



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

## **Understanding the Household's Food Insecurity and Poverty Status in Gert Sibande District of Mpumalanga Province of South Africa**

Peter Temitope Agboola<sup>a</sup>®, Danhong Chen<sup>b</sup>, Shyam S. Nair<sup>c</sup>, and Lawrence Art Wolfskill<sup>d</sup>

<sup>a</sup>Graduate Student, Agricultural Science,  
1905 University Ave., Sam Houston State University,  
Huntsville, TX 77340, USA

<sup>b</sup>Associate Professor, Agricultural Science,  
Pirkle Center 440F, Sam Houston State University,  
Huntsville, TX 77340, USA

<sup>c</sup>Associate Professor, Agricultural Science,  
Pirkle Center 440D, Sam Houston State University,  
Huntsville, TX 77340, USA

<sup>d</sup>Associate Professor, Agricultural Science,  
Pirkle Center 440E, Sam Houston State University,  
Huntsville, TX 77340, USA

---

### **Abstract**

This study evaluated households' food insecurity and poverty status in Gert Sibande District of Mpumalanga Province in South Africa. Using electricity as the cooking energy, growing cereals, being employed, and employment income were negatively associated with food insecurity, whereas housing ownership and access to government child support were positively associated with food insecurity. While household size was positively associated with being poor, employment income, access to social grants, and receipt of remittance were negatively associated with households' poverty status. To address food insecurity and poverty issues, multiple measures are needed, including population planning, employment training programs, and social welfare programs.

**Keywords:** COVID-19; food security; poverty; social grant; remittance

---

®Corresponding author:

Email: teetop32000@gmail.com

## **Background**

The world is no longer a stranger to different forms of disproportional challenges and tragedies. Regardless of the varying magnitude of devastation caused by local and global issues, the SARS-CoV-2/COVID-19 virus has caused enormous suffering around the world. The pandemic and its ripple effects have spread to virtually all parts of the world, causing adverse outcomes such as increased mortality and exacerbation of poverty and food insecurity within the already marginalized populations of the world (Dabone et al., 2021). These marginalized populations include African, Caribbean, and Black (ACB) populations where food insecurity has become disproportionately high since the COVID-19 pandemic started, as there have been reports of lack of access to healthy food, food unaffordability, and food unavailability (Dabone et al., 2021; Feeding America, 2020; Omotayo and Aremu, 2020). This is no exception to a nation like the Republic of South Africa, as about half of the population in South Africa lives in poverty (World Bank, 2020). The prevalence of food insecurity (or percentage being moderately or severely food insecure) increased from 42.9% of the population in 2014–2016 to 44.9% in 2018–2020 in South Africa (FAO, ECA, and AUC, 2021).

The model of food security is a comprehensive assessment that is somewhat complex to understand. Many definitions of food security emerged in the late 1990s, but the concept of food security originated in 1970 during a time of global food shortage (Daniel G. Maxwell, 1996). Food security was mainly defined and instituted on food availability and food supply both at local and international levels. In 1974, food security was described at the World Food Summit as the process that can sustain food consumption, expansion, reduced fluctuation in price, and production of basic world foodstuff through a constant supply of food to the people (United Nations, 1974).

At the 1996 World Food Summit, food security was defined as when “all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.” (World Bank, n.d.) This definition incorporated four pillars of food security, including physical availability of food, economic and physical access to food, food utilization, and stability of the other three dimensions over time (FAO, 2008). Availability deals with the supply side and mainly concerns food production and inventory; access involves financial resources (e.g., incomes, expenditures, food prices) to obtain food and physical access to food markets; utilization refers to a nutritious diet and the biological processing of food intake; food security requires the stability in the availability, access, and utilization of food over time (FAO, 2008; Devereux, Bene, and Hoddinott, 2020).

COVID-19 did not disrupt food production significantly, as the agriculture sector was largely exempted from lockdown restrictions (Devereux, Bene, and Hoddinott, 2020). However, COVID-19-related illness, absence, and quarantine-caused labor shortages led to temporary supply chain disruptions, resulting in higher prices and occasional stockouts of meat products on grocery shelves (Balagtas and Cooper, 2021).

COVID-19 posed significant risks to food accessibility, due to falling incomes, rising prices, and transportation restrictions. Job losses and unemployment have led to reduced income and deepened

poverty in South Africa during the pandemic (Arndt et al., 2020; Jain et al., 2020). In April 2020, South Africa's president announced a budget of R500 billion rand or \$26 billion U.S. dollars to help combat the devastating effects of COVID-19 on the economy (Anna and Magome, 2020). The competition commission of South Africa received many complaints alleging that retailers raised prices substantially for essential food items and other pandemic-related products (Competition Commission of South Africa, 2020). Meanwhile, many people in South Africa were frustrated about the strenuous process of getting transportation permits to move from one community to another (Iwara et al., 2020).

This study aims to investigate the socioeconomic characteristics of the sampled farming households and analyze the factors that contribute to food insecurity and poverty in the Gert Sibande district of Mpumalanga Province, South Africa. Mpumalanga Province is one of the most prominent provinces in South Africa. It has been characterized as one of the stable economic resource provinces in the country, with most of the population living in rural areas (Mngqawa, Mangena-Netshikweta, and Katerere, 2016; Simpson et al., 2019). This study thereby leverages the momentum to inform, influence, and catalyze key agricultural actors to sustainably reduce food insecurity and poverty in the district, province, and South Africa at large. To our knowledge, this is the latest study investigating the food security and poverty status of residents in Mpumalanga Province during the COVID-19 pandemic. This study is guided by the following three research questions: (i) What is the socioeconomic, food security, and poverty status of the residents in the study area? (ii) What are the factors associated with the households' food insecurity status? and (iii) What are the factors relating to the households' poverty status?

## **Review of Recent Literature on Food Security and Poverty in South Africa**

### *Impact of the COVID-19 Pandemic on Poverty and Food Security*

During the COVID-19 pandemic, active employment in South Africa declined by 21 percentage points, attributed to nonemployment paid leave and temporary layoff (Jain et al., 2020). As a result, wage earnings were down about 30% for all workers in South Africa, with a 40% reduction for the lower-educated workers in particular (Arndt et al., 2020). Low-income households depended heavily on low-education labor incomes and received little capital income. Thus, they were more severely impacted by the wage reduction and threatened by food insecurity during the pandemic (Arndt et al., 2020). Ningi et al. (2022) studied the food security status of a sample of 283 households from Hamburg and Melani communities in Eastern Cape, one of the poorest provinces in South Africa. They found that more than 20% of the households from these two communities were moderately or severely food insecure during the pandemic. Another study (Hamadani et al., 2020) compared the income level and food security status of 2,424 mothers in rural Bangladesh before the pandemic and during the lockdown. Ninety-six percent of the mothers experienced reduced income, and the number of families experiencing moderate or severe food insecurity increased by 51.7%. A case study from the Vhembe district of South Africa revealed that many people had to rely on savings, social grants, and donated food parcels for survival during the pandemic (Iwara et al., 2020). Omotayo and Aremu (2020) analyzed a sample of 133 rural

households from North West Province in South Africa and found that 40.6% of them were food insecure.

### *Drivers of Poverty and Food Insecurity in South Africa*

Poverty was the most-cited factor underlying food insecurity in South Africa. According to a systemic review of 169 food insecurity studies in South Africa between 1995 and 2014, 86 (or 51%) of the studies considered poverty or lack of income as an important factor associated with food insecurity (Misselhorn and Hendriks, 2017). Sixty (or 70%) of the 86 studies evaluated the impact of individual or household income on food security. Recent studies also found that income was positively associated with food security in South Africa (Cheteni, Khamfula, and Mah, 2020; Dunga, 2020; Ijatuyi, Omotayo, and Nkonki-Mandleni, 2018; Megbowon and Mushunje, 2018).

Both public income transfers (social grants) and private income transfers (remittances) are expected to increase income and food expenditures, thus alleviating poverty and food insecurity (Misselhorn and Hendriks, 2017; Waidler and Devereux, 2019). Based on a nationally representative survey (National Income Dynamic Survey) of 28,000 individuals in South Africa, Waidler and Devereux (2019) found that Older Person's Grant had a positive relationship with dietary diversity. In contrast, Dunga (2020) did not find a significant association between social grants and food security among female-headed households in South Africa. Chakona and Shackleton (2019) found that households who received social grants had lower monthly food expenditures, had lower dietary diversity, and were more likely to be food insecure, compared with those who did not receive social grants. Previous evidence indicated that social grants might discourage people from engaging in subsistence farming or homestead food gardening, as the grants might have provided enough funds to purchase food (Minkley, 2012; Trefry, Parkins, and Cundill, 2014). Therefore, grants might also be viewed as hurdles to long-term food security (Misselhorn and Hendriks, 2017). Musakwa and Odhiambo (2021) confirmed a causal relationship between remittance and poverty in South Africa using time series data from 1980 to 2017. They recommended that South Africa should continue adopting policies to encourage emigration and increase remittance inflows to reduce poverty.

Women play an essential role in household food security. They are often the drivers of homestead food production, but are also hampered by limited access to and control over farm and non-farm assets (Misselhorn and Hendriks, 2017). Many studies found that female-headed households were more food secure than male-headed households in South Africa (Cheteni et al., 2020; Ningi et al., 2022). Female-headed households were also found to have a more diverse diet than their male-headed counterparts, since women had the capability of selecting, purchasing, and preparing a diverse diet for their families (Megbowon and Mushunje, 2018). However, another argument is that men tend to engage in various income-generating activities and have better access to land and credit than women. A study of rural households in the North West Province of South Africa found that male-headed households were more likely to be food secure than their female-headed counterparts (Omotayo and Aremu, 2020).

## Methods

### *Study Area*

The study was carried out in the Gert Sibande District Municipality of the Mpumalanga province in South Africa (see Figure 1). The district was named after Richard Gert Sibande, an African National Congress (ANC) political activist. The district was chosen for the survey because it is the largest of the three districts in the province, making up almost half of the geographical area of Mpumalanga province. It is comprised of seven local municipalities: Govan Mbeki, Chief Albert Luthuli, Msukaligwa, Dipaleseng, Mkhondo, Lekwa, and Pixley ka Isaka Seme. The district is primarily rural, with more than half the population living in rural areas. The main economic activities of the Gert Sibande District Municipalities are manufacturing, mining, and agriculture, although service-related sectors, such as transport, trade, community services, tourism, and finance, are dominant economic drivers in some parts of the district.

### *Sampling Methods and Sample Size*

Two of the seven municipal areas were selected for data collection (see Figure 2). The Govan Mbeki municipality consists of a population of 294,538 (99.68 per km<sup>2</sup>) and 83,874 households (28.39 per km<sup>2</sup>), while Albert Luthuli comprises a population of 186,010 (33.46 per km<sup>2</sup>) and 47,705 households (8.58 per km<sup>2</sup>) (Frith, 2011). The research was conducted in 20 villages dispersed throughout the two municipal areas: Bethel, Embalenhle, Trichardt, Secunda, Leslie, eMzinoni, Kinross, Lebogang, Charl Cilliers, Leandra, Bhevula, Eerstehoek, Embhuleni, Enikakuyengwa, Mpisikazi, Tshabalala, Lukwatini, Mpuluzi, Silobela, and Emjindini (see Figure 2)

Multistage sampling was used in the collection of the data. In the first stage, purposive sampling was used to select two municipalities based on their relative sizes in terms of population in the district. Both selected municipalities have the largest population in the province, while the residents principally engage in agricultural and farming operations. In the second stage, 20 rural farming communities for data collection were selected by simple random sampling. The rural farming communities belonged to the two selected municipalities. In the third stage, simple random sampling was used to select 20 households in each of the 20 rural farming communities, which totaled 400 administered questionnaires. Overall, 383 questionnaires were filled out properly by the household heads. Socioeconomic characteristics of the households and their perception of food security were collected from all respondents. The chart below shows the sequence of local municipalities and how the sample survey took place (see Figure 2). The sample survey was obtained from the November 23, 2020, to January 25, 2021.

Mbeki municipality consists of a population of 294,538 (99.68 per km<sup>2</sup>). The sample size was determined using sampling formula (Krejcie and Morgan, 1970):

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)} \quad (1)$$

Where: S = Required Sample size

X = Z value (e.g., 1.96 for 95% confidence level)

N = Population Size

P = Population proportion (expressed as decimal) (assumed to be 0.5 or 50%)

d = Degree of accuracy (5%), expressed as a proportion (.05)

N = 131,579, which is the total number of households in the two municipal areas

$$X^2 = 3.841$$

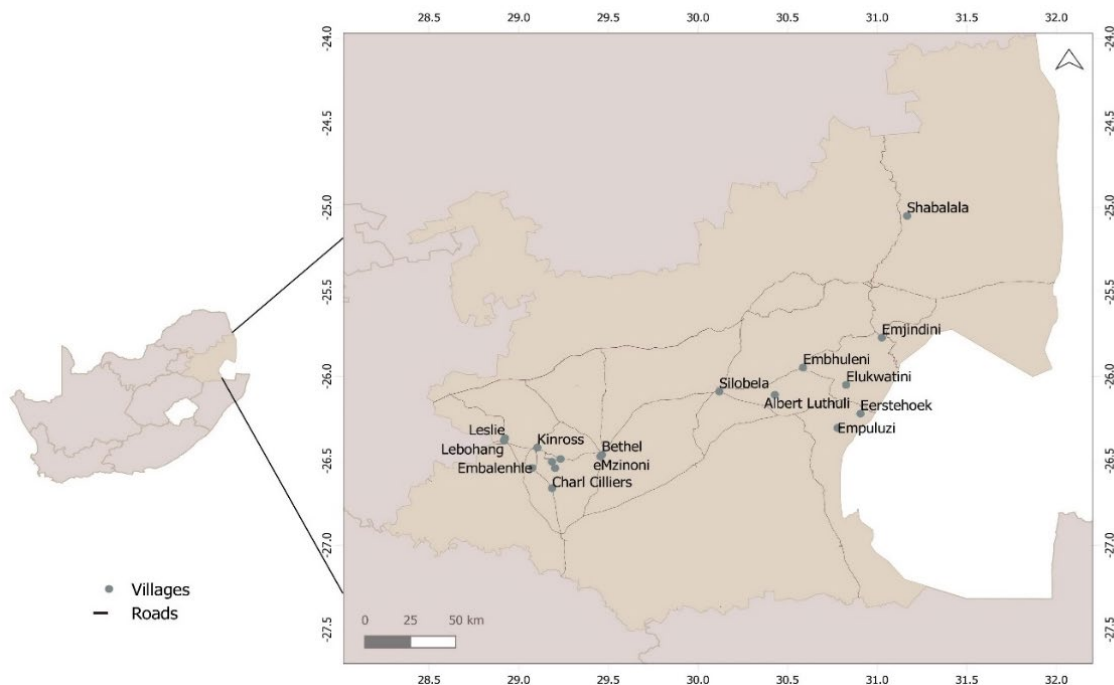
$$P = 0.5$$

$$d^2 = 0.05$$

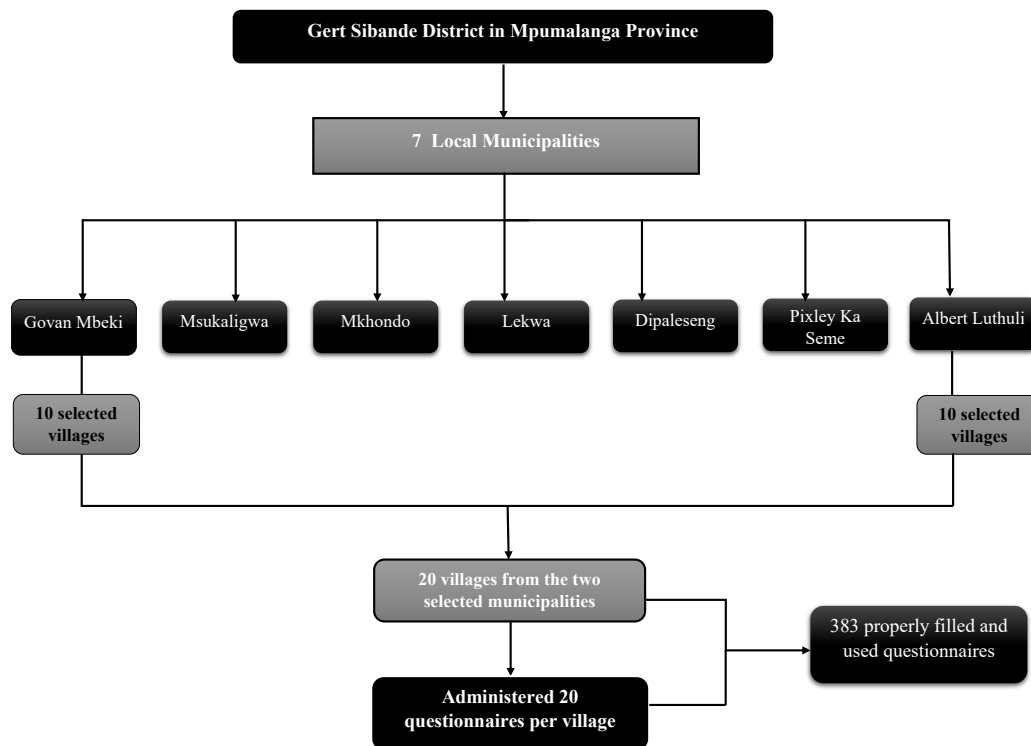
$$S = \frac{3.841 * 131,579 * 0.5 * 0.5}{((0.05)^2 * (131,579 - 1)) + (3.841 * 0.5 * 0.5)}$$

$$S = \frac{126348.73}{329.905}$$

$$S = \underline{\underline{383}}$$



**Figure 1.** Gert Sibande Municipality of Mpumalanga Province, South Africa



**Figure 2.** Schematic Flow for the Sampling Method and Sample Size for the Study

### *Statistical and Analytical Structure*

The study's data were analyzed with Microsoft Excel, IBM SPSS Statistics (Version 25) predictive analytical software and STATA Statistical Software (Version 16) for descriptive and inferential statistics.

### *Household Food Insecurity Assessment Scale (HFIAS)*

The information gathered from this study was used to categorize households based on their level of food security. The Household Food Insecurity Assessment Scale (HFIAS) has been used for many years by several researchers to assess the food security status of households. The instrument was developed by the Food and Nutrition Technical Assistance (FANTA) project (Copeland, Frankenberger, and Kennedy, 2002; Coates, Webb, and Houser, 2003; Faber, Schwabe, and Drimie, 2009; Deitchler et al., 2010). It has been used globally to measure the rate of food insecurity in rural households and to check the level of food shortages and poor dietary intake in rural communities. The HFIAS is a composite index calculated for each household and consists of nine key questions designed to measure the severity of household food insecurity for the past 30 days. If a respondent answers "yes" to a question, a frequency question is asked to assess whether the event happened rarely (once or twice), sometimes (three to 10 times), or often (more than 10 times) in the past 4 weeks. "Rarely," "sometimes," and "often" are assigned scores of 1, 2, and 3, respectively. The HFIAS score is the sum of the numbers for each frequency question. It ranges

from 0 to 27. The higher the score, the more severe the food insecurity the households have experienced (Adams, Grummer-Strawn, and Chavez, 2003; Pardilla et al., 2014). We included the detailed HFIAS questions in the appendix. Secondly, the households were classified into four food insecurity categories: food secure, mildly food insecure, moderately food insecure, and severely food insecure, according to the Household Food Insecurity Assessment (HFIA) categorization scheme shown in the appendix.

### Foster-Greer-Thorbecke (FGT) Indices

The Foster-Greer-Thorbecke (FGT) poverty index was used to categorize the poverty status of the sample. As a generalized measure of poverty, the FGT index is an inferential statistic and has been widely used to measure households' poverty status (Foster, Greer, and Thorbecke, 2010). It combines information on the extent of poverty (as measured by the head count ratio), the intensity of poverty (as measured by the total poverty gap), and the severity of poverty (Alkire and Santos, 2013). The formula for the FGT is given by:

$$FGT_{\alpha} = \frac{1}{N} \sum_{i=1}^H \left( \frac{z - y_i}{z} \right)^{\alpha} \quad (2)$$

where  $Z$  represents the poverty line, measured as per capita monthly income in this study.  $N$  is the total number of members of the population under consideration.  $H$  is the number of those with incomes at or below  $z$ .  $y_i$  is the per capita monthly income of the  $i$ -th person.  $\alpha$  is a parameter characterized by the degree of poverty aversion (i.e., the parameter  $\alpha$  determines the precise measure of poverty). When  $\alpha$  equals zero, the head count ratio ( $H$ ) is generated, indicating the proportion of the population below the poverty line; when  $\alpha$  equals 1, the poverty gap ratio (PG) is generated (often considered to represent the depth of poverty); and when  $\alpha$  equals 2, the poverty severity (PS) is generated.

### Regression Models of Factors Associated with Household Food Insecurity and Poverty Status

An OLS model was used to evaluate the factors relating to the household's food insecurity status.

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \dots + \beta_n X_n + \varepsilon_i \quad (3)$$

where  $Y_i$  is a continuous variable denoting the severity of food insecurity,  $X_1$  to  $X_n$  are the independent variables described in Table 3.  $\varepsilon_i$  is the error term.

A binary logistic regression model was employed to determine the factors influencing the farming households' poverty status. The binary logistic regression model is stated as:

$$\text{Logit}(p) = \text{Log}\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \dots + \beta_n X_n \quad (4)$$

where  $p = \text{prob}(Y_i = 1)$ .

$Y_i$  is the binary variable with a value of 1 if respondents are in poverty and 0 otherwise.  $\beta_0$  is the intercept (constant), and  $\beta_1, \beta_2, \dots, \beta_n$  are the regression coefficients of the predictor variables,  $X_1, X_2, \dots, X_n$ . The logistic regression model is widely used to analyze data with dichotomous dependent variables. Hence, it was considered a suitable model for this research because the dependent variable was dichotomous. The model will be estimated by the Maximum Likelihood method. All the dependent and independent variables are described in Table 1.

The dependent variable of the OLS model was the HFIAS score, a continuous variable measuring the severity of food insecurity. This variable was explained in the section Household Food Insecurity Assessment Scale (HFIAS). A binary logistic regression model was employed to determine the factors associated with the households' poverty status. The dependent variable, poverty status, was a binary variable, with 1 being at or below the poverty line (in this case, R1,268 per capita per month) and 0 otherwise. The poverty line was derived by Statistics South Africa in 2020 (Statistics SA, 2020). The poverty status in the regression indicates whether a household is at or below the poverty line, whereas the H index indicates the percentage of all the households in the sample at or below the poverty line. The independent variables in these two models included the age, gender, educational level, employment status of the household head, housing ownership, cooking energy, access to farming land, crop grown, employment income, access to social grant, receipt of remittance, and access to government child support and/or pension grant.

**Table 1.** Factors Influencing Household Food Insecurity and Poverty Status in Mpumalanga Province of South Africa

Variable	Description
Dependent variable	
HFIAS score	Continuous
Poverty status	1= below poverty line; 0 = above poverty line
Independent variable	
Gender	1 = male; 0 = female
Age of household head	Continuous
Education level	1 = primary education or above; 0 = no formal education
Household size	Number of members
Housing ownership	1 = own; 0 = rent
Cooking energy	1 = electricity; 0 = other
Access to farming land	1 = yes; 0 = no
Crop grown	1 = cereal; 0 = other
Employment status of household head	1 = employed; 0 = unemployed
Employment income in rands	Continuous
Access to social grant	1 = yes; 0 = no
Receipt of remittance	1 = yes; 0 = no
Access to government child support	1 = yes; 0 = no
Access to government pension grant	1 = yes; 0 = no

## Results and Discussion

### *Demographic Characteristics of Households in the Study Area*

Table 2 illustrates the socioeconomic characteristics of 383 households in the study area. The age distribution of the respondents reveals that most respondents fell into the age intervals of 46–55 years (42.30%), with an average age of 52 years in the pooled dataset. According to a previous study (Aldrich and Cliff, 2003), the age of the household head is highly important because it reveals whether the households benefit from the experience of the household head or whether the households have to base their decisions on the risk of taking advice from other households. Most households (56.14%) have between 1 and 5 family members. The average household size was 5. Large household sizes may result in insufficient food intake and poor health, thereby exacerbating poverty (Omotayo, 2017).

Furthermore, 40.73% of the participants have completed secondary education. A higher number of years of education could have a positive influence on the ability of households to know their diet, food composition, and the need for diversity. Seventy-seven percent of the household heads were employed, with an average employment income of R11,336 per month. The majority of households owned their homes (84%). More than 90% of households used electricity as their cooking energy. About 90% of them had access to farming land. Many of them received remittance (42%), had access to social grants (24%), government child support (12%), or pension grants (23%).

**Table 2.** Demographic Characteristics of Household Heads

Households' Characteristics	Frequency	Percentage (%)	Mean
Gender			
Male	238	62.14	
Female	145	37.86	
Age			
18–35	13	3.39	
36–45	80	20.89	51.95
46–55	162	42.30	
56–65	109	28.46	
> 65	19	4.96	
Household size			
1–5	215	56.14	
6–10	164	42.82	5.39
11–15	4	1.04	
Marital status			
Married	225	58.75	
Never married	83	21.67	
Widowed	37	9.66	
Divorced	38	9.92	

**Table 2.** Continued

Households' Characteristics	Frequency	Percentage (%)	Mean
Education level			
No formal education	76	19.84	
Primary education	72	18.80	
Secondary education	156	40.73	
Tertiary education	79	20.63	
Employment status			
Permanent employment	82	21.41	
Seasonal employment	28	7.31	
Self-employed	185	48.30	
Not employed	88	22.98	
Total	383	100	

### *Descriptive Statistics of the Sample*

Table 3 presents the descriptive analysis of household demographics for the study. The HFIAS score in the sample ranged from 0 to 24, with a mean score of 6.51. Roughly 33% of the sampled households were living below the poverty line. About 62% of the households were male headed, with the remaining 38% being female headed. This finding is in line with the traditional belief and prior findings that households in Africa are predominantly male oriented in nature (Omotayo, 2016; Wahaga, 2018).

**Table 3.** Descriptive Statistics of Dependent and Independent Variables

Variable	Mean	Std.		
		Dev.	Min	Max
HFIAS score	6.51	6.18	0	24
Poverty status (1 = below poverty line; 0 = above poverty line)	0.33	0.47	0	1
Gender (1 = male; 0 = female)	0.62	0.49	0	1
Age of household head	51.95	8.84	27	80
Education level (1 = no formal education; 2 = primary education; 3 = secondary education; 4 = tertiary education)	2.62	1.02	1	4
Household size	5.39	1.58	1	13
Housing ownership (1 = own; 0 = rent)	0.84	0.37	0	1
Cooking energy (1 = electricity; 0 = other)	0.95	0.23	0	1
Access to farming land (1 = yes; 0 = no)	0.90	0.31	0	1
Crop grown (1 = cereal; 0 = other)	0.39	0.49	0	1
Employment status of household head (1 = employed; 0 = unemployed)	0.77	0.42	0	1
Employment income in thousand rands	11.34	10.21	0	71

**Table 3.** Continued

	Mean	Std. Dev.	Min	Max
Access to social grant (1 = yes; 0 = no)	0.24	0.43	0	1
Receipt of remittance (1 = yes; 0 = no)	0.42	0.49	0	1
Access to government child support (1 = yes; 0 = no)	0.12	0.32	0	1
Access to government pension grant (1 = yes; 0 = no)	0.23	0.42	0	1

Note: The mean of dummy variables indicates the proportion of responses with a value of 1.

To avoid inconsistency and bias from the estimated parameters, the study subjected the variables to a multicollinearity test using the Collin command in STATA 16. The multicollinearity test was carried out with Variance Inflation Factor (VIF), and the mean VIF was 1.41 (see Table 11). All the VIF values were below 5, and the tolerance values were above 0.2. A high level of tolerance computed for the variables indicates an absence of serious multicollinearity in the analysis.

**Table 4.** Multicollinearity Test of Variables

Variable	VIF	Tolerance
Gender	1.02	0.9851
Age of household head	1.75	0.5729
Education level	2.11	0.4742
Household size	1.12	0.892
Housing ownership	1.1	0.9058
Cooking energy	1.04	0.9604
Access to farming land	1.26	0.7959
Crop grown	1.25	0.8004
Employment status of household head	1.78	0.5618
Employment income	1.94	0.5159
Access to social grant	1.61	0.6226
Receipt of remittance	1.21	0.8249
Access to government child support	1.19	0.8392
Mean VIF	1.41	

### *Respondents' Food Security Profile*

Table 5 summarizes the responses to the HFIAS questions. The results indicate that about 51% of the households were worried about running out of food. Half (50%) of the households were unable to eat their preferred meal due to a lack of resources. Additionally, half (50%) of the households reported eating undesirable food because of a lack of resources. About 1 in 8 households (13%) complained about not having food at all in their households; another 8 (12%) of the households went to sleep hungry; and 2% of the households indicated that they had no food to eat all day. Based on the HFIA categorization scheme outlined in the Appendix, it was found that just over a third (34.46%) of the households were food secure in the sample, whereas 40.47% and 20.89%, respectively, of the households were moderately and severely food insecure. The prevalence of food insecurity in the study area was 61.36%, significantly higher than the average of 44.9% in

2018–2020 in South Africa (FAO, ECA, and AUC, 2021). This finding might indicate a severe food insecurity problem of farming households during the pandemic.

**Table 5.** Responses to the HFIAS Questions and HFIA Categories

Questions	Percentage of Yes Responses
1. Worried about food	51
2. Unable to eat preferred meal due to lack of resources	50
3. Eat just a few kinds of food	46
4. Ate undesirable meal due to lack of resources	50
5. Ate smaller meal due to not having enough food	43
6. Ate fewer meals or skipped some meals in a day	35
7. No food at all in the household	13
8. Went to sleep hungry	12
9. Did not eat at all for a whole day	2
Categories	Percentage
Food secure	34.46
Mildly food insecure	4.18
Moderately food insecure	40.47
Severely food insecure	20.89

#### *Poverty Status of Respondents*

Table 6 demonstrates the FGT poverty indices of the sample. The incidence of poverty (H) in this study was 0.3264, indicating that 32.64% of the households were considered poor, while the remainder (67.36%) were categorized as non-poor households. Moreover, poverty depth (PG) among the sampled rural households was 0.1300, meaning that, on average, each household member (both poor and non-poor) would need to increase their monthly income by 13% of the poverty line (R1,268 per capita) to eliminate poverty in the sample. The poverty severity (PS) among the sampled households was 0.0727. Among the poor households in the sample, the average poverty gap per person was R504.94, which is the minimum cost per person of eliminating poverty using transfer payments to the poor households. In other words, this amount will be the average cost per person of filling up each poverty gap. From the findings, it could be inferred that the existence of poverty abounds among the rural households in the study area.

**Table 6.** Poverty Status of Participating Households

FGT Poverty Indices	Abbreviation	Number
FGT incidence	H	0.3264
FGT depth	PG	0.1300
FGT severity	PS	0.0727
Poverty Line (z)		R1268
Poverty Status	Frequency	Percentage
Above poverty line	258	67.36%
Below poverty line	125	32.64%
Total	383	100%

*OLS Results for Factors Associated with Household Food Insecurity*

The OLS results for the factors associated with households' food insecurity status are presented in Table 7. Small VIF values indicate a low level of multicollinearity. Out of the 13 independent variables considered in the model, 6 were statistically significant. These were housing ownership ( $p < 0.05$ ), cooking energy ( $p < 0.05$ ), crops grown ( $p < 0.05$ ), employment status of the household head ( $p < 0.01$ ), employment income ( $p < 0.001$ ), and access to government child support ( $p < 0.001$ ). Owning a house was positively correlated with food insecurity, whereas using electricity as a cooking energy source and growing cereals were negatively correlated with food insecurity.

The coefficient of the employment status of the household head was found to be negatively associated with food insecurity (-2.10) at a significance level of 0.01. Being employed reduced the HFIAS score by 2.10, with other factors held constant. This finding corroborates existing studies (Muche, Endalew, and Koricho, 2014; Aragie and Genanu, 2017) showing that the household head's employment and income status are significant determinants of how food-secured a household will be.

Furthermore, the coefficient for employment income was negative (-0.29) and significant ( $p < 0.001$ ). For each 1,000 Rand growth in income, the HFIAS score would be reduced by 0.29, indicating that the household head's income has the probability of enhancing the food security status of the family. It corroborates the findings from previous studies (Ahmed et al., 2017; Ijatuyi et al., 2018; Megbowon and Mushunje, 2018; Cheteni et al., 2020; Dunga, 2020). Poverty, or lack of income, has been established as a top contributor to food insecurity in South Africa (Misselhorn and Hendriks, 2017). It is imperative for the government to boost employment and create opportunities for households to earn various sources of incomes. However, access to social grant did not have a significant relationship with food insecurity in this study. Similar to previous findings (Patel, 2012), access to government child support was positively associated with food insecurity in this study. Perhaps food-insecure households were more likely to receive government child support.

**Table 7.** Factors Associated with Households' Food Insecurity and Poverty Status

Independent Variable ↓	Coefficient (Std. Error)	VIF	Coefficient (Std. Error)	Odds Ratio (Std. Error)
Gender	-0.06 (0.45)	1.02	-0.01 (0.69)	0.99 (0.68)
Age of household head	0.004 (0.03)	1.75	0.04 (0.06)	1.04 (1.04)
Education level	-0.30 (0.31)	2.11	0.02 (0.43)	1.02 (0.44)
Household size	0.09 (0.15)	1.12	2.77 (0.56)***	15.88 (8.89) ***
Housing ownership	1.42 (0.62)*	1.10	1.77 (1.27)	5.89 (7.50)
Cooking energy	-2.07 (0.98)*	1.04	-1.39 (1.01)	0.25 (0.25)
Access to farmland	-0.83 (0.80)	1.26	-1.25 (1.24)	0.29 (0.35)
Crop grown	-1.17 (0.50)*	1.25	-1.14 (0.79)	0.32 (0.25)
Employment status	-2.10 (0.69)**	1.78	2.09 (1.13)	8.05 (9.13)
Employment income	-0.29 (0.03)***	1.94	-1.87 (0.36)***	0.15 (0.06)***
Access to social grant	0.65 (0.64)	1.61	-2.27 (0.86)**	0.10 (0.09)**
Receipt of remittance	-0.38 (0.49)	1.21	-2.79 (0.94)**	0.06 (0.06)**
Access to government child support	2.97 (0.74)***	1.19	1.25 (1.15)	3.50 (4.01)
Intercept	13.58 (2.48)		-6.19 (3.95)	0.002 (0.01)

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$

#### *Logit Results for the Factors Relating to Households' Poverty Status*

Table 7 also includes the Logit results for the factors relating to households' poverty status. Four factors were statistically significant, including household size ( $p < 0.001$ ), employment income ( $p < 0.001$ ), access to social grants ( $p < 0.01$ ), and receipts of remittance ( $p < 0.01$ ). Table 4 shows that the coefficient for household size was 2.77, with an odds ratio of 15.88. This result implies that a larger household size was significantly associated with a higher probability of being poor. For each additional member in the household, the odds of living below the poverty line increased by a factor of 15.88. This is in line with prior findings that a larger household size could worsen the poverty status of the household (Damisa, 2011; Sarti, Terraneo, and Tognetti Bordogna, 2017).

Moreover, the coefficient of the respondent's monthly employment income captured in 1,000 South African Rands was negative (-1.87) at a significance level of 0.001, indicating that an increase in the household head's income would decrease the probability of living below the poverty line. An odds ratio of 0.15 indicates that for each additional 1,000 Rands of monthly income, the odds of being poor decreased by 85%, holding other variables constant. This is in line with the existing literature as an increase in income could reduce the poverty level of households (Bigsten, Kebede, and Taddesse, 2003). Meanwhile, access to social grants and receipts of remittances were both negatively associated with households' poverty status, suggesting that providing social grants and remittances might help alleviate poverty. Indeed, many residents in South Africa relied on social grants for survival during the pandemic (Iwara et al., 2020). It was found that social grants were positively correlated with food security in South Africa (Waidler and Devereux, 2019). Our study provided additional evidence supporting the role of social grants in reducing poverty. A previous study established a causal relationship between remittance and poverty (Musakwa and Odhiambo, 2021). Therefore, policy makers in South Africa should

continue encouraging emigration and remittance inflows by removing regulatory obstacles to migration and international monetary transfers.

### *Limitations*

This was not a causal study and only correlations may be implied from the results of the models. We only sampled two of the seven municipalities in the Gert Sibande District of Mpumalanga Province of South Africa. As the two municipalities were not randomly chosen, the sample may not be representative of either the district or the entire province. Another limitation is that no specific questions were asked about how the household was affected by the pandemic.

## **Conclusions**

Food insecurity and poverty are major problems for many households in developing nations. In South Africa, these dual threats constitute physical and economic problems decreasing the nutritional and health base of the households. This study, therefore, evaluated the factors contributing to households' food insecurity and poverty in the Gert Sibande Municipality of Mpumalanga Province of South Africa. It was designed to recognize the knowledge gaps, encourage new thinking, and stimulate concrete actions on leveraging agriculture to improve households' food security and poverty status. A large household size was reported in the research, which could result in a lower income per capita, leading to poverty in the study area. The logit model results indicated that a larger household size was associated with a significantly higher probability of living under the poverty line. Perhaps population planning programs may be initiated to promote fewer births through eugenic procreation.

The results of the two models highlighted the importance of employment income in alleviating food security and poverty. Households' employment income came from three major sources: seasonal, permanent, and self-employment. The average monthly incomes of households relying on farming and off-farm activities as their primary livelihood activities were R12,430 and R10,865, respectively. For households relying on both on-farm and off-farm livelihood activities, their average monthly income (R21,008) was almost two times that of those depending on just one source of livelihood. Therefore, involvement in both on-farm and off-farm livelihood activities might prevent food insecurity and poverty. Engaging in agricultural production constitutes an important source of income for the residents in the sampled area. Training programs may be used to enhance the farming ability and employability of the adult residents, generating multiple sources of income for the household.

Additionally, we found evidence showing that access to social grants may help reduce poverty. As such, social welfare programs such as governmental transfer payment programs and non-governmental charitable donations could go a long way toward addressing food insecurity and poverty issues in the sampled area. Households' ability to endure difficulties such as food insecurity and poverty is greatly determined by their respective asset portfolios, such as financial, physical, and intangible human assets. To strengthen their asset portfolios, multiple measures are

needed, including population planning, employment training programs, and social welfare programs.

## References

- Adams, E.J., L. Grummer-Strawn, and G. Chavez. 2003. "Community and International Nutrition Food Insecurity Is Associated with Increased Risk of Obesity in California Women." *Journal of Nutrition* 133.
- Ahmed, U.I., L. Ying, M.K. Bashir, M. Abid, and F. Zulfiqar. 2017. "Status and Determinants of Small Farming Households' Food Security and Role of Market Access in Enhancing Food Security in Rural Pakistan." *PLoS ONE* 12(10).
- Aldrich, H.E., and J.E. Cliff. 2003. "The Pervasive Effects of Family on Entrepreneurship: Toward a Family Embeddedness Perspective." *Journal of Business Venturing* 18(5):573–596.
- Alkire, S., and M.E. Santos. 2013. "A Multidimensional Approach: Poverty Measurement and Beyond." *Social Indicators Research* 112:239–257.
- Anna, C., and M. Magome. 2020. "South Africa Announces \$26 Billion to Help Struggling Nation." Available online: <https://www.pbs.org/newshour/world/south-africa-announces-26-billion-to-help-struggling-nation>.
- Aragie, T., and S. Genanu. 2017. "Level and Determinants of Food Security in North Wollo Zone (Amhara Region–Ethiopia)." *Journal of Food Security* 5(6):232–247.
- Arndt, C., R. Davies, S. Gabriel, L. Harris, K. Makrelov, S. Robinson,... and L. Anderson. 2020. "Covid-19 Lockdowns, Income Distribution, and Food Security: An Analysis for South Africa." *Global Food Security* 26:100410.
- Balagtas, J.V., and J. Cooper. 2021. "The Impact of COVID-19 on United States Meat and Livestock Markets." *Choices* 36(3):1–10.
- Bigsten, A., B. Kebede, and M. Tadesse. 2003. "Growth and Poverty Reduction in Ethiopia: Evidence from Household Panel Surveys." *World Development* 31(1):87–106.
- Chakona, G., and C.M. Shackleton. 2019. "Food Insecurity in South Africa: To What Extent Can Social Grants and Consumption of Wild Foods Eradicate Hunger?" *World Development Perspectives* 13:87–94.
- Cheteni, P., Y. Khamfula, and G. Mah. 2020. "Exploring Food Security and Household Dietary Diversity in the Eastern Cape Province, South Africa." *Sustainability* 12(5):1851.

- Coates, J., A. Swindale, and P. Bilinsky. 2007. *Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide*, version 3. Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development.
- Coates, J., P. Webb, and R. Houser. 2003. *Measuring Food Insecurity: Going beyond Indicators of Income and Anthropometry*. Washington, DC: Food and Nutrition Technical Assistance.
- Competition Commission South Africa. 2020. *Joint Briefing to the Portfolio Committee on Trade and Industry and Select Committee on Economic Development, Small Business Development, Tourism, Employment and Labour*. Pretoria, South Africa: Competition Commission South Africa. Available online: <http://www.thedtic.gov.za/wp-content/uploads/Competition-Commission19-May-2020.pdf>.
- Copeland, R., T. Frankenberger, and E. Kennedy. 2002. *Food and Nutrition Technical Assistance Project Assessment*. Washington, DC: Food and Nutrition Technical Assistance.
- Damisa, M. 2011. "Household Typology Based Analysis of Livelihood Strategies and Poverty Status in the Sudan Savannah of Nigeria." Available online: [www.Learningpublics.org](http://www.Learningpublics.org).
- Deitchler, M., T. Ballard, A. Swindale, and J. Coates. 2010. *Validation of a Measure of Household Hunger for Cross-Cultural Use*. Washington, DC: Food and Nutrition Technical Assistance II Project. Available online: <http://www.fanta-2.org>.
- Devereux, S., C. Béné, and J. Hoddinott. 2020. "Conceptualising COVID-19's Impacts on Household Food Security." *Food Security* 12(4):769–772.
- Dunga, H.M. 2020. "An Empirical Analysis on Determinants of Food Security among Female-Headed Households in South Africa." *International Journal of Social Sciences and Humanity Studies* 12(1):66–81.
- Faber, M., C. Schwabe, and S. Drimie. 2009. "Dietary Diversity in Relation to Other Household Food Security Indicators." *International Journal of Food Safety, Nutrition and Public Health* 2(1):1.
- FAO, ECA and AUC. 2021. *Africa – Regional Overview of Food Security and Nutrition 2021: Statistics and Trends*. Accra, FAO.
- Food and Agriculture Organization of the United Nations. 2008. *An Introduction to the Basic Concepts of Food Security*. Paris, France: EC—FAO Food Security Programme. Available online: <https://www.fao.org/3/al936e/al936e00.pdf>.
- Foster, J., J. Greer, and E. Thorbecke. 2010. "The Foster-Greer-Thorbecke (FGT) Poverty Measures: 25 Years Later." *Journal of Economic Inequality* 8(4):491–524.

- Frith, A. 2011. "Albert Luthuli Local Municipality." Available online: <https://census2011.adrianfrith.com/place/860>.
- Hamadani, J.D., M.I. Hasan, A.J. Baldi, S.J. Hossain, S. Shiraji, M.S.A. Bhuiyan,... and S.R. Pasricha. 2020. "Immediate Impact of Stay-At-Home Orders to Control COVID-19 Transmission on Socioeconomic Conditions, Food Insecurity, Mental Health, and Intimate Partner Violence in Bangladeshi Women and Their Families: An Interrupted Time Series." *The Lancet Global Health* 8(11):e1380-e1389.
- Ijatuyi, E.J., A.O. Omotayo, and B. Nkonki-Mandleni. 2018. "Empirical Analysis of Food Security Status of Agricultural Households in the Platinum Province of South Africa." *Journal of Agribusiness and Rural Development* 47(1):29–38.
- Iwara, I.O., F. Musvipwa, K.E. Amaechi, and R. Raselekoane. 2020. "COVID-19 Lock-Down Socio-Economic Challenges Faced by Households in Rural Areas: A Perspective from Vhembe District, South Africa." *Sociološki pregled* 54(3):761–798.
- Jain, R., J. Budlender, R. Zizzamia, and I. Bassier. 2020. "The Labor Market and Poverty Impacts of COVID-19 in South Africa." Southern Africa Labour and Development Research Unit Working Paper 264.
- Krejcie, R.V., and D.W. Morgan. 1970. "Determining Sample Size for Research Activities." *Educational and Psychological Measurement* 30(3):607–610.
- Maxwell, D.G. 1996. "Measuring Food Insecurity: The Frequency and Severity of Coping Strategies." *Food Policy* 21(3):291–303.
- Megbowon, E.T., and A. Mushunje. 2018. "Assessment of Food Security among Households in Eastern Cape Province, South Africa: Evidence from General Household Survey, 2014." *International Journal of Social Economics* 45(1).
- Minkley, G. 2012. "Rainwater Harvesting, Homestead Food Farming, Social Change and Communities of Interests in the Eastern Cape, South Africa." *Irrigation and Drainage* 61:106–118.
- Misselhorn, A., and S.L. Hendriks. 2017. "A Systematic Review of Sub-National Food Insecurity Research in South Africa: Missed Opportunities for Policy Insights." *PLOS ONE* 12(8):e0182399.
- Mngqawa, P., L.M. Mangena-Netshikweta, and D.R. Katerere. 2016. "Grain Production by Rural Subsistence Farmers in Selected Districts of Limpopo and Mpumalanga Provinces South Africa." *PULA: Botswana Journal of African Studies* 30(1).

- Muche, M., B. Endalew, and T. Koricho. 2014. "Determinants of Household Food Security among Southwest Ethiopia Rural Households." *Asian Journal of Agricultural Research* 8(5):248–258.
- Musakwa, M.T., and N.M. Odhiambo. 2021. "The Causal Relationship between Remittance and Poverty in South Africa: A Multivariate Approach." *International Social Science Journal* 71(239-240):37–48.
- Ningi, T., A. Taruvinga, L. Zhou, and S. Ngarava. 2022. "Factors That Influence Household Food Security in Hamburg and Melani, Eastern Cape, South Africa." *African Journal of Science, Technology, Innovation and Development* 14(4):1050–1058.
- Omotayo, A.O. 2016. "Farming Households' Environment, Nutrition and Health Interplay in Southwest, Nigeria." *International Journal of Scientific Research in Agricultural Sciences* 3(3):84–98.
- Omotayo, A.O. 2017. "Economics of Farming Household's Food Intake and Health-Capital in Nigeria: A Two-Stage Probit Regression Approach." *The Journal of Developing Areas* 51(4):109–125.
- Omotayo, A.O., and A.O. Aremu. 2020. "Underutilized African Indigenous Fruit Trees and Food–Nutrition Security: Opportunities, Challenges, and Prospects." *Food and Energy Security* 9(3). Available online: <https://onlinelibrary.wiley.com/doi/full/10.1002/fes3.220>.
- Pardilla, M., D. Prasad, S. Suratkar, and J. Gittelsohn. 2014. "High Levels of Household Food Insecurity on the Navajo Nation." *Public Health Nutrition* 17(1):58–65.
- Patel, L. 2012. "Poverty, Gender and Social Protection: Child Support Grants in Soweto, South Africa." *Journal of Policy Practice* 11(1–2):106–120.
- Sarti, S., M. Terraneo, and M. Tognetti Bordogna. 2017. "Poverty and Private Health Expenditures in Italian Households during the Recent Crisis." *Health Policy* 121(3):307–314.
- Simpson, G.B., J. Badenhorst, G.P.W. Jewitt, M. Berchner, and E. Davies. 2019. "Competition for Land: The Water-Energy-Food Nexus and Coal Mining in Mpumalanga Province, South Africa." *Frontiers in Environmental Science* 7. Available online: <https://www.frontiersin.org/articles/10.3389/fenvs.2019.00086/full>.
- Statistics South Africa. 2020. *Statistics South Africa. National Poverty Lines*. Available online: <http://www.statssa.gov.za/publications/P03101/P031012020.pdf>.
- Trefry, A., J.R. Parkins, and G. Cundill. 2014. "Culture and Food Security: A Case Study of Homestead Food Production in South Africa." *Food Security* 6(4):555–565.

United Nations. 1974. "Report of the World Food Conference." World Food Conference, Rome, Italy, June 5–16.

Wahaga, E. 2018. "The Gendered Nature of Productive and Reproductive Roles in the Agricultural Sector." *International Journal of Development and Sustainability* 7(1).

Waidler, J., and S. Devereux. 2019. "Social Grants, Remittances, and Food Security: Does the Source of Income Matter?" *Food Security* 11(3):679–702.

World Bank. n.d. *What is Food Security?* Washington, DC: World Bank. Available online: <https://www.worldbank.org/en/topic/agriculture/brief/food-security-update/what-is-food-security>.

World Bank. 2020. *Poverty & Equity Brief, South Africa*. Washington, DC: World Bank. Available online: [https://databankfiles.worldbank.org/public/ddpext\\_download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global\\_POVEQ\\_ZAF.pdf](https://databankfiles.worldbank.org/public/ddpext_download/poverty/33EF03BB-9722-4AE2-ABC7-AA2972D68AFE/Global_POVEQ_ZAF.pdf).

## Appendix

**Table A1.** Household Food Insecurity Access Scale (HFIAS) Questions

No.	Questions
1	In the past four weeks, did you worry that your household would not have enough food? 0 = No (skip to Q2) 1 = Yes
1a	How often did this happen? 1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to 10 times in the past four weeks) 3 = Often (more than 10 times in the past four weeks)
2	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources? 0 = No (skip to Q3) 1 = Yes
2a	How often did this happen? 1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to 10 times in the past four weeks) 3 = Often (more than 10 times in the past four weeks)
3	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources? 0 = No (skip to Q4) 1 = Yes
3a	How often did this happen? 1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to 10 times in the past four weeks) 3 = Often (more than 10 times in the past four weeks)
4	In the past four weeks, 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? 0 = No (skip to Q5) 1 = Yes
4a	How often did this happen? 1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to 10 times in the past four weeks) 3 = Often (more than 10 times in the past four weeks)
5	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food? 0 = No (skip to Q6) 1 = Yes
5a	How often did this happen? 1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to 10 times in the past four weeks) 3 = Often (more than 10 times in the past four weeks)

**Table A1.** Continued

No.	Questions
6	In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food? 0 = No (skip to Q7) 1 = Yes
6a	How often did this happen? 1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to 10 times in the past four weeks) 3 = Often (more than 10 times in the past four weeks)
7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food? 0 = No (skip to Q8) 1 = Yes
7a	How often did this happen? 1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to 10 times in the past four weeks) 3 = Often (more than 10 times in the past four weeks)
8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food? 0 = No (skip to Q9) 1 = Yes
8a	How often did this happen? 1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to 10 times in the past four weeks) 3 = Often (more than 10 times in the past four weeks)
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food? 0 = No 1 = Yes
9a	How often did this happen? 1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to 10 times in the past four weeks) 3 = Often (more than 10 times in the past four weeks)

Source: Coates, Swindale, and Bilinsky (2007). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide: version 3.

**Table A2.** Calculation of Household Food Insecurity Access (HFIA) Categorical Variable

HFIA Categories	Calculation
Food secure	HFIA category = 1 IF (Q1a = 0 or Q1a = 1) and Q2 = 0 and Q3 = 0 and Q4 = 0 and Q5 = 0 and Q6 = 0 and Q7 = 0 and Q8 = 0 and Q9 = 0
Mildly food insecure	HFIA category = 2 IF (Q1a = 2 or Q1a = 3 or Q2a = 1 or Q2a = 2 or Q2a = 3 or Q3a = 1 or Q4a = 1) and Q5 = 0 and Q6 = 0 and Q7 = 0 and Q8 = 0 and Q9 = 0
Moderately food insecure	HFIA category = 3 IF (Q3a = 2 or Q3a = 3 or Q4a = 2 or Q4a = 3 or Q5a = 1 or Q5a = 2 or Q6a = 1 or Q6a = 2) and Q7 = 0 and Q8 = 0 and Q9 = 0
Severely food insecure	HFIA category = 4 IF Q5a = 3 or Q6a = 3 or Q7a = 1 or Q7a = 2 or Q7a = 3 or Q8a = 1 or Q8a = 2 or Q8a = 3 or Q9a = 1 or Q9a = 2 or Q9a = 3

Source: Coates, Swindale, and Bilinsky (2007). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide: version 3.