insecurity and its consequences is necessary because it provides an estimate of the prevalence and causes of hunger so that policy makers can better target and intervene to aid high-need populations<sup>7</sup>. Supported by accurate data, proper evaluation systems can be implemented to improve the security of food and alleviate the consequences of food insecurity. Food insecurity should measure not only reductions in food quantity, but also food quality, for studies have shown fruits and vegetables are among the first food groups to be eliminated when money is short<sup>8</sup>.

Previously, food insecurity was measured on national and regional levels based on economic indicators of food production and food availability<sup>11</sup>. The most common methods to measure food insecurity include: national levels of dietary energy supply, individual food intake reports, anthropometric measures, and questionnaires measuring experiences of food security<sup>12</sup>. The first three approaches can be timely, expensive, and lack the ability to measure the “experience” of the household. The questionnaire approach excels in exploring the psychometric and physical conditions of each household individually, is less expensive, easier to use, and can be applied to a diverse amount of populations<sup>12</sup>.

### *The Latin American and Caribbean Food Security Scale*

In an effort to quantify hunger in the United States, the National Nutrition Monitoring and Related Research Act was passed to standardize tools to measure and

obtain data on food insecurity around the nation<sup>13</sup>. In 1992, the US Household Food Security Supplemental Module (HFSSM) was created from a hunger index defined by the Massachusetts Nutrition Survey (1983) and further investigations<sup>13</sup>. Using this module as a framework, similar surveys have been distributed on five different continents to measure food insecurity and explore the factors with which it is associated. This HFSSM survey has been translated and modified to fit different cultures, such as Latin America and the Caribbean<sup>14</sup>.

A food security status was generated in this study based on the respondent's number of affirmative answers to the distributed survey. Food insecurity is classified into four categories: food secure, mildly food insecure, moderately food insecure, and severely food insecure<sup>15</sup>. The fifteen-question survey tests both psychometric underlying conditions of the households, as well as the physical food-related conditions. The survey uses questions that progressively increase in severity. The insecurity score is designed to increase based on affirmative responses to questions that indicate a higher level of food insecurity, and should encompass all of the previous, less severe responses. The first eight survey questions inquire about the food-related condition of the household, while the last 7 questions ask about the child's experience in the household. The survey is designed this way with the assumption that children are "protected" within the household, meaning they are the last to feel the food insecurity<sup>15</sup>. In theory, the quality of the food will first decrease, then the quantity of the adults' food, then the quantity of the children's food, which if answered affirmatively, would indicate a severely food insecure household. It is important to note that the survey as a whole is used to indicate the level of food insecurity, not each question separately.

If a tool is valid, it will measure what it is intended to measure, in this case, the level of food insecurity<sup>17</sup>. Typically, to determine validity, a tool is typically compared to a "gold standard." Though there is not yet a gold standard for measuring food insecurity, there are factors that have been demonstrated to be linked to this condition including:

poverty, access to public services, structural material of house, number of occupants per room per house, and agricultural production of the country. This study tested internal validity, meaning it measured how valid an instrument is in measuring within itself or within a population<sup>17</sup>. The instrument is deemed reliable if it provides a consistent and reproducible measure every time it is used. This study will further evaluate the reliability of the Rasch model in regards to measuring food insecurity.

Criterion validity, on the other hand, demonstrates the accuracy of a tool by comparing it to an existing valid measurement or tool<sup>17</sup>. The food security status determined in this study was run against other “criterion” that might be linked to food insecurity. A strong correlation between the two measures indicates criterion validity<sup>17</sup>.

## **Methods**

In all, 265,229 Guatemalan households completed the Latin American and Caribbean Food Security Scale survey. Inhabitants within eight of the twenty-two departments in Guatemala responded to this survey. The east side of Guatemala was not included, for this area of the country is least indigenous. Samples were received from both urban and rural areas; the instrument was expected to perform the same in each setting.

A total of 295,243 households responded to this survey. Surveys were completed through interviews. The interviewers were standardized under the same methodologies, though the condition of the interview was not standardized. The interviews were done in May, June, and July 2010, in the second half of each month. Harvest season in Guatemala is after July. With these conditions, food insecurity was expected to be higher than if the interview were conducted at the beginning of the month or after the harvest season.

Households that responded only to the last seven questions regarding the child’s experience and that failed to respond to the first eight regarding the household were omitted (n=30,014). These households therefore reported incomplete information and

were left out under the terms that, comparatively, so few households committed this mistake. All departments within Guatemala were affected by dropping these participants, particularly department six, which was deleted entirely. The final number of respondents was counted under the conditions that all of the first eight questions about the household were responded to and if the household contained children, all seven final questions were completed.

Using *STATA* statistical software the data were revised for further analysis using *Winsteps* modules 3.69.1.6<sup>18</sup>. In order to properly analyze this data with regards to increasing severity, the data needed to be transformed. In the beginning, an affirmative answer counted as one, while a negative answer counted as two. Because the survey generally increased with severity with each question, more affirmative answers should equate to a higher number, thus a higher severity. To correct this scale, the answers were recoded, “yes” equaling one, “no” equaling zero. Based on the number of affirmative answers, the household was then classified into a “food security status,” used in the criterion validity portion of the study (Table 1).

### *The Rasch model*

In general, Rasch analysis models item difficulty/severity as a log transformation of the probability of a person responding to a given item in a certain way. The Rasch model compares dichotomous data, transformed from the human sciences, against a mathematical framework and assesses the fitness and internal validity of the tool used to measure the data<sup>20</sup>. In an academic setting, the Rasch model can be used to measure cognitive ability of a student; it assumes as the difficulty of the question increases, the likelihood of a student responding correctly decreases. The number of correct answers before an incorrect answer should be consistent with the scale, increasing in a steady, straight line, assuming the student correctly answered the previous “easier” questions. The same model and analysis can be used when measuring household food insecurity



status. It is assumed that if a participant answers yes to a question that dictates severe food insecurity (such as “child goes to bed hungry”) all other less severe food condition questions should also be answered affirmatively. The Rasch model has been used to determine the internal validity of other household food security surveys in the past<sup>19,20</sup>.

The Rasch model generates mean square fit statistics, which measure the difference between the expected and the actual responses<sup>20</sup>. One type, information weighted, or “infit” values are commonly used in food insecurity studies, to determine the appropriateness of the model based on the responses of the participants<sup>21</sup>. As a general rule, infit values of 0.8-1.2 is recommended, 0.7-1.3 values are considered good, and 0.6-1.4 are considered adequate. A score of 1 indicates perfect coherence with the model predictions; an infit value higher than one shows a fit to the model with more variation than expected; values below one signify a better than expected fit or less variation than the model predicts in the observed response pattern<sup>21</sup>. The Joint Maximum Likelihood Estimation (JMLE) explains why the first question is often overestimated (having an infit value greater than 1), because the first question has no previous question for comparison. This survey is considered a short tool, with less than 25 questions, and displays some evidence of bias (question one infit value= 1.39). This bias results from the possibility of extreme scores within the estimation space, without the ability to measure them<sup>22</sup>. However, the sample size is large enough to significantly reduce the impact of the bias. A test item is considered biased when the item within this survey is found to misrepresent what is being measured, putting one group at a disadvantage in taking the examination<sup>23</sup>.

The severity values of the fifteen items in the survey were also computed using the mean-square fit statistics of the Rasch model. Each survey item was run in order of relative severity, and assigned a relative severity value. Differential Item Functioning (DIF) was used to evaluate whether there were differences between urban and rural populations. DIF is displayed when there is a significant difference in the probability of respondents from two distinct groups (such as male vs. female or urban vs. rural)<sup>23</sup>. DIF

CONTRAST is estimated by subtracting each DIF item calibration by area. A DIF CONTRAST greater than or equal to .5 logit units is substantial, demonstrating a bias within the data<sup>23</sup>.

*Criterion validity*

A 1-way ANOVA test and a 4x2 chi square significance test were run to generate a Food Security Status (4 categories) based on the number of affirmative answers to the survey. The classifications were grouped based on the guidelines produced by ELCSA (Table 1).

<b>Households With Children Food Security Status Classification</b>	
0	Food secure
1-5	Mildly Food Insecure
6-10	Moderately Food Insecure
11+	Severely Food Insecure

<b>Households Without Children Food Security Status Classification</b>	
0	Food secure
1-3	Mildly Food Insecure
4-6	Moderately Food Insecure
7-8	Severely Food Insecure

**Table 1** The Guidelines to determine a household (with or without) food security status, developed by the ELCSA committee<sup>15</sup>.

The distributed survey not only collected responses to the fifteen questions, but also reported the conditions of the household including: construction material of the house, the level of crowding, the number on appliances and vehicles, poverty level,

number of rooms/bedrooms, and access to public services (water, sewer, electricity, and phone). This information was collected at the same time the food security scale was presented.

The mean values of each category were formulated into a principal component, by calculating the mean value within each factor. Then, a 1-way ANOVA test was run between each mean value (continuous variable) with the assigned food security status of each household. This test was adjusted using the Bonferroni multiple comparison test. The test was run to determine differences among sub factors within each category. For example: within the household construction materials, a Bonferroni multiple comparison test was run between each household material to test for a difference between each individual factor. If a significant difference is found between each material, one can conclude that each material contributes to the relation to the food security status, not just the general factor of “household material.”

### Results

First, a descriptive analysis was created for the study. The survey was completed in thirteen of the twenty-two Guatemalan departments.

Area	n(%)
Urban	75,255 (.28)
Rural	189,971 (.72)

**Table 2** The distribution of areas completing the ELCSA survey in Guatemala.

Household Characteristics	Mean number
People per house	5 ± 2.4
Number of Rooms	2.0 ±1.2
Number of Rooms that are Bedrooms	1.6±0.9

**Table 3** Household characteristics of the households surveyed in Guatemala.

<b>Poverty Level</b>	<b>n(%)</b>
Not Poor	117,686 (.44)
Poor	84,288 (.32)
Critically Poor	63,255 (.24)

**Table 4** Number of households in the Guatemalan sample survey in each poverty status, as classified by the Guatemala National Institute of Statistics.

<b>Households with Kids</b>	<b>n(%)</b>
Yes	217,334 (.82)
No	47,895 (.18)

**Table 5** The number of households in the sample population containing kids. Having kids increases the risk and severity of food insecurity.

The physical conditions of the house were reported as well:

<b>Exterior Wall Material</b>	<b>n(%)</b>
Block	154,642 (.58)
Wood	39,852 (.15)
Adobe	26,240 (.10)
Other	84,121 (.17)
<b>Floor Material</b>	<b>n(%)</b>
Cement brick	24,002 (.09)
Cement Cake	136,302 (.51)
Dirt	87,078 (.33)
Other	3,185 (.07)
<b>Roof Material</b>	<b>n(%)</b>
Metal sheet	219,549 (.83)
Concrete	22,824 (.09)
Palm leaf	13,498 (.05)

Other	9,124 (.03)
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**Table 6** The most common exterior house materials, floor materials, and roof material within the Guatemalan households surveyed.

<b>Connected to Service</b>	<b>n(%yes)</b>
Water	168,474 (.64)
Sewer	87,584 (.33)
Electricity	217,513 (.82)
Telephone	10,527 (.04)
Trash (public or private)	61,465 (.23)

**Table 7** The amount of Guatemalan households surveyed that were connected to water, sewer, electricity, telephone, and trash services.

<b>Belongings</b>	<b>n(%yes)</b>
Television	174,073 (.66)
Radio	125,435 (.47)
Recorder	71,037 (.27)
Gas Stove	111,351 (.42)
Refrigerator	75,924 (.29)
Electric Iron	114,495 (.43)
Washing Machine	14,147 (.05)
Bicycle	86,631 (.33)
Car	26,173 (.10)

**Table 8** The number of surveyed households with common possessions.

The Food Security Status (FSS) of each Household was determined based on the number of affirmative answers to the food-related questions on the survey. The mean food security status of the entire data was 8, a moderately to severe food security status, depending on if the household has children or not.

<b>Food Security Status</b>	<b>n(%)</b>
0	48,078 (.18)
1	48,852 (.18)
2	44,277 (.17)
3	124,022 (.47)

**Table 9** The food security status of the households In Guatemala responding to the survey. The classifications were determined by ELCSA.

### *Criterion Validity*

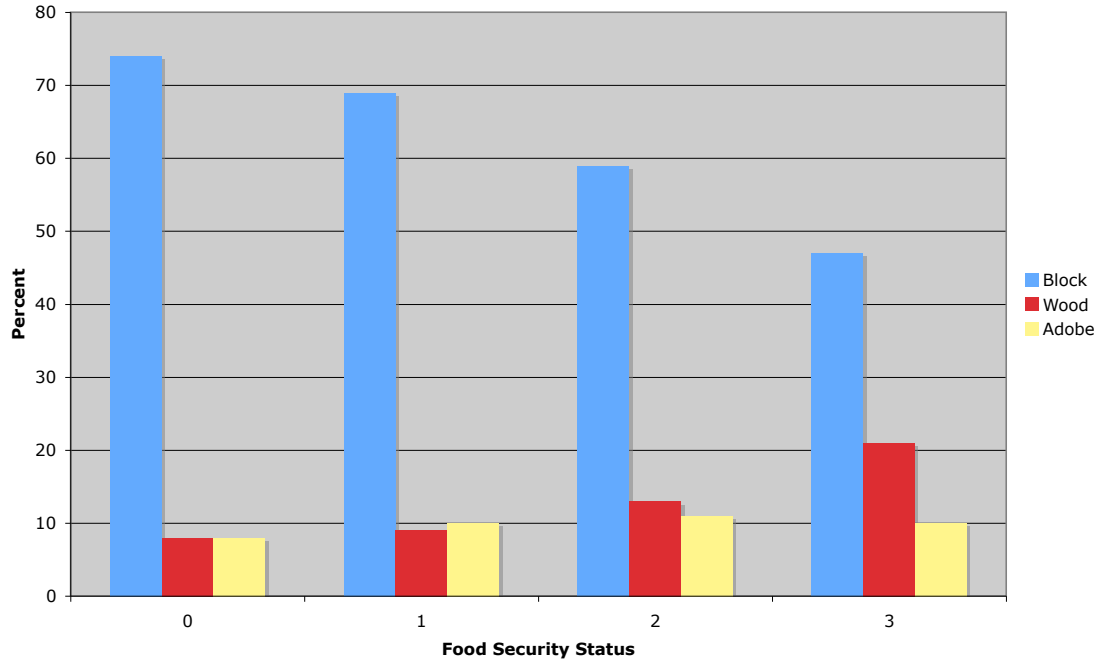
Next, a bivariate analysis was conducted to compare the food security status to each of the reported conditions of the households. Statistically significant differences ( $p=0.000$ ) were found in all of the 1-way ANOVA test run between the principal factors and the food security status generated in this study. The principal factor (mean value) of household materials, access to public services, number of appliances and vehicles, and level of crowding were all found to be significantly different from the food security status classified by ELCSA.

Bonferroni tests run within each principal component found a statistically significant difference ( $p=0.000$ ) between each individual factor within the component.

<b>Food Security Status</b>	<b>Urban, n(%)</b>	<b>Rural, n(%)</b>
0	19,083 (38)	29,040 (15)
1	17,605 (23)	31,246 (16)
2	10,826 (14)	33,450 (17)
3	27,786 (36)	96,235 (50)

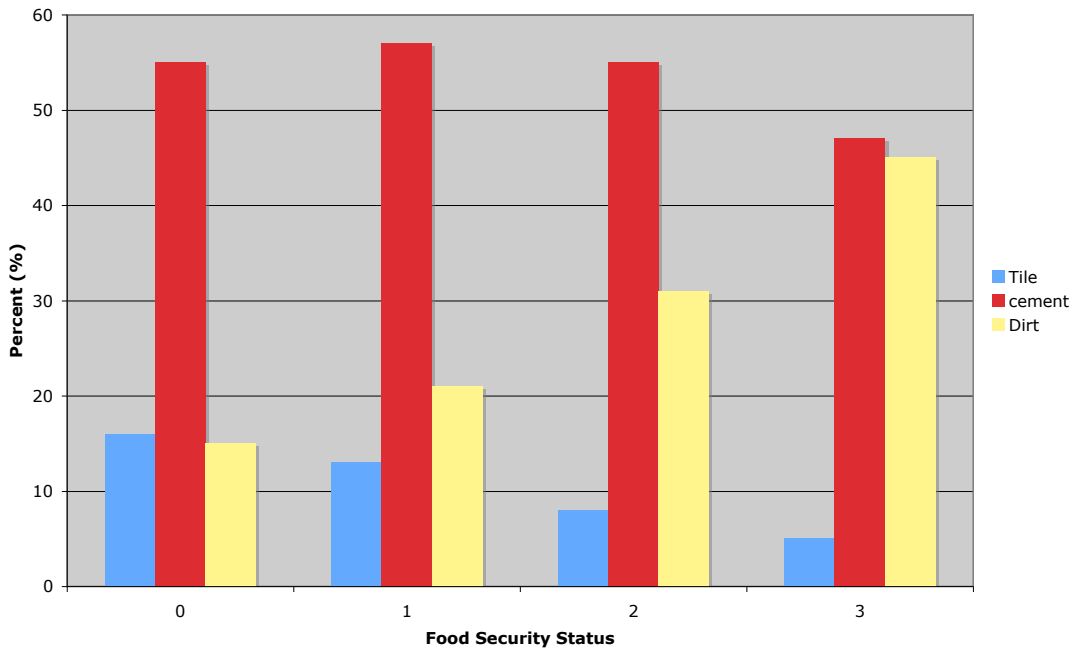
**Table 10** Food Security Status as compared to the location of the household. There is a significant difference between the food security status and the location of the household ( $p=0.000$ ).

**Food Security Status Versus House Exterior Materials**



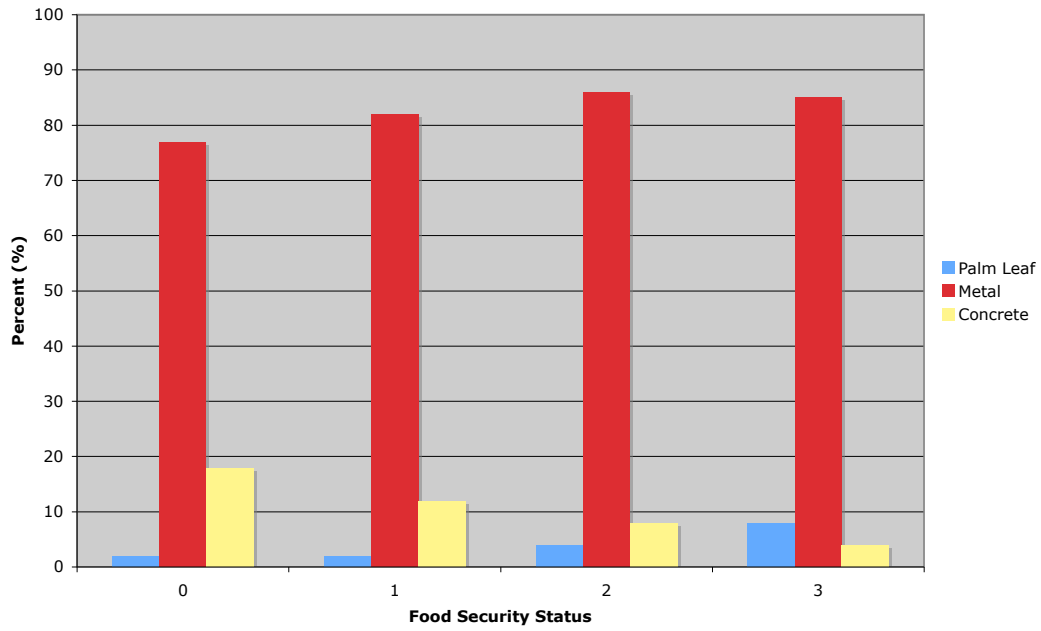
**Figure 1** The food security status determined by this study compared to the exterior material of the household. There was a significant difference found between the food security status and the exterior material of the household principal component ( $p=0.000$ ).

**Food Security Status Versus Floor Material**



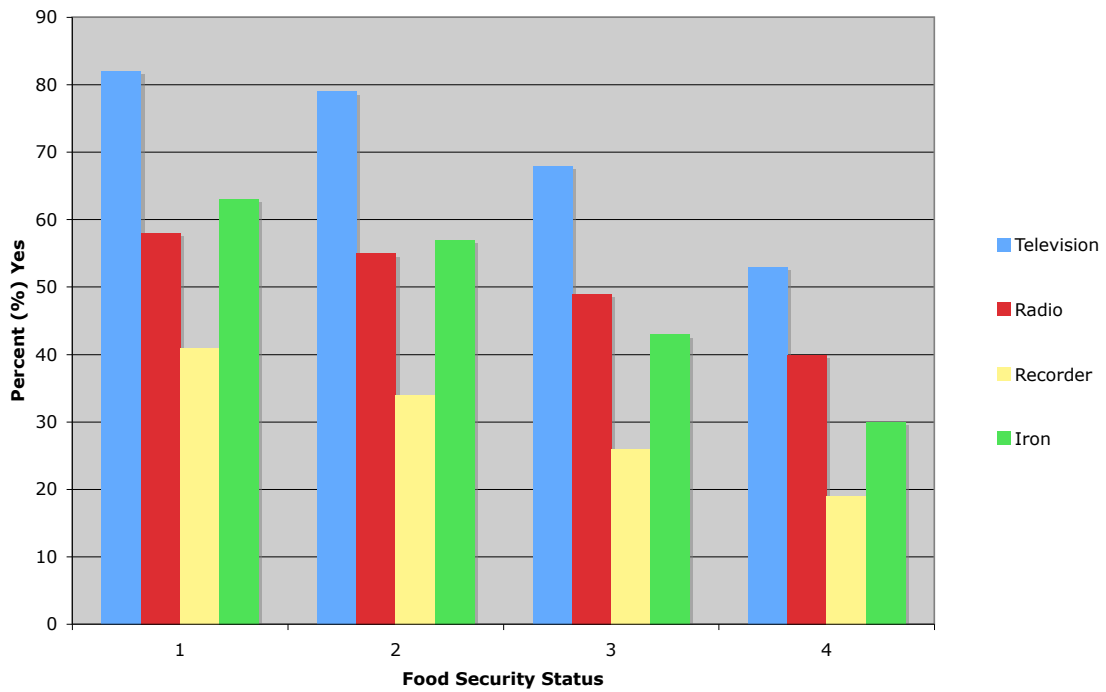
**Figure 2** Food Security Status compared to the material of the floor. A significant difference was found between the FSS and the principal component, “floor material.”

**Roof Material Versus Food Security Status**



**Figure 3** The FSS compared to the roof material of each household surveyed. A significant difference was determined between the FSS and principal component, ‘roof material” (P=0.000).

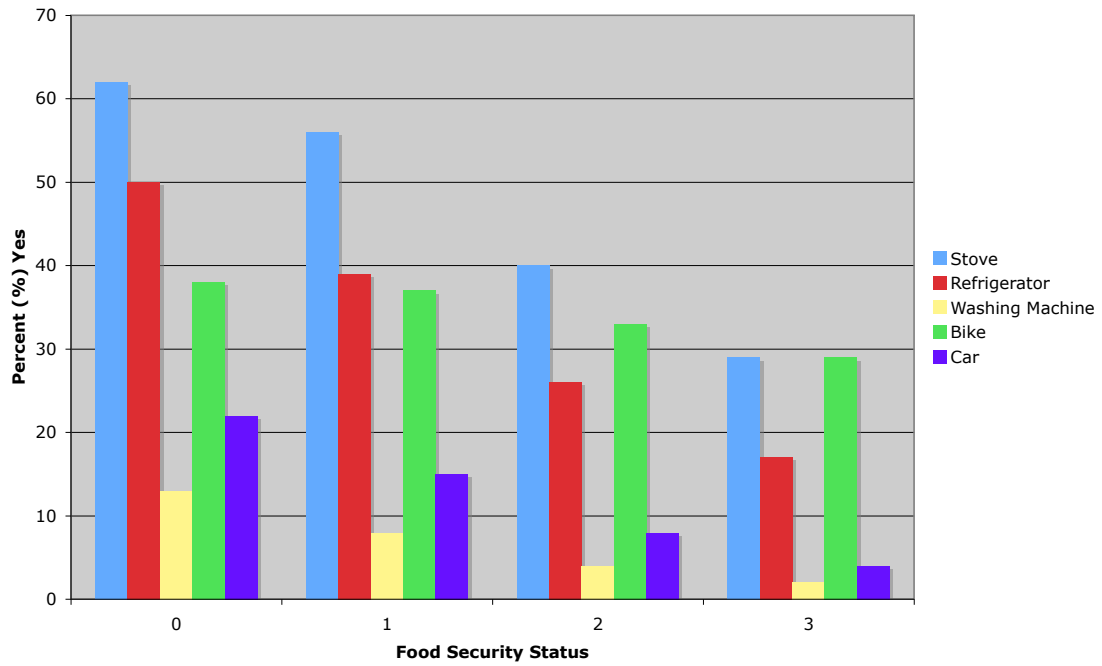
**Belongings Versus Food Security Status**



**Figure 4** The comparison of FSS to the possessions in the household. There was a significant difference found between the FSS and principal component, “belongings and vehicles (Figure 5)” (p=0.000).

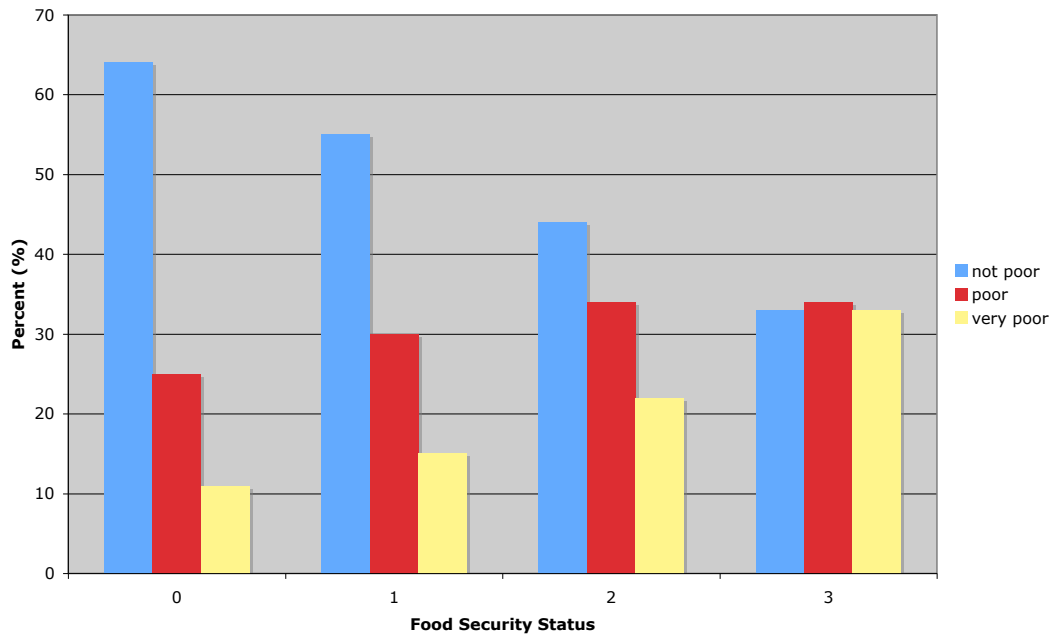


**Appliances/Vehicles Versus Food Security Status**



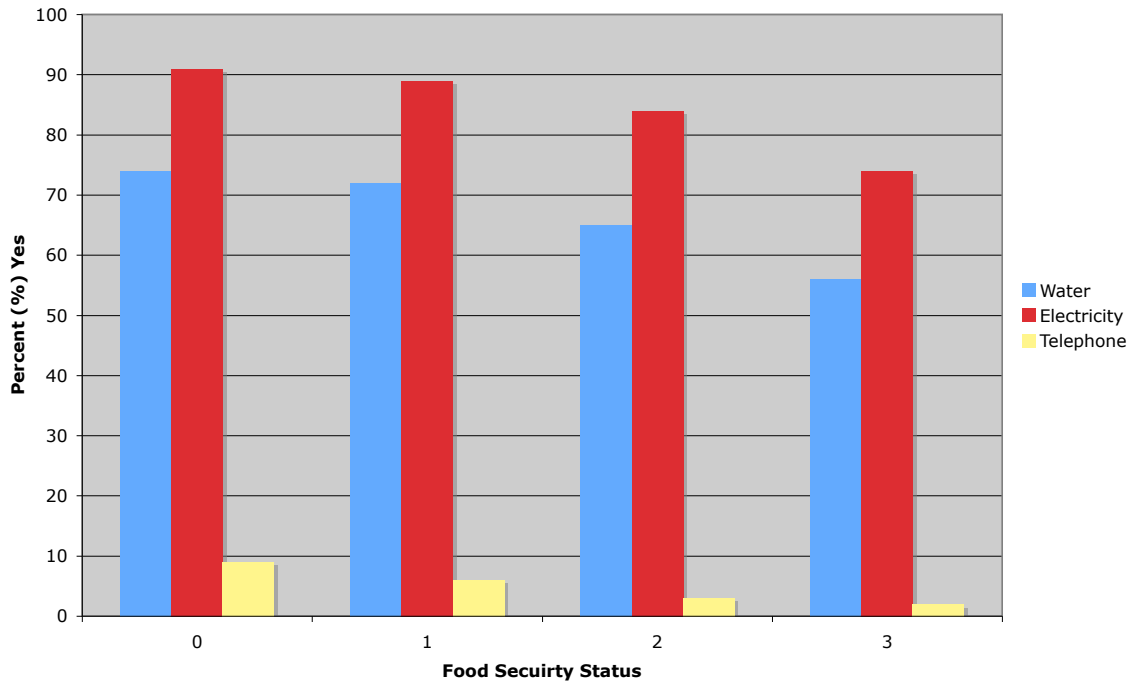
**Figure 5** The FSS compared to Appliances and Vehicles. A significant difference was determined between the FSS and the possession of Appliances and Vehicles ( $p=0.000$ ).

**Poverty Level Versus Food Security Status**



**Figure 6** The Food security status compared to the poverty level of the household, as classified by the Guatemala National Institute of Statistics.

### Access to Services Versus Food Security Status

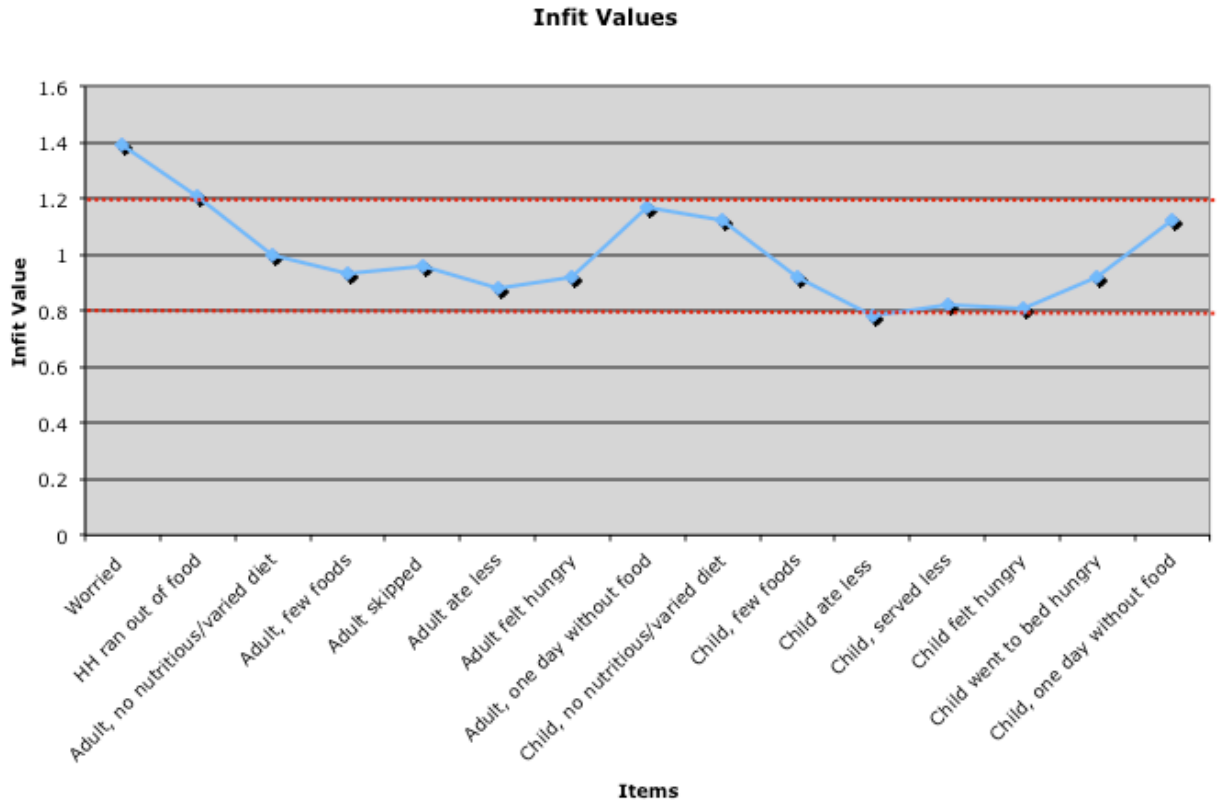


**Figure 7** Food security status compared to access to services (water, electricity, and telephone). A significant difference was found between the FSS generated and the principal component “Access to services” ( $p=0.000$ ).

### *Internal Validity*

Question Number	DIF Measure	DIF S.E.	Person/Class	DIF Measure	DIS S.E	DIF Contrast
1	-5.16	.03	2	-4.51	.02	-.66
2	-1.56	.02	2	-1.56	.01	.00
3	-0.15	.02	2	-.40	.01	.25
4	-1.15	.02	2	-1.01	.01	-.15
5	.77	.02	2	.80	.01	-.02
6	-.36	.02	2	-.18	.01	-.18
7	1.02	.02	2	1.18	.01	-.16
8	1.92	.02	2	2.12	.01	-.20
9	-.76	.02	2	-.96	.01	.20
10	-.54	.02	2	-.78	.01	.23
11	-.06	.02	2	-.28	.01	.22
12	-.10	.02	2	-.14	.01	.04
13	.89	.02	2	.74	.01	.14
14	2.18	.02	2	2.15	.01	.03
15	2.96	.03	2	2.96	.01	.00

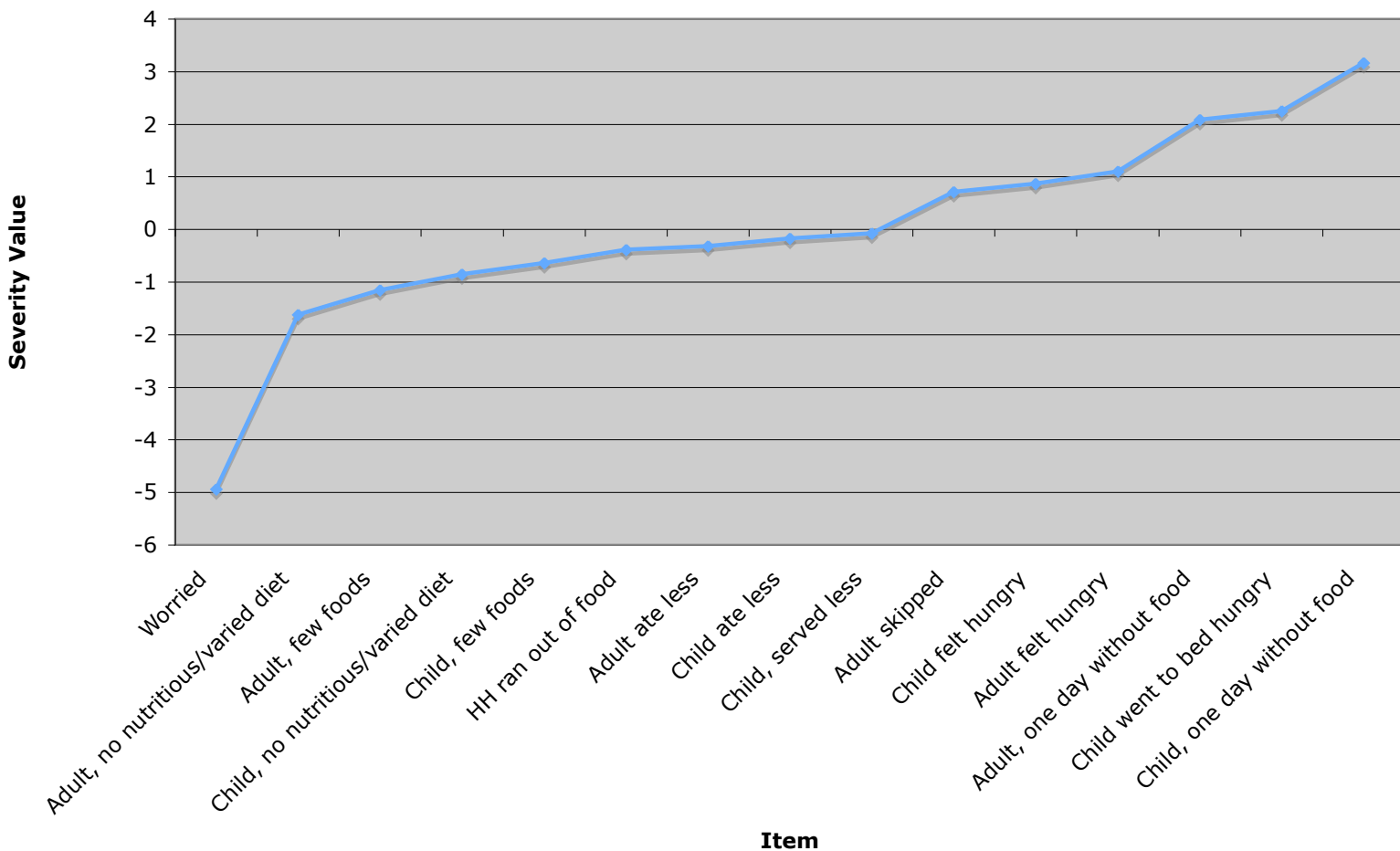
**Table 11** The DIF CONTRAST values run between the urban and rural settings of the households who responded to the survey.



**Figure 8** The infit values of each item of the ELCSA survey. What is considered the “good” range, 0.8-1.2, is highlighted.

Within the Rasch analysis, all but one item of the food security scale fell into what is considered a good range for reliability: 0.8-1.2, (adequate .6-1.4) as highlighted in Figure 18. The only item falling outside of this range was question one (infit value=1.39), a value that still is just outside of the 0.7-1.3 adequate range. These infit values support the internal validity of this tool, suggesting each item is an individual factor and that the respondent understood the survey and was able to correctly portray their household experience.

### Severity Values



**Figure 9** The Severity Values of each item in the Latin American and Caribbean Food Security Scale. Items arranged in order of increasing severity.

## **Discussion**

The purpose of this study was to assess the internal and criterion validity of the Latin America and Caribbean Food Security scale. With this data set, this scale will be part of a national living conditions survey.

With use of the Rasch model, all but one of the items fell within the recommended range of infit values (a value of 1 indicates perfect compliance with the framework), supporting the internal validity of the study. This indicated that the actual responses were very similar to the expected responses and interviewees generally understood the survey. The severity of the questions increased in a straight line, demonstrating what was hypothesized about the different levels of food insecurity, and confirms the correct order of questions increasing in severity within the questionnaire.

Question two is more severe than question one, representing a physical lack of food rather than a psychometric measure of food insecurity. Question two also indicates a more severe level of food insecurity than question three because it measures the quantity of the food, while question three measures the quality of the food. This confirms that the quality of the food first diminishes (and is less severe) before the quantity of the food is affected. The scale is designed this way so that it can be used in the future as a cut off point to identify food insecure households without having to interpret each item individually. Typically, when the quality or variety of the food begins to decrease, a household will move from a food secure status to a mildly food insecure household status.

Question five represents a higher level of food because it communicates that the adult not only skipped a meal, but it general reduced their portion size due to a lack of food. When households begin to decrease the serving size of their meal, or skip a meal entirely, their status increases to moderately food insecure. The severity then escalates toward the most severe question on the household questions: did the adult go a full day without food.

Question nine, asking about the *quality* of the diet of the child is less severe than decreasing *quantity* of the adult's intake. The severity values in the child portion of the survey continue to represent greater levels of insecurity ending with the most food insecure situation: *child going the entire day without food*. This is the most food insecure situation possible measured by the scale, for it is assumed that every measure has been taken to protect the child from the household food insecurity status. An affirmative answer to questions regarding feeling hunger or going a whole day without food classifies a household as severely food insecure. This pattern is consistent with the theory that first quality of adult food decreases, then quantity, followed by quality of child's food, and finally quantity of child's food.

Aside from one value on the DIF CONTRAST test, the differential item functioning results did not show a significant difference, ( $p < 0.5$ ) indicating there is no significant difference when applying this survey to an urban versus a rural setting. This function, along with the Rasch model results, further supports the internal validity of this study.

The statistically significant results of the 1-way ANOVA display the external validity of this tool. The correlation between the food security status and the other factors previously linked to food insecurity implies that this survey can be used to measure household food insecurity. With these results, one can see that a house with poorer house construction materials, less access to public services, fewer appliances or vehicles, a more severe poverty level, and a more crowded house strongly correlates to a more food insecure household. The trends were the same for every variable studied: as conditions within the household worsen, the food insecurity status increases. Food insecurity was also found to be more severe in rural settings and households with children.

It is important to recognize the general pattern of these indicators and understand the correlation the food security status has with each factor. However, these results do not mean the indicators are absolute- they do not *depend* on one another. For example, just

because a house is classified as very poor, does *not* mean it is necessarily food insecure. The household could have other means of obtaining food without a strong income. It is true for the reverse situation as well; just because a house is labeled non-poor, does not mean it too is automatically food secure. These households may have a steady income, but may chose to spend their money on other things besides food.

By verifying the validity of the Latin American and Caribbean food Security scale in Guatemala, the high-risk and at-risk food insecure populations can be targeted and assisted. Once these households or areas have been identified, the negative effects of food insecurity, such as vitamin and mineral deficiency or child growth stunting, can be measured using anthropometric measurements.

Interventions such as fortifying foods, performing nutrition education, or implementing self-sustaining agriculture programs can help alleviate the problem within the population. It is then necessary to monitor the intervention and reassess the problem, such as retaking anthropometric measurements, and determining the efficacy of the intervention. Governmental Agency, United States Agency of International Development (USAID), has demonstrated the importance of targeting at-risk populations and the immense amount of benefits that can result from interventions. USAID contributes around \$16 to \$18 million dollars a year to it's food assistance program in Guatemala, which improves the food security of nearly half a million poor Guatemalan families<sup>4</sup>. The money is split up to help ensure food security around the nation, with around one third of it being "monetized" for use within the markets and basic health care<sup>4</sup>. The money is also used to buy food commodities to distribute to families through community development programs.

With support from the criterion validity tests, these households can be targeted not only in Guatemala, but in other countries as well. For example, in 2003, a similar survey helped target food insecure households, and the Brazilian government implemented the national program, "Fome Zero (Zero Hunger)," to assist with food



insecurity on the federal, economical, and agricultural level<sup>24</sup>. The government essentially created a cycle that paid farmers for their foods produced, and in turn placed those local foods in public centers for consumption. This program increased income and food accessibility, while decreasing hunger and food insecurity in previously identified populations.<sup>24</sup> Programs similar to this one can help alleviate hunger and food insecurity around the world. It is critical first, however, to measure and identify the vulnerable populations in order to implement successful programs.

Limitations of this study include: non-standardized methodologies of the interviewers and lack of data from every county in the country of Guatemala. This survey is *one* indication of food insecurity; it is not the only or complete measure of food insecurity within a country.

### **Conclusion**

This study supported the validity of the *Latin American and Caribbean Food Security Scale* to measure food insecurity in Guatemala. This tool is cost efficient, simple to apply and evaluate, and can provide accurate indicators of household food insecurity. This tool can assist the World Food Summit and governmental agencies around the world to alleviate the detrimental phenomenon of food insecurity.

Based on these findings, the authors support the use of this tool in nationally representative surveys to portray the food insecurity phenomenon and to help policy makers target and more efficiently assist at-risk or high-risk populations in meeting their nutritional requirements for healthy and productive lives.

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## Appendix

### The Latin American And Caribbean Food Security Scale

1. During the last three months, were you worried that your household would run out of food because of lack of money or other resources to obtain food?
2. During the last three months, did your household run out of food because of lack of money or other resources to obtain food?
3. During the last three months, did your household lack of enough money or other resources to obtain a nutritious and varied diet?
4. During the last three months, did you or any adult in your household have to consume just one or two kinds of food because of lack of money or other resources to obtain food?
5. During the last three months, did you or any adult in your household not eat breakfast, lunch or dinner because of lack of money or other resources to obtain food?
6. During the last three months, did you or any adult in your household eat less than you thought you should because of lack of money or other resources to obtain food?
7. During the last three months, did you or any adult in your household feel hungry but couldn't eat because there was neither food nor any way to obtain it?
8. During the last three months, did you or any adult in your household go without eating for a whole day there was neither food nor any way to obtain it?
9. During the last three months, did any child in your household not receive a nutritious and varied diet because of lack of money or other resources to obtain food?
10. During the last three months, did any child in your household have to consume just a few types of food because of lack of money or other resources to obtain food?
11. During the last three months, any child in your household eat less than you thought they should because of lack of money or other resources to obtain food?
12. During the last three months, did you have to serve less food to any child in your household because of lack of money or other resources to obtain food?
13. During the last three months, any child in your household feel hungry but you could not get more food because of lack of money or other resources to obtain food?
14. During the last three months, any child in your household go to bed hungry because of lack of money or other resources to obtain food?
15. During the last three months, any child in your household go without eating for a whole day there was no food nor you had the possibility of obtain it?