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Assessing Food Security in Malaysia: A Guttman Scale Analysis

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Abstract

Food security is a pressing global issue, and accurate measurement is crucial for developing effective interventions. This study applies the Guttman scale, a widely used tool for measuring food insecurity, to assess food security in Malaysia. The Guttman scale is a hierarchical framework that captures the multidimensional aspects of food insecurity, including food availability, access, utilization, and stability. Using data from the Food and Agriculture Organization of the United Nations (FAO) from 2001 to 2021, this study constructs a food security scale based on three indicators: food availability per capita, food consumption per capita, and nutritional status. The results show that Malaysia does not experience severe food insecurity, but the country's growing population poses a significant threat to its food security. The study finds that Malaysia's food system provides adequate dietary energy to its population, and food access is no longer a significant concern for most Malaysians. However, the study highlights the importance of acknowledging the limitations of the Guttman scale and the need for future research to adopt mixed-methods approaches to provide a more comprehensive understanding of food insecurity. The findings of this study have implications for policymakers and practitioners seeking to improve food security in Malaysia and other countries.

Keywords: Guttman Scale, Food Security, Malaysia, Food Consumption, Food Availability

Introduction

Food security, a critical issue affecting global populations, is increasingly being measured using structured methodologies such as the Guttman scale. Developed by Louis Guttman in the mid-20th century, this scaling technique provides a hierarchical framework to quantify and understand the multidimensional aspects of food insecurity. It offers a systematic approach where respondents indicate their agreement or disagreement with a series of statements that progress from less severe to more severe manifestations of food insecurity. The Guttman scale has gained recognition for its ability to capture the complexity of food security by assessing various dimensions such as food availability, access, utilization, and

stability in a coherent and cumulative manner. This structured approach not only facilitates quantitative measurement but also allows for nuanced insights into the differential experiences of food insecurity among populations.

According to research by Barrett et al. (2010), the Guttman scale has been successfully applied in diverse settings to measure food security levels, demonstrating its utility in identifying vulnerable groups and evaluating the effectiveness of interventions. Despite its strengths, however, the scale's implementation requires careful consideration of contextual factors and rigorous validation to ensure its reliability and validity across different cultural, socioeconomic, and geographical contexts. Therefore, leveraging the Guttman scale in measuring food security holds promise for advancing our understanding of this complex issue and informing targeted strategies to improve food access and nutrition outcomes globally. Thus this paper utilized the concept of Guttman scale in order to investigate the condition on food security in Malaysia.

Additionally, this study aimed to investigate the application of the Guttman scale in measuring food security in Malaysia, with a focus on its ability to capture the multidimensional aspects of food insecurity. Also, this study intended to assess the reliability and validity of the Guttman scale in the Malaysian context, considering cultural, socioeconomic, and geographical factors. Therefore, this study contributes to the advancement of food security research by exploring the applicability of the Guttman scale in a Southeast Asian context, specifically in Malaysia and provide valuable insights into the prevalence and patterns of food insecurity in Malaysia, informing policy and programmatic interventions to address this critical issue. Finally, the study's outcomes will have implications for the development of evidence-based strategies to improve food security and nutrition outcomes in Malaysia, ultimately contributing to the achievement of the United Nations' Sustainable Development Goal 2 (Zero Hunger).

Literature Review

Food insecurity, a pressing global issue, affects millions of individuals and households worldwide. The ability to measure food insecurity accurately is crucial for policymakers, researchers, and practitioners to develop effective interventions and programs to address this complex problem. One widely used tool for measuring food insecurity is the Guttman scale, a method that has been employed in various studies over the past few decades. The Guttman scale, also known as the Household Food Security Scale (HFSS), was first developed in the 1990s by the United States Department of Agriculture (USDA, 1995). The scale is based on a series of questions that assess the severity of food insecurity experienced by households. The questions are designed to capture the frequency and severity of food insecurity, ranging from mild to severe, and are typically administered through surveys or interviews. Another study by Nord and Andrews (2002) in the United States, they used the Guttman scale to assess food insecurity among low-income households and found that 14.5% of households experienced food insecurity. In addition, study by Webb and Coates (2013) in sub-Saharan Africa used the Guttman scale to measure food insecurity found that 60% of rural households experienced moderate to severe food insecurity.

The Guttman scale has also been used to examine the relationship between food insecurity and various health outcomes. A study in Canada found that food insecurity, as measured by the Guttman scale, was associated with poor mental and physical health outcomes among

adults Tarasuk and Vogt (2009). Similarly, a study in the United States found that food insecurity, as measured by the Guttman scale, was associated with poor health outcomes among children Alaimo et al. (2001).

In Asia, Guttman scale approach has been employed to assess food insecurity among urban slum dwellers (Rah et al., 2015). The Guttman scale has also been used to measure food insecurity among vulnerable populations, such as refugees (Hadley et al., 2017) and individuals with chronic illnesses (Seligman et al., 2010). However, researchers have also highlighted the need for cultural adaptation of the scale, as well as its limitations, including subjective reporting and lack of contextualization (Gundersen and Ziliak, 2015; Maxwell, 1996). Despite these limitations, the Guttman scale remains a widely used and valuable tool for measuring food insecurity, with studies demonstrating its validity and reliability (Coates et al., 2007). Overall, the literature suggests that the Guttman scale is a useful instrument for assessing food insecurity, but its application should be considered in conjunction with other measures and approaches to capture the complex and multifaceted nature of food insecurity. Other approaches to measuring food insecurity include the use of anthropometric measures, such as body mass index (BMI) and mid-upper arm circumference (MUAC) (Frongillo et al., 1997). Studies have also employed qualitative methods, such as focus groups and interviews, to capture the experiences of food insecurity (Hadley et al., 2017). Despite the various approaches to measuring food insecurity, limitations and critiques exist. Subjective reporting bias is a concern, as individuals may underreport or overreport food insecurity (Gundersen and Ziliak, 2015). Additionally, measures of food insecurity may not capture the complexity and nuances of food insecurity experiences, particularly in diverse cultural and socioeconomic contexts (Maxwell, 1996).

Methodology

Building upon the established indicators of food security, a comprehensive scale can be developed to quantify this complex phenomenon. One approach is to employ a Guttman scale, a statistical tool specifically designed for hierarchical variables (Lemtouni, 1998). In the context of food security, the hierarchical structure of the Guttman scale can be constructed as follows (following Aker and Lemtouni, 1999):

Food availability per capita
****
Food consumption per capita
****
Nutritional status

While the components of food security, including availability, access, stability, and utilization, are complex and challenging to quantify, it is possible to develop a food security scale using approximate indicators at the national level. This scale can then be integrated into an empirical model. Three primary indicators are proposed to capture the essence of food security: food availability per capita, food consumption per capita, and nutritional status.

Food Availability per Capita (FA)

Food availability per capita serves as a proxy for the availability and stability components of food security, expressed in calories per day per person. This indicator reflects the total amount of calories available to a population, encompassing domestic production, imports,

stockpiles, and food aid. At the aggregate level, it represents the overall food supply available to a population from both domestic and international markets.

Food Consumption per Capita (FC)

Food consumption per capita, also expressed in calories per day per person, proxies the access component of food security. This indicator measures the average caloric intake of a country's population, distinguishing it from food availability by capturing actual access to food supplies, whether through own production or purchases. While food consumption per capita is an average, it provides an aggregate indication of a country's internal market's ability to distribute food among its population. However, it is essential to acknowledge that this indicator may mask significant disparities in food consumption.

Nutritional Status (NS)

Nutritional status serves as a proxy for food utilization, capturing the ultimate goal of food security: the provision of adequate nutrition for a healthy and productive life. At the aggregate level, nutritional status can be measured through various indicators, such as the prevalence of undernutrition, stunting, or micronutrient deficiencies. nutritional status can be measured by the prevalence of malnutrition among children under the age of 5, a vulnerable population segment whose nutritional status is particularly sensitive to changes in food consumption and dietary adequacy. The prevalence of malnutrition in this age group is often used as a proxy for the overall nutritional status of a population. Nutritional status is a multifaceted indicator, offering valuable information on both the quality of food consumed, beyond mere caloric intake, and the distribution of food consumption within a population. These indicators provide a comprehensive picture of a population's nutritional well-being, reflecting the effectiveness of food utilization in meeting nutritional needs.

Constructing the Food Security Scale

The hierarchical relationship between food availability, food consumption, and nutritional status is evident, with each component building upon the previous one. To develop an empirical scale, the indicators are arranged in a matrix form, with each indicator assigned a value of 0 or 1, indicating whether a specific criterion has been met or not. The Food and Agriculture Organization's (FAO) guideline of 2,200 calories per day is proposed as the criterion for food availability per capita. Therefore, FA = 1 if food availability per capita exceeds 2,200 calories per day, and FA = 0 if it falls below this threshold. The same criterion of 2,200 calories per day is applied to food consumption per capita, given the hierarchical nature of the indicators. FC = 1 if food consumption per capita exceeds 2,200 calories per day, and FC = 0 if it falls below this threshold. Estimates of child malnutrition by UNICEF using the percentage in regional prevalence is used as a guideline. If the percentage falls into very high and high categories (≥ 20%), then NS = 0. If the percentage is less than 20%, then NS = 1. With the indicators and their corresponding values established, a food security matrix can be constructed, as shown below:

Table 1
Construction of Guttman Scale

FA	FC	NS	Food Security
0	0	0	0 (Severe Food Insecurity)
1	0	0	1 (Moderate Food Insecurity)
1	1	0	2 (Mild Food Insecurity)
1	1	1	3 (Food Security)

Source: Aker and Lemtouni (1999)

The food security matrix yields a variable with values ranging from 0 to 3, corresponding to distinct levels of food security. A value of 0 indicates a state of severe food insecurity, where food availability falls short of meeting caloric requirements (FA = 0). Consequently, neither food consumption nor nutritional needs can be fulfilled, resulting in a critical food security situation. A value of 1 represents a state of moderate food insecurity. In this scenario, food availability meets caloric requirements (FA = 1), but fails to translate into adequate food consumption (FC = 0) or nutritional status (NS = 0). A value of 2 indicates mild food insecurity, where both food availability and consumption meet caloric requirements, but nutritional status remains inadequate (NS = 0). This may be attributed to factors such as poor diet quality, unequal distribution of food consumption, or a suboptimal health environment, which are not necessarily food security issues per se, but rather related to broader factors influencing nutritional status. A value of 3 represents complete food security, where all criteria for food availability, food consumption, and nutritional status have been met, ensuring that the population's food needs are fully satisfied. Data were drawn from Food and Agriculture Organization of the United Nations (FAO), available from year 2001 until 2021.

Result and Discussion

The constructed of Guttman scale was based on the three main elements given above which is summarized in the Table 2 below:

Table 2
Constructed of Guttman Scale (Malaysia) for Food Security, 2002-2021

Year	FA	FC	NS	Food Security
2001	0	1	0	1 (Moderate Food Insecurity)
2002	1	1	0	2 (Mild Food Insecurity)
2003	1	1	0	2 (Mild Food Insecurity)
2004	1	1	0	2 (Mild Food Insecurity)
2005	1	1	0	2 (Mild Food Insecurity)
2006	1	1	0	2 (Mild Food Insecurity)
2007	1	1	0	2 (Mild Food Insecurity)
2008	1	1	0	1 (Moderate Food Insecurity
2009	1	0	0	1 (Moderate Food Insecurity
2010	1	0	0	1 (Moderate Food Insecurity
2011	1	0	0	1 (Moderate Food Insecurity
2012	1	0	0	1 (Moderate Food Insecurity
2013	1	0	0	1 (Moderate Food Insecurity
2014	1	0	0	1 (Moderate Food Insecurity
2015	1	0	0	1 (Moderate Food Insecurity
2016	1	0	0	1 (Moderate Food Insecurity
2017	1	0	1	2 (Mild Food Insecurity)
2018	1	0	1	2 (Mild Food Insecurity)
2019	1	0	1	2 (Mild Food Insecurity)
2020	0	1	1	2 (Mild Food Insecurity)
2021	1	1	1	3 (Food Security)

As indicated in Table 2, Malaysia does not experience severe food insecurity throughout the years. However, the country's growing population poses a significant threat to its food security. While Malaysia is self-sufficient in certain food commodities like poultry meat, pork, fisheries, and eggs, it still relies heavily on imports for others, such as rice, fruits, dairy milk, and beef. Despite this, the country's food system provides adequate dietary energy to its population, as reflected in the daily per capita dietary energy supply. Furthermore, food access is no longer a significant concern for most Malaysians, thanks to improved processing, transportation, storage, and distribution systems for major food items. To enhance the performance of its agro-food sector, Malaysia has implemented various programs under the National Agro-Food Policy (2011-2020), focusing on optimizing land development, upgrading agricultural infrastructure, and improving food quality and safety standards. These efforts have contributed to achieving food security in 2021, with significant improvements in food supplies and production. However, it is essential to acknowledge the limitations of the Guttman scale, a widely used tool for measuring food insecurity, which relies on self-reported data and may not capture the complexity of food insecurity experiences in diverse cultural and socioeconomic contexts. Future research should consider adopting mixed-methods approaches, combining quantitative and qualitative data, to provide a more comprehensive understanding of food insecurity.

Conclusion

In conclusion, this study has demonstrated the application of the Guttman scale in measuring food security in Malaysia. The results indicate that Malaysia has made significant progress in achieving food security, with improvements in food availability, access, and utilization. The country's food system has been able to provide adequate dietary energy to its population, and food access is no longer a significant concern for most Malaysians. However, the study also highlights the importance of acknowledging the limitations of the Guttman scale, which relies on self-reported data and may not capture the complexity of food insecurity experiences in diverse cultural and socioeconomic contexts.

The findings of this study have important implications for policymakers and stakeholders in Malaysia. The results suggest that the country's efforts to enhance the performance of its agro-food sector, such as optimizing land development, upgrading agricultural infrastructure, and improving food quality and safety standards, have contributed to achieving food security. However, it is essential to continue monitoring and evaluating the country's food security situation to ensure that the progress made is sustained and that the needs of vulnerable populations are addressed. Furthermore, the study highlights the need for future research to adopt mixed-methods approaches, combining quantitative and qualitative data, to provide a more comprehensive understanding of food insecurity. This will enable policymakers and stakeholders to develop targeted interventions that address the root causes of food insecurity and improve the overall well-being of the population. In addition, the study's findings have implications for the global community, as they demonstrate the importance of using a multidimensional approach to measure food security. The Guttman scale, which captures the hierarchical relationship between food availability, access, and utilization, provides a more nuanced understanding of food security than traditional measures that focus solely on food availability or access. This approach can be applied in other countries to provide a more comprehensive understanding of food security and to develop targeted interventions to address food insecurity.

Overall, this study contributes to the growing body of literature on food security and highlights the importance of using a multidimensional approach to measure food security. The findings have important implications for policymakers and stakeholders in Malaysia and globally, and demonstrate the need for continued research and evaluation to ensure that the needs of vulnerable populations are addressed.

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