Prevelance of Food Insecurity In Botswana 2021/22

STATISTICS BOTSWANA

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PREVELANCE OF FOOD INSECURITY IN BOTSWANA 2021/22

Statistics Botswana conducts the Quarterly Multi-Topic Survey (QMTS) mainly to produce labour force indicators. One of the modules included in the QMTS on rotational basis is the Food Insecurity Experience Scale (FIES), to estimate the prevalence of moderate or severe food insecurity in the population.

PREFACE

Statistics Botswana conducts the Quarterly Multi-Topic Survey (QMTS) mainly to produce labour force indicators. Other modules are included on a rotational basis or as per stakeholders' needs, and also to fill indicator gaps for developmental frameworks (Vision 2036, National Development Plans, and Sustainable Development Goals (SDGs)).

One of the modules included in the QMTS on rotational basis is the Food Insecurity Experience Scale (FIES), to estimate the prevalence of moderate or severe food insecurity in the population. This Statistical brief presents results from the analysis of the FIES data collected in the QMTS during the fourth quarter (October to December) of the year 2021 and the year 2022.

The results showed that the percentage of persons who experienced moderate or severe food insecurity (SDG indicator 2.1.2) increased to 53.29 percent nationally in 2021/22, from 51.06 percent estimated for 2020/21 and 50.8 percent in 2018/19; whereas the percentage of the population that experienced severe food insecurity increased to 26.16 percent in 2021/22 from 20.16 percent in 2020/21 and 22.20 percent in 2018/19, respectively.

I wish to thank the Food and Agriculture Organization (FAO) of the United Nations, for training Statistics Botswana in the technical analysis of FIES data to produce the Sustainable Development Goal (SDG) 2.1.2 Indicator, "Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale".

Finally, I would like to thank the respondents who provided invaluable information for the survey, and all the other stakeholders who contributed to the success of the survey.

Dr. Burton Mguni
Statistician General
May 2023

1.0 Introduction

Botswana was among the 193 United Nations Member States that endorsed the 2030 Agenda for Sustainable Development. To show commitment and ensure success in implementing Agenda 2030, Botswana developed a National Framework for Sustainable Development (NFSD) and the Botswana SDGs Roadmap.

The second of the 17 SDGs, Goal 2 aims to end hunger, achieve food security and improve nutrition and promote sustainable agriculture. To achieve the goal, several targets have been set, the first one being Target 2.1: To end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round, By 2030. Several indicators are used to monitor progress on each target. Target 2.1 is monitored through two (2) Indicators, Indicator 2.1.1 that measures "Prevalence of Undernourishment" and Indicator 2.1.2: that measures "Prevalence of moderate or severe food insecurity in the population", based on the Food Insecurity Experience Scale.

The Food Insecurity Experience Scale (FIES) measures the severity of food insecurity experienced by households or individuals using using eight questions on households or individuals experiences regarding access to food. The questions are answered directly with a yes/no response. The responses are analysed to produce internationally comparable estimates of the proportion of the population facing moderate to severe difficulties in accessing food.

According to the FIES (household module), with increasing severity, there is possibility of households experiencing reduced quantity of food consumed as portion sizes are reduced, households eat less and meals are skipped. At its most severe level, households can go without eating for a day or more, with some households experiencing hunger. The scale further reveals that the household's experience of food insecurity may be characterized by uncertainty and anxiety regarding food access and compromising the quality of the diet and having a less balanced and more monotonous diet.

Statistics Botswana (SB) in its mandate to produce official statistics, conducts relevant surveys and produces indicators to enhance achievement of national priorities through informed policy formulation and programming in Government and other key agencies. To achieve the aforementioned, in 2019 SB started collecting data on FIES and produced the SDG Indicator 2.1.2: Prevalence of moderate and severe food insecurity for 2018/19. Subsequent to the 2019 survey, FIES data was also collected in quarter 4 of 2021 and 2022.

2.0 Summary of Results

The survey data was analysed using the Rasch model based on its suitability for generating a reliable measure of food insecurity. It quantifies the percentage of variation in the data that can be accounted for by the model. After testing adherence to the Rasch model's assumptions for the FIES data, it was found that the data met the quality standards necessary for accurately estimating the prevalence of food insecurity in Botswana. In the case of an eight-item FIES scale, the Rasch reliability score of 70 percent or higher is deemed satisfactory. The Rasch reliability score for the 2022 Botswana FIES data was acceptable at 75 percent.

This section gives a summary of results pertaining to two globally-comparable indicators of prevalence of food insecurity, at the, Moderate or Severe and the Severe levels.

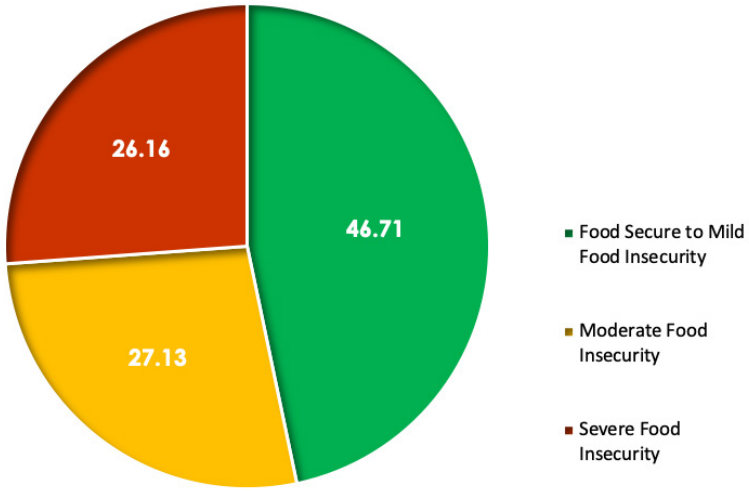
Moderate or severe Food insecurity occurs when a person or household has limited or uncertain access to sufficient and healthy food because of financial limitations or other constraints. As a result of financial or other constraints, people may have to compromise on the quality and quantity of their diets, but they do not necessarily suffer from extreme hunger or starvation.

The results in figure 1 show that at national level 53.29 percent of the population in Botswana was affected by moderate or severe food insecurity in 2021/22 (SDG Indicator 2.1.2), out of which 27.13 percentage were affected by moderate food insecurity and 26.16 percent were affected by severe food insecurity. This translates to about 46.71 percent of the population being food secure to mildly food insecure.

2.1 National Food Insecurity Prevelance 2021/2022

The results in figure 1 show that at national level 53.29 percent of the population in Botswana was affected by moderate or severe food insecurity in 2021/22, and 26.16 percent was affected by severe food insecurity. This translates to about 46.71 percent of the population being food secure to mildly food insecure.

Figure 1: National Food Insecurity Prevalence (Percentage)



2.2 Comparison between FIES 2018/19, 2020/21 and 2021/22

According to table 1 and figure 2, the percentage of persons who experienced moderate or severe food insecurity increased to 53.29 percent nationally in 2021/22 from 51.06 percent in 2020/21 and 50.8 percent in 2018/19.

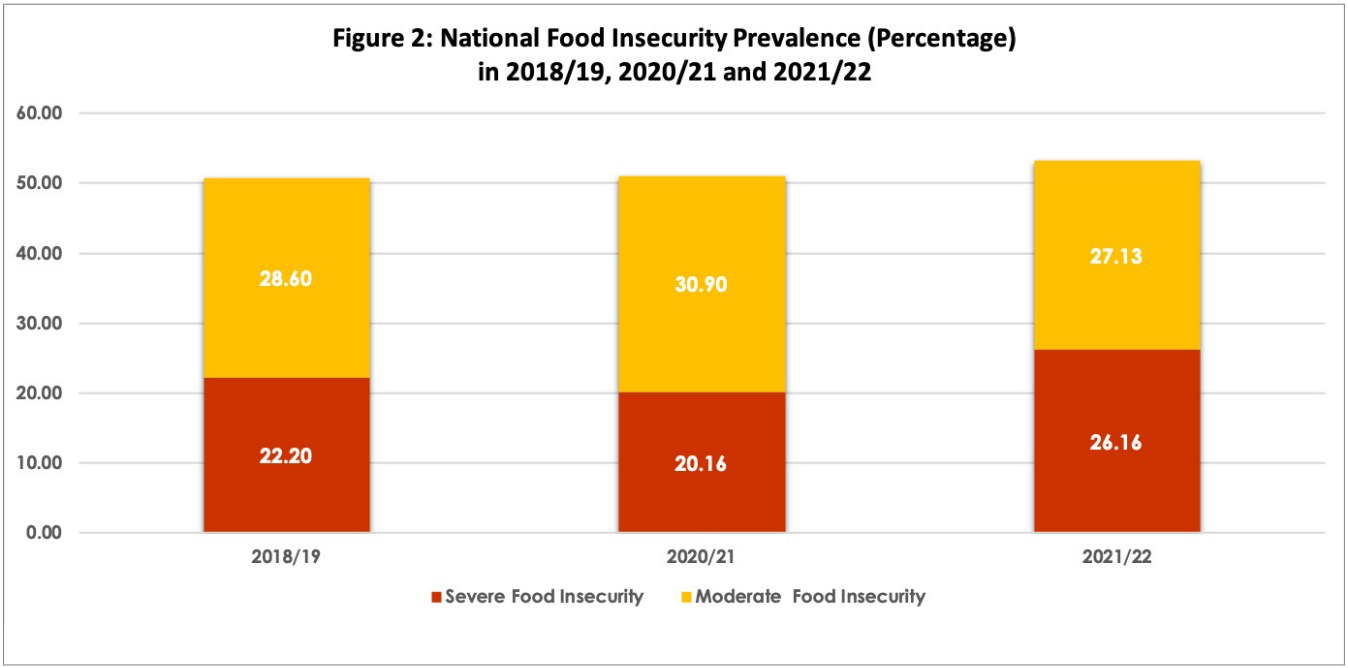
Those who experienced moderate food insecurity increased from 28.60 percent in 2018/19 to 30.90 in 2020/21 and further reduced to 27.13 in 2021/22. The percentage who experienced severe food insecurity increased to 26.16 percent in 2021/22 from 20.16 percent in 2020/21 and 22.20 percent in 2018/19.

The results further show a rise in moderate or severe food insecurity in cities/towns from 31.70 percent in 2018/19 to 31.90 in 2020/21 and 34.94 percent in 2021/22. A similar pattern is observed in urban villages showing an increase from 46.60 percent in 2018/19 to 46.81 percent in 2020/21 and 53.21 percent in 2021/22. In contrary, rural areas experienced a decline from 65.68 percent in 2020/21 to 64.35 percent in 2021/22.

Moderate food insecurity in rural areas increase from 32.40 percent in 2018/19 to 34.34 percent in 2020/21 and thereafter reduced to 30.86 in 2021/22. With regard to severe food insecurity, there was a reduction from 33.10 percent in 2018/19 to 31.34 percent in 2020/21 and thereafter increased to 33.49 percent in 2021/22.

Table 1: Prevalence rates of food insecurity by Strata between 2019, 2021 and 2022

	2018/19			2020/21			2021/22		
	Moderate or Severe	Moderate	Severe	Moderate or Severe	Moderate	Severe	Moderate or Severe	Moderate	Severe
Cities/ towns	31.70	19.80	11.90	31.90	20.75	11.15	34.94	17.30	17.64
Rural areas	65.50	32.40	33.10	65.68	34.34	31.34	64.35	30.86	33.49
Urban villages	46.60	29.10	17.50	46.81	30.46	16.35	53.21	28.40	24.81
National	**50.80**	**28.60**	**22.20**	**51.06**	**30.90**	**20.16**	**53.29**	**27.13**	**26.16**



3.0 Conclusion

After the release of the 2018/19 FIES statistical brief, Statistics Botswana planned to include the FIES module in the QMTS on an annual basis. However, It was not possible to collect data in 2020 for the 2019/20 period due to COVID-19 and lack of funding and thereafter was included in the quarter 4 of 2021 and 2022 as reflected in this statistical brief. The FIES module will be included in the QMTS annually going forward to meet the food insecurity SDGs indicator needs.

It is hoped that stakeholders support the continued data collection and computation of the indicators to timeously track progress in Target 2.1: To end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round, By 2030.

Annexure 1: FIES Methodological Conceptualisation

The FIES Measure

Experience-based food security measurement is a comprehensive and context-specific approach that focuses on capturing the experiences of individuals regarding their perceived food security status. The method assesses food security at the household or individual level. Unlike the Food Insecurity Experience Scale, other food security measures rely on external indicators such as household income, food prices, and production levels and they do not capture the lived experiences of individuals who may have different needs and priorities when it comes to accessing and consuming food.

The FIES methodology measures access to food over a specific period, in this case 12 months. It is composed of eight questions (items), which cover different aspects of food insecurity. The respondents are asked about their experiences of food insecurity, such as uncertainty about food availability, insufficient quantity or quality of food, and skipping meals or going a Wholeday without eating because of lack of resources. The FAO has designed and standardised the tool to be used in different countries and contexts and it has been tried and tested in several countries hence considered globally valid.

Key Concepts

The fundamental principle of experience-based food insecurity scales is that both the questions (items) and the people (individuals or households) being surveyed are measured on the same underlying continuum. Although the data in the FIES module is expressed using a binary format with responses given as either “yes” or “no”, food insecurity cannot be simply categorised as a “yes/no” proposition but rather, it manifests in varying degrees of intensity along a spectrum. This means that the questions used in the scale are designed to measure food insecurity experiences on a common scale or metric. This common metric allows for the calculation of a food insecurity score that can be used to classify individuals or households into categories of food insecurity, such as mild, moderate, or severe **(figure 3)**. By positioning both the questions and respondents on the same underlying scale ensures that the questions are measuring the same construct and that responses are comparable. This is essential for generating accurate and reliable data on food security levels generating meaningful and actionable data on food insecurity.

Figure 3: Food Insecurity along a Spectrum of Severity

The Rasch model is used to compute food insecurity levels. It works by estimating the probability of a person giving a particular response to a question based on their level of the underlying traits being measured. The model accounts for variations in the difficulty of the questions and the ability of the respondents, and uses the estimates to create a scale that represents the level of food insecurity experienced by each individual.

The severity of food insecurity is typically measured by the number of affirmative responses to these questions. There is a positive relationship between the severity of a respondent’s food insecurity status and the probability that they will respond affirmatively to a question related to food insecurity **(see Box 1)**.

Box 1: The likelihood of the i-th respondent answering "Yes" to the j-th question in a sample can be modeled by the logistic function, where the probability of a positive response is given by:

$$Prob(X_{i,j} = \text{Yes}) = \frac{\exp(a_i - b_j)}{1+\exp(a_i - b_j)}\ ,\ \forall\ i, j,$$

where a_i and b_j represent, respectively, the position of the respondent and of the item on a one-dimensional scale of severity.

Annexure 2: Survey Design

Coverage

The survey was designed to ensure the appropriate level of precision required for both national and subnational estimates to enhance policy decisions. Since this is a household survey, only private dwellings were covered and Institutional dwellings such as prisons, hospitals, army barracks and hotels were not covered. The coverage was at national level guided by census districts (district and sub-districts) that Statistics Botswana normally follows in the selection of survey units.

Survey Sampling

The design followed a two-stage sampling technique with probability proportional to size (PPS). The first stage involved sampling of primary sampling units (PSUs), Enumeration Areas (EAs) and sampling of households with systematic sampling in the second stage. The sampling procedure yielded a sample size of 312 EAs resulting in 3,744 households. These were selected with Probability Proportional to Size (PPS) method where Measure of size (MOS) is the number of households as enumerated from the 2022 Population & Housing Census.

Data Collection

The QMTS data was collected through an electronic questionnaire using the Computer Assisted Personal Interviews (CAPI) system. The FIES module, however, was part of the modules which are included in the survey on a rotational basis. Both the 4 weeks and a 12-month reference (recall) period were used to collect data on food insecurity in Botswana and this statistical brief only reports the 12-month reference period. A 12-month reference (recall) period was used to account for potential seasonal differences in food insecurity across the year.

ANNEXURE 3: Statistical Validation

Estimated Severerity Paramaters

As shown in Table 2 below the severity of items and respondents is determined by their estimated parameters on a scale which includes the mean severity level, and the standard error associated with each item. Item parameters are derived from the overall pattern of responses given by all respondents, rather than from the responses of individual respondents.

- **An item that represents a less severe food insecurity experience will have a smaller parameter value assigned to it on the severity scale, while an item that represents a more severe food insecurity experience will have a larger parameter value assigned to it.**

The concept of relative severity is expressed by noting that it is based on the recognition that respondents are **"less likely to report more severe food insecurity experiences"**. For example, Table 2 below shows that item "Wholeday" has the highest severity, meaning that, of all items, it received the least number of "yes" responses.

Table 2: Estimated severity parameters for the FIES items

ITEMS	Severity	S.E.	Infit	S.E.Infit	Outfit
Worried	-1.66	0.07	1.27	0.04	1.97
Healthy	-1.74	0.07	1.11	0.04	2.05
Fewfood	**-1.51**	**0.07**	**0.9**	**0.04**	**1.35**
Skipped	0.01	0.07	0.93	0.04	0.99
Ate Less	-0.13	0.07	0.85	0.03	0.91
Run Out	**0.75**	**0.07**	**0.85**	**0.04**	**0.76**
Hungry	1.45	0.07	0.76	0.04	0.62
Wholeday	2.83	0.09	1.07	0.06	1.39

The results further indicate that all the items included in the analysis have acceptable infit statistics, ranging from 0.7 to 1.3. Infit statistics evaluates the quality of individual items on a severity scale, and values between 0.7 and 1.3 indicate that the items are performing well and contributing meaningfully to the overall assessment of food insecurity. The outfit statistics for all the items in the analysis are below 3, suggesting that items are accurately measuring the severity of food insecurity experiences and are appropriate for use in evaluating food insecurity. The standard errors also are relatively small which reflects a good sample size.

Table 3 shows the estimated severity parameters for each raw score. The raw score indicates the sum of "yes" responses given to the eight FIES questions. The raw score provides an indication of the level of food insecurity experienced by an individual or household. **However,** parameters of the respondents enable a more accurate assessment of the relative disparity in food insecurity across the scale, among respondents with different raw scores.

Table 3: Estimated severity parameters for each raw score

Raw Score	Severity	Error
0	-3.48	1.51
1	-2.64	1.14
2	**-1.62**	**0.93**
3	-0.84	0.87
4	-0.08	0.86
5	**0.69**	**0.9**
6	1.57	0.99
7	2.76	1.23
8	4.31	1.51

Probability of food insecurity

Table 4 reflects the probability of moderate or severe and severe food insecurity for each of the nine possible raw scores. The table also shows that after adjustment of the global standard to the national metric for Botswana, thresholds for moderate or severe, and severe food insecurity are -0.29 and 2.91 respectively. If the probability of moderate or severe food insecurity is high for a particular raw score, it means that individuals or households with that raw score are more likely to experience food insecurity at moderate or severe levels. For example, given a raw score of 8 with a severity parameter of 4.3, with a moderate or severe threshold at -0.29 and severe threshold at 2.91, the probability that a household is severe or moderate food insecure or severe food insecure is 0.99 and 0.82 respectively. The probability that a household is in severe food insecurity at raw score 4, with severity parameter of -0.08 and threshold of 2.91, is 0.

Table 4: Probability of food insecurity by raw score

Raw Score	Severity	Moderate or Severe	Severe
0	-3.48	0.000	0.000
1	-2.64	0.019	0.000
2	**-1.62**	**0.075**	**0.000**
3	-0.84	0.264	0.000
4	-0.08	0.595	0.000
5	**0.69**	**0.861**	**0.007**
6	1.57	0.970	0.088
7	2.76	0.993	0.450
8	4.31	0.999	0.824
Adjusted thresholds of food insecurity on the latent trait			
Moderate or Severe	-0.29		
Severe	2.91		

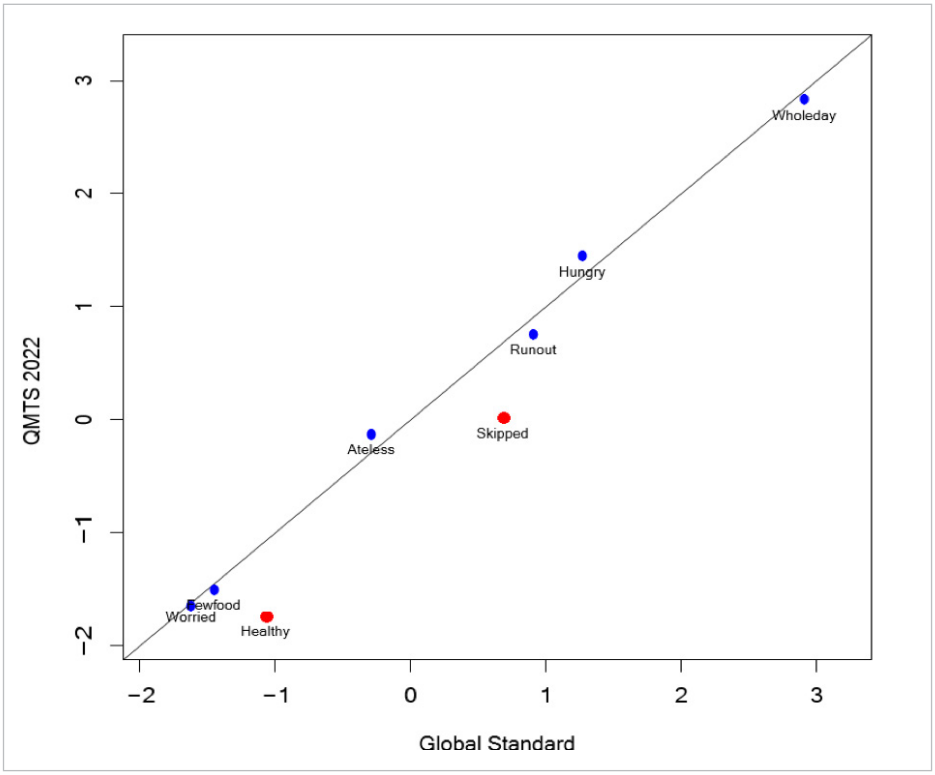
Equating

To establish the FIES global reference scale, FAO collected data from approximately 150 countries worldwide between 2014 and 2019. The data collected was analysed using the Rasch model, which allowed for the development of a consistent and reliable measure of food insecurity across different populations. To estimate the prevalence of food insecurity, the two FIES indicators, Prevalence of Moderate or Severe Food Insecurity and the Prevalence of Severe Food Insecurity were used and the standard threshold that permit the estimation of the two indicators are set at the severity of two items on the global reference scale. The equating procedure maps these standard thresholds to the national FIES scales, which is necessary because severity of food insecurity differs across countries and the standard thresholds may not be applicable in all contexts. The equating procedure ensures comparability of FIES scores obtained in different countries.

When comparing Botswana's FIES data to a global scale, selecting which items to use for equating is a crucial decision as it affects the position of the threshold used to classify people into categories of food insecurity and the prevalence rates of food insecurity. Figure (4) in this annex 3 shows the absolute differences in severity between the items on the global scale and Botswana scale. The table further reflects that items "HEALTHY" and "SKIPPED" are the most discrepant or unique in severity between the two scales with a correlation among common items at 98%. This may indicate that these items are less applicable or relevant in certain populations or contexts. Using a subset of items that are considered both relevant and comparable across various settings is essential to maintain the comparability of FIES scores across different contexts.

To attain the maximum number of items that result in the best alignment for equating, both "SKIPPED" and "HEALTHY" were omitted from the analysis to avoid redundancy in the scale, see Figure (4) below.

Figure 4: FIES scale estimated in Botswana using the 2022 data, against the global standard, after adjustment



The equating plot, absolute differences and correlation changes when omitting items "SKIPPED" and "HEALTHY" from analysis as in Figure 4. Correlation among common items changes from 98% to 99.7% which is much closer to 1. The remaining six items were found to be aligned with corresponding levels on the global reference scale as they have moved closer to the diagonal line.

References http://www.fao.org/3/ca9318en/CA9318EN.pdf

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