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MANOELLA REZENDE SOARES GOMES

FOOD SECURITY INDICATORS IN BRAZIL: A CASE STUDY

RECIFE

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Final paper presented to the Department of Economics of the Federal University of Pernambuco as a requirement for obtaining a bachelor's degree in Economic Sciences.

Advisor: Ricardo Chaves Lima

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ABSTRACT

This study examines the relationship between socioeconomic variables and the Food Consumption Score (FCS), a widely used proxy indicator for food security, among Brazilian households. It was based on a sample of 456 surveys collected from individuals responsible for their household food decisions. The analysis revealed that available income can have a direct influence in the dietary diversity, subsequently affecting the food security level of households, as well as age and level of education of the respondent. Gender also emerged as a significant variable, as women tended to have a higher FCS than men. These findings provide insights into the food consumption patterns within households sharing similar characteristics and can enhance specific points for a more in-depth study. The results described in this paper pertain to this specific case study and it is advised caution when generalizing these findings to another population in Brazil.

Keywords: food security; dietary diversity; FCS

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SUMMARY

1. INTRODUCTION

According to the Food and Agriculture Organization of the United Nations' (FAO) definition, "food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (World Food Summit, 1996).

The first official concept of "food security" surfaced in the 1970s during a global food crisis and, for over 25 years, its definition has been broadened and improved, incorporating other aspects rather than simply the level of food supplies, as it did initially. According to the FAO, "today, the concept encompasses not only the availability of food, but also its accessibility, utilization, and sustainability" (FAO, 2013), as well as the access by vulnerable people, balancing the supply and the demand. With the development and refinement of the official definition, it now reflects the complexity of food security, an international issue and a crucial indicator for policymaking.

As a result of the continuous evolution of the concept, "food security" is a very flexible term and has over 200 definitions published (Maxwell & Smith, 1992). That considered, it is important to note that the way in which data on food insecurity is collected and analyzed can vary significantly depending on the definition used, even inside the same study. This underscores the need for clarity in the definition of food security used in policymaking and data collection efforts.

These issues are particularly relevant in the context of the COVID-19 pandemic, for example, which has exacerbated global food insecurity. For instance, a report from the FAO showed that, in 2020, an estimated 2.37 billion people lacked access to adequate and nutritious food, with Latin America being one of the most affected regions, where 41% of the population experienced severe or moderate food insecurity, with a discrepancy between genders – women had higher percentages than men in all regions (FAO, 2021). In Brazil, a study by the Brazilian Institute of Geography and Statistics (IBGE) revealed that 10.3 million people were living in households with some degree of food insecurity in 2019, representing 4.9% of the population.

There are several indicators that can be used to assess food security of families. The Brazilian Food Insecurity Scale (EBIA) is one of them, developed to assess both the availability and the quality of food intake of families (ALMEIDA et al., 2017). Another indicator widely used in food security studies worldwide is the Food Consumption Score (FCS). According to Chinnakali et al. (2014), "the FCS is a composite measure that reflects food consumption over a given period of time and considers both the diversity and frequency of food consumption".

The use of FCS can contribute to identifying more vulnerable groups and assist in planning public policies aimed at guaranteeing the human right to adequate food. This was the chosen tool for assessing food situation in the sample collected and used in this research.

This topic holds great significance given its direct influence on the population's health and well-being. Understanding which are the main food security indicators in Brazil becomes crucial for evaluating and proposing solutions to the challenges faced in achieving adequate nutrition.

Therefore, this study aims to analyze possible food security indicators in Brazil, considering aspects such as availability, access and utilization of food, and identify the most relevant food security indicators and their relation to the analyzed sample. With the results, this paper aspires to provide insights that could assist on improving food security in Brazil, perhaps assessing interventions and programs that address the specific needs of the population. Ultimately, the findings of this study have the potential to improve the health and well-being of the population by providing valuable information on which food security indicators are most effective for policymaking inside of the characterization of the sample.

2. PROBLEM DISCUSSION

The definition of "food security" has evolved over time in order to broaden and encompass different facets of the term, with a fundamental role played by the FAO in this process. Initially, in 1974, their primary focus was centered on the stability and volume of food supplies, to ensure that enough food, in sufficient quantity, would be available. In 1996, the official definition of food security adopted by both the FAO and the World Food Program (WFP) highlighted the concern for people's ability to have economic and equal access to food, as well as its quality and safety.

In a classic work about the subject, Sen (1981), through his "entitlement approach", provides insight into how food insecurity is not only due to a lack of adequate food, but also to the inability of certain groups to access such food, often due to extreme poverty, even with functioning markets. This emphasizes the importance of the rights of individuals to access food, acknowledging that the underlying social and economic factors can prevent this, rather than only focusing on increasing food production (DEVEREUX, 2001).

In other words, the general concept of food security has evolved from a focus on aggregate food availability, or the supply side, to an individual emphasis that also considers the demand side (BARRETT, 2002).

In capitalist economies, such as Brazil, access to food on a daily basis is often tied to having an income, exempting children that rely on school lunch and families that practice family farming for self-consumption (HOFFMANN, 2008). With food being treated as a commodity, the primary focus is on maximizing profits, which leaves it subject to price fluctuations as a result of the law of supply and demand. Because of that, those who lack the financial resources to purchase food face a greater risk of food insecurity, which can negatively impact their health and overall well-being. As so, food insecurity is directly related to poverty and social inequality, being the last one an essential synonym to it (FREITAS, 2005).

Understanding the factors that are directly related to food insecurity is crucial for effective policymaking, as it allows the identification of specific needs that may only be identifiable through research. This knowledge can inform targeted interventions and programs that address the root causes of food insecurity and ultimately lead to improved health and well-being outcomes for those affected.

A study conducted by Ribeiro et al. (2005) primarily focuses on the correlation between food insecurity and the rising prevalence of obesity, as households with limited resources tend

to purchase food with high energetic density and fat content. It was found that food insecurity was prevalent among low-income households, especially those with lower education levels. For that reason, the authors suggest that policies and interventions to improve food security should not only focus on food availability, but also on its accessibility.

Pereira et al. (2022) also reported a similar association, which analyzed data collected from households in a Brazilian city in Tocantins. The study found a correlation between household food and nutritional security and obesity. Among other socioeconomic factors, the study identified a strong association between food insecurity and female-headed households. These findings highlight the complex interplay between food security, nutrition and the socioeconomic factors.

As discussed by Arimond et al. (2010), "dietary diversity is indeed strongly associated with nutrient adequacy and is thus an essential element of diet quality". Foremost, this present study analyzed the food consumption patterns between the households within the sample and associated their socioeconomic characteristics to enhance which ones were more relevant. As the proxy indicator used for food security is the food consumption score (FCS), it takes in consideration the dietary diversity (as explained in section 3.1) and thus its diet quality, while analyzing the level of food security in the household level.

2.1. Food security in Brazil: history and policies

Figure 1 shows the four dimensions of food security (FAO, 2008).

Table 1 – The four dimensions of food security

Physical AVAILABILITY of food	Food availability addresses the "supply side" of food security and is determined by the level of food production, stock levels and net trade.
Economic and physical ACCESS to food	An adequate supply of food at the national or international level does not in itself guarantee household level food security. Concerns about insufficient food access have resulted in a greater policy focus on incomes, expenditure, markets and prices in achieving food security objectives.
Food UTILIZATION	Utilization is commonly understood as the way the body makes the most of various nutrients in the food. Sufficient energy and nutrient intake by individuals is the result of good care and feeding practices, food preparation, diversity of the diet and intra-household distribution of food. Combined with good biological utilization of food consumed, this determines the *nutritional status* of individuals.
STABILITY of the other three dimensions over time	Even if your food intake is adequate today, you are still considered to be food insecure if you have inadequate access to food on a periodic basis, risking a deterioration of your nutritional status. Adverse weather conditions, political instability, or economic factors (unemployment, rising food prices) may have an impact on your food security status.

Source: FAO, 2018

In Brazil, the concept of food security was introduced in the 1990s, with the creation of the National Council for Food Security (CONSEA) in 1993 and the holding of their first National Conference on Food Security (CNSNA) in 1994. Since then, several public policies have been implemented with the aim of promoting food security in the country, such as the National School Feeding Program (PNAE) in 1955, the Zero Hunger Program in 2003 and one of its initiatives, the Food Acquisition Program (PAA).

The Zero Hunger Project aimed to address the issue of food insecurity by proposing structural policies to increase the supply of basic foods and improve income, aiming at reducing the incompatibility of food prices and the purchasing power of Brazilian consumers. As of the PAA, it is a program that buys food directly from family farmers and distributes it to populations in food insecurity, allowing to meet the demands for access to food by vulnerable populations and, at the same time, also supporting family farming (GRISA & ZIMMERMANN, 2015).

The establishment of the Millennium Development Goals (MDG) by UN and its adoption by 191 countries, including Brazil, created a global partnership to address socioeconomic issues (i.e. poverty) from 2000 to 2015, with unprecedent efforts. Even though Brazil had one of the best outcomes in the world, the new Agenda 2030, set as a continuation of the MDG, still presents with significant challenges to overcome, particularly in reducing social and economic inequality, worsened by the current economic scenario (GOMES, BARBOSA & OLIVEIRA, 2020).

One of the social assistance programs of Brazil is the Bolsa Familia Program (PBF), the main income transfer program of the Federal Government, which provides monthly financial assistance to beneficiary families (FERREIRA et al., 2011). According to the Ministry of Social Development and Fight Against Hunger (2023), in order to receive the direct income transfer, beneficiary families of the PBF must fulfill certain conditionalities in the areas of health and education, such as: prenatal care of pregnant women, compliance with the immunization schedule, monitoring the nutritional status of children under 7 years old and achieving the children's minimum school attendance levels.

Ferreira et al. (2011) conducted a study with children from *quilombola*[1] communities of the Brazilian state Alagoas and found low prevalence of stunted growth, an indicator of chronic

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[1]*Quilombolas*: people who are descendants of communities that were established by runaway slaves during the colonial period in Brazil, historically subjected to discrimination. Even nowadays, they continue to experience social and economic disparities in comparison to the rest of the country.

malnutrition that happens when a child has lowest height than expected. With 76% of the children belonging to families assessed by the Bolsa Familia Program, the authors believe that at least part of this effect may be due to the implementation of the program and its conditionalities, which reflect positively in the health and nutrition of the children.

3. METHODOLOGY

3.1. The Food Consumption Score (FCS)

There are numerous methods to analyze the food consumption of households. In this research, the indicator chosen was the FCS, created and widely used by the WFP (WFP, 2005) as a proxy of food security. It takes in consideration dietary diversity (by dividing the different types of food into groups), food frequency (answered by the respondent to each food group) and relative nutritional importance (by giving different weights to every group in its calculus). In this study, the FCS will be used as the proxy indicator of food security in the household level.

The FCS is calculated through analysis of the food consumption of a household in a seven-day recall period: to collect this information, the person most responsible for the household's food was asked how many of the last seven days they consumed food items, which were divided into eight food groups that reflect the local diet of the country. Each of those food groups has an individual weight that reflects the quality of the nutrients brought to the household's diet, which is its relative nutritional importance, shown in **Table 2**.

Table 2 – Food groups

Food group	Title	Examples of food items	Weight
1	Main staples	Rice, bread, corn, wheat	2
		Potato, cassava, yam	
2	Pulses	Beans, soya, nuts, peanuts	3
3	Vegetables	Carrot, broccoli, onion, tomato, lettuce	1
4	Fruits	Banana, apple, lemon, papaya	1
5	Meat and fish	Beef, pork, fish	4
		Egg	
6	Milk	Milk, yogurt, cheese and other dairy products	4
7	Oil	Oil, fat, butter	0.5
8	Sugar	Sugar, honey, jam, cake, sweets	0.5

Source: own elaboration

The frequency of consumption of each food group ranges from 0 to 7, as the recall period's limit is seven days. The score is calculated through the following calculus:

$$FCS = \sum_{i=1}^{8} fi \text{ x } wi$$

Where:

- i – the number of the food group;
- f_i – the frequency of consumption of the food group (0 to 7);
- w_i – the weight of the food group.

The possible FCSs are in a continuous range from 0 to 112, 0 representing when there is no consumption of any of the eight food groups and 112 when all eight food groups are consumed in all the latest seven days. It is important to emphasize that the FCS is not a simple frequency sum – through weighting each food group, it is also taken in consideration the relative nutritional importance.

According to the WFP's standards, the households are then classified in three food consumption groups, based on their FCS:

- Households with poor consumption: range from 0 to 21;
- Households with borderline consumption: range from 21.5 to 35;
- Households with acceptable consumption: higher than 35.

From those options, only the last one is considered "food secure".

Instead of solely providing this classification, this score also offers a broader perspective on the dietary habits of the analyzed population.

3.2.   Survey design

The questions in this survey were carefully designed to gather primary data on specific socioeconomic variables while also providing a deeper understanding of the food consumption pattern within the households participating in this study. For this reason, the target respondent was the head of the household or the person that is most responsible for the food decisions in the house.

The first part of the survey consisted of questions about the following socioeconomic information's of the respondent:

- Age;
- Gender;
- Educational level;

- Working status;

- Monthly gross family income;

- Number of people that live in that household (N);

- How many of those people receive any type of income (W).

The last two variables (N and W) were combined to calculate the **dependency ratio** (DR): the proportion of the household members that do not receive any type of income, as a fraction of the total number of household members.

$$DR = \frac{(N - W)}{N}$$

This variable has a continuous range of 0 to 1, with 0 representing the case of all household members having some sort of income, and 1 indicating that none of them have any type of income.

The second part of the survey was related to the food consumption of the households. Some of the questions focused on the data collection of dietary diversity and consumption frequency in order to calculate the FCS. The inquiries were clear, direct, not complex to answer and did not involve subjectivity, which is an advantage for simplifying the data collection process.

To calculate the FCS, described in section 3.1, ten questions were asked about the frequency of consumption of the food groups in the last seven days to the head of the household. The question asked was "related to the last seven days, in how many of them did you consume:" to each one of the eight food groups (**Table 1**). With the individual answers, each of the household's FCS can be then individually calculated.

By examining the correlation between the socioeconomic variables and the FCS, used as a proxy indicator for food security, it was possible to determine the relevancy of each of these parameters in relation to household-level food security.

3.3. Online survey

There has been a significant increase in primary research on computer-mediated methods over time. Although this technology is still young, it brings the advantage of not being as time-consuming as a regular interview, that has not only the time limitation, but also geographic. With the online survey, access to a wider range of the population is possible and the data collection can be happening while other tasks are simultaneously in course.

In 2021, 90,0% of Brazilian households had internet access, marking a 6% increase compared to the previous national research conducted in 2019. Specifically, in the age group of 60 years and older, the percentage increase was even higher: the number rose from 44,8% in 2019 to 57,5% in 2021. (PNAD, 2021). In the current global scenario, people of all age groups are becoming more connected, even the ones living in farther away parts of the world.

For all those same reasons, internet research is more economical and accessible (KRAUT et al. 2004). Anyone can start an online survey without any financial cost, as there is a variety of options of websites that offer this tool for free. This makes the data collection more democratic, as it allows all interested researchers to have access to respondents, regardless of whether they have financial support or not, as it could eliminate or substantially decrease the recruitment cost.

The use of a convenience sample for this study was appropriated since its purpose was to provide a case study. However, due to its nonprobability nature, the results found have limitations in terms of generalizability, as they may be subject to biases, and could not be representative of a larger population.

On the other hand, as said in Eysenbach (2004), "every biased sample is an unbiased sample of another target population, and it is sometimes just a question of defining for which subset of a population the conclusions drawn are assumed to be valid". Furthermore, the population of the sample used in this paper was carefully described in the results section.

The target respondent of the survey was the individual with a better understanding of the household food decisions, namely the household heads. Therefore, the survey was distributed to social media groups related to this topic, with a specific request that the respondent be the household head to ensure the highest level of precision in the answers.

3.4.   Survey data and the variables

The total number of fully completed surveys was 456. The data was collected from 29/09/2022 to 13/12/2022 and **Table 3** shows a description of the variables.

This survey was administered in collaboration with other researchers from the same food security research group, each focusing on different aspects. The section of socioeconomic variables has common points to those studies.

Table 3 – Variables of the model

Variables	Definition
Age	Age of the household head. The minimum age considered for this survey was 18 years old.
Gender	Gender of the household head. Male or female.
Educational level	Number of years of formal education of the household head.
Marital status	If the household head is married/in a common-law marriage or not.
Employment status	If the household head is currently working or not.
Income	Monthly gross income of the entire household. It was not considered per capita.
Dependency ratio	Proportion of the household members that do not receive any type of income as a fraction of the total number of household members.
FCS	Food Consumption Score. Individually calculated for each household through the collected consumption data.

Source: own elaboration

4. RESULTS

Table 4 displays a summary of all socioeconomic variables collected through the 456 surveys submitted.

Table 4 - Socioeconomic characteristics of the sample

| Age	Frequency	Percentage
18 to 24	43	9,4%
25 to 34	90	19,7%
35 to 44	98	21,5%
45 to 54	103	22,6%
55 or more	122	26,8%
Gender	**Frequency**	**Percentage**
Male	91	20,0%
Female	365	80,0%
Educational level[2]	**Frequency**	**Percentage**
Low	22	4,8%
Medium	174	38,2%
High	260	57,0%
Marital status	**Frequency**	**Percentage**
Single	235	51,5%
Married	221	48,5%
Employment status	**Frequency**	**Percentage**
Unemployed	142	31,1%
Employed	314	68,9%
Income	**Frequency**	**Percentage**
Below the median[3]	209	45,8%
At least the median	247	54,2%
Dependency ratio	**Frequency**	**Percentage**
0,00 to 0,20	152	33,3%
0,21 to 0,40	97	21,3%
0,41 to 0,60	113	24,8%
0,61 to 0,80	54	11,8%
0,81 to 1,00	40	8,8%
FCS	**Frequency**	**Percentage**
0 to 40	0	-
40 to 49	9	2,0%
49,5 to 58	6	1,3%
58,5 to 67	15	3,3%
67,5 to 76	50	11,0%
76,5 to 85	72	15,8%
85,5 to 94	93	20,4%
94,5 to 103	94	20,6%
103,5 to 112	117	25,7%

Source: own elaboration

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[2]**Low**: maximum of 9 years; **medium**: more than 9 and maximum of 14 years; **high**: more than 14 years.
[3]**Median**: R$4.500,00.

The majority of the respondents were female (80,0%), with high educational level (57,0%) with means at least a post-graduate study, with formal employment (68,9%) and an average age of 44 years old. The median monthly gross income of the household was R$4.500,00. The decision to use the median instead of the average was motivated by the median generally being less distorted by outliers and better representing the typical value of the sample.
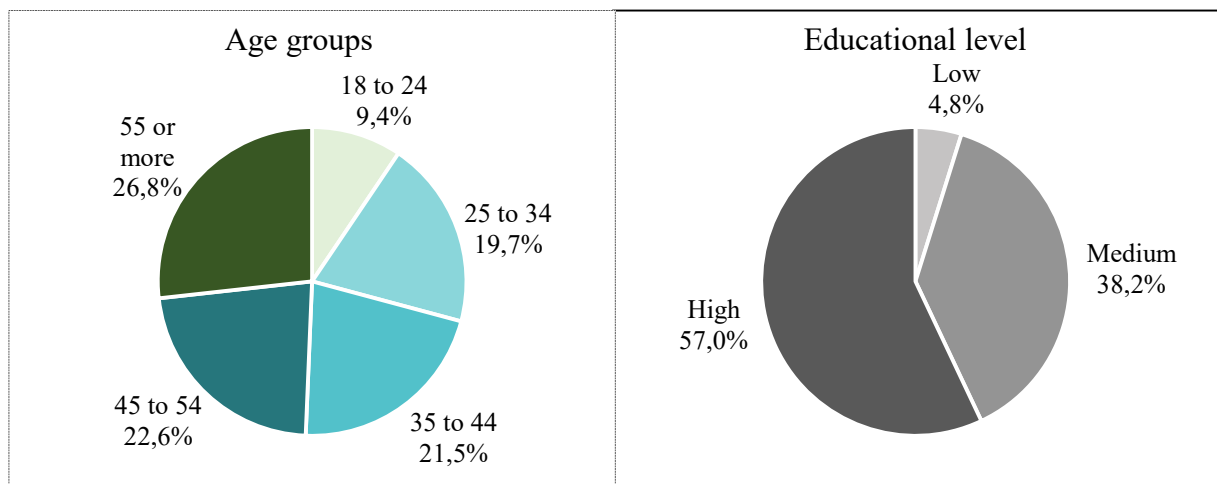
Although the predominance of the household heads was single (51,5%), the disparity was not significantly substantial. The statistics are shown on **Graphic 1**, **Graphic 2** and **Graphic 3**.

Graphic 1 – Proportion of gender, marital status and employment status
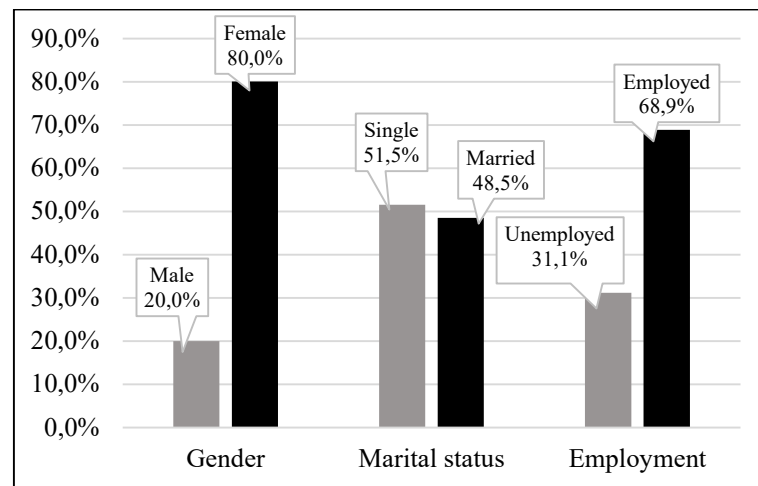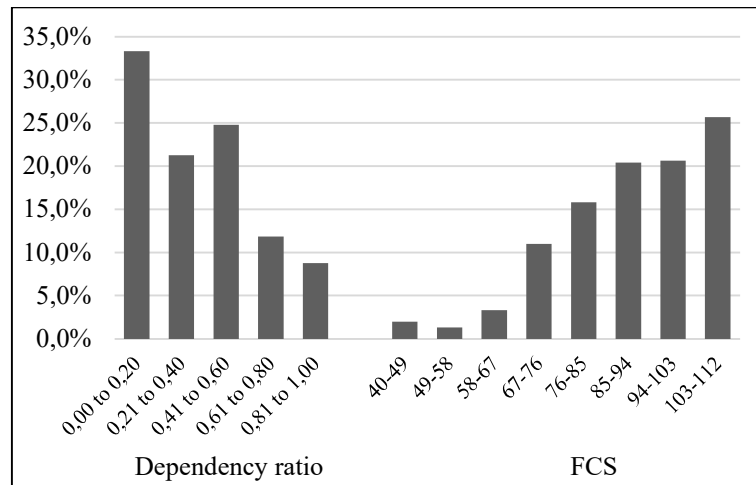

Source: own elaboration

**Graphic 2** – Proportion of age groups and educational level

Source: own elaboration

Graphic 3 – Proportion of dependency ratio and FCS

Source: own elaboration

Among the 456 surveys conducted, it was found that 100% of the respondents were "households with acceptable consumption" based on their FCS scores, which were all above 35, lowest recorded score in the sample being 40. This result classifies all participant households as "food secure" by the WFP standards.

In this context, the FCS served as a measure of how food secure the respondent's households are, now ranging on a scale from 40 to 112. Higher scores indicate a higher level of food security. It is on this basis that the following study explored the correlation between each of the socioeconomic variables and the FCS, proxy of food security level.

Graphic 4 – Statistics of consumption of all eight food groups
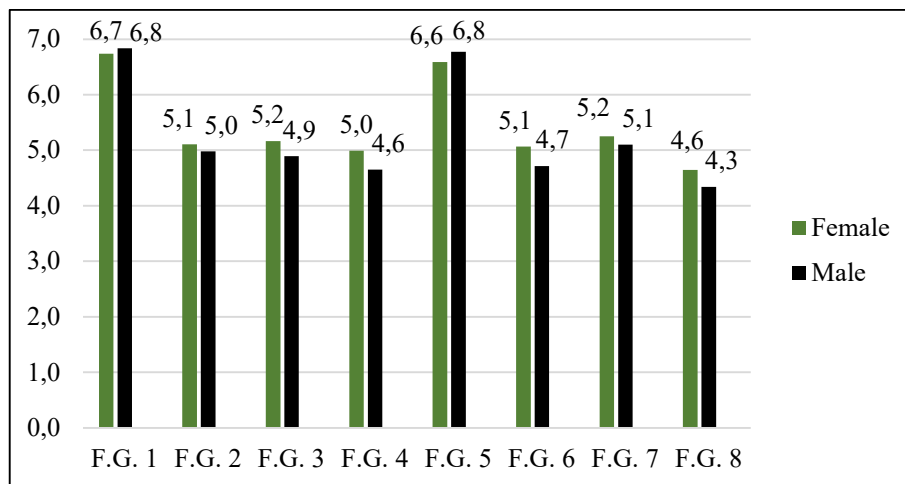
Source: own elaboration

Graphic 4 shows the average consumption frequency of each food group (which were described in **Table 2**).

The two groups with the highest average consumption in the households of the sample were, by far, food groups 1 and 5, respectively "main staples" and "meat and fish". Overall, consumption was quite balanced between households led by both female and male heads. However, it is worth mentioning that in households led by males, there was considerably less consumption of "fruits" (F.G. 4) and "milk" (F.G. 6) compared to households led by female.

Graphic 5 – Consumption of "vegetables", "fruits" and "sugar" according to income
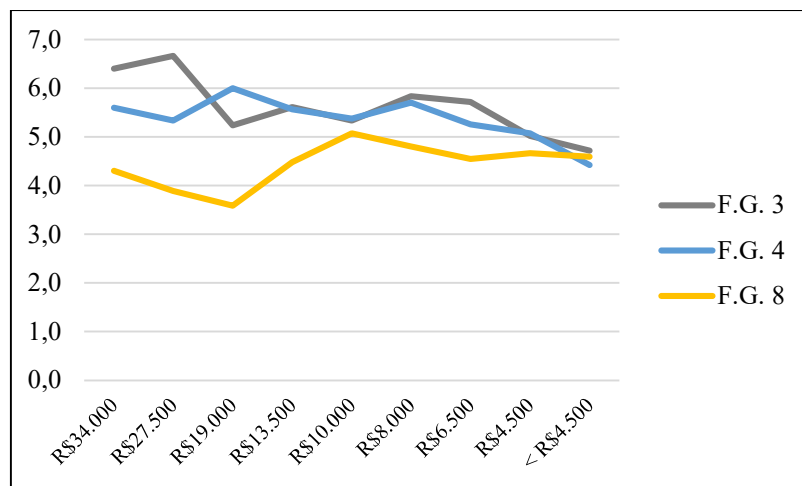
Source: own elaboration

**Graphic 5** shows the behavior of consumptions patterns among three of the eight food groups.

Food groups 3 and 4, representing "vegetables" and "fruits", respectively, exhibit a decreasing trend in both their consumptions with a decrease in "income". This could be associated to, when a smaller portion of the household revenue can be allocated to food expenses, as it's the case with low incomes, the investment in nutritional quality and dietary diversity is significantly limited. Consequently, this directly influences negatively the FCS and the level of food security within the family.

In food group 8, which represents "sugar" (i.e. cake, sweets, jam), a different behavior happened. With decreasing "income", the consumption of this food item showed, most of the time, an increase pattern. This result agrees with the study conducted by Ribeiro et al. (2005), where it was found that households with limited resources tend to purchase food with high energetic density and fat content, such as the items of this food group.

Graphic 6 – Consumption of "main staples" and "meat and fish" according to income
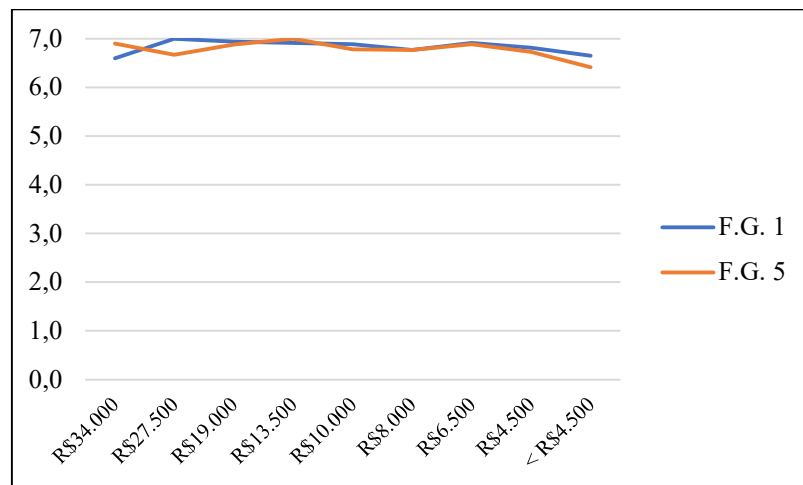
The consumption of food groups 1 ("main staples" as rice, bread and potato) and 5 ("meat and fish") had a stable behavior – even among very different income groups, the variation on their consumption was relatively small, as shown in **Graphic 6**.

Graphic 7 – Correlation between FCS and dependency ratio
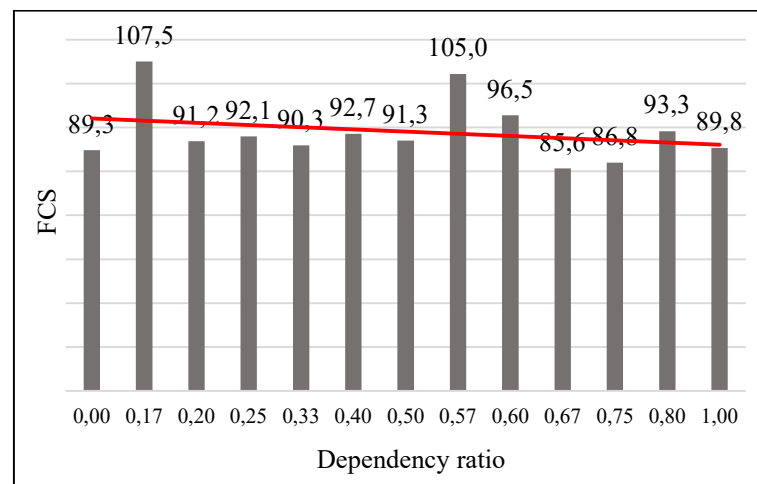
Graphic 7 shows how the FCS distributes among the different dependency ratios of the sample. A negative correlation, which a coefficient of -0,2168, can be observed between the two variables: the fewer dependents in the household (i.e., the lower the dependency ratio), the higher the FCS tends to be.

One likely explanation for this result could be the fact that, when there are more economically active individuals within the household, resulting on a higher total income and larger portion of being allocated to food expenses. This can facilitate a more diverse and nutritional dietary, extending beyond the staple foods.

**Graphic 8** – Dependency ratio and employment status x FCS
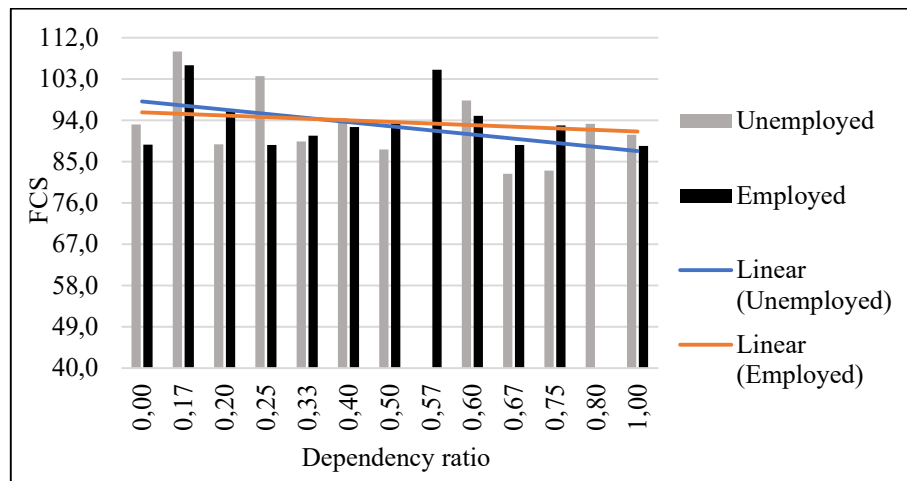
Source: own elaboration

Expanding the analysis of **Graphic 7** by including the employment status (**Graphic 8**), a considerable difference was found between employed and unemployed respondents.

Among respondents with formal employment, the negative correlation observed between the dependency ratio and the FCS had a coefficient of -0.1642. For unemployed respondents, the negative correlation appears to be more significant, with a coefficient of -0.4307.

This disparity may be attributed to unemployed individuals allocating a smaller portion of the household's budget to food, potentially dominated by staple food with limited diversity. This is especially noticeable in cases where the dependency ratio is 1.00, indicating that no one in the household is receiving any type of income. In such scenarios, it is possible that the household has a limited budget, with essential monthly expenses but no monthly income, which can significantly affect their ability to access a diverse and nutritionally balanced diet, that would lead to a higher FCS.
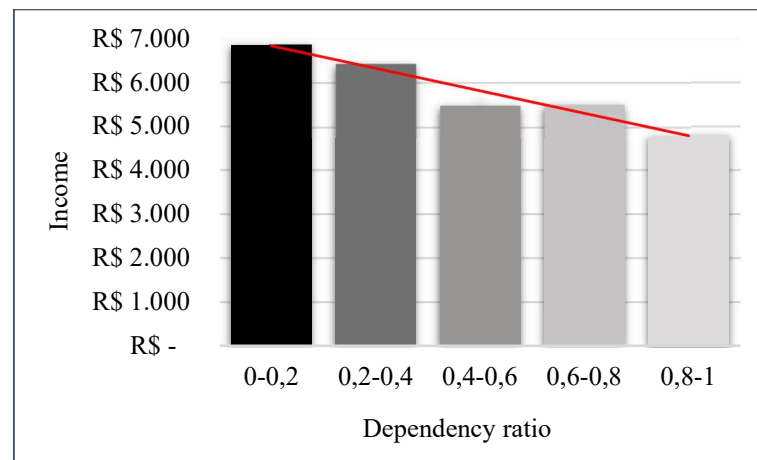
Source: own elaboration

In **Graphic 9**, the analysis reveals a decreasing trend between the average household income and the dependency ratio. This shows that the households from the sample with more economically active individuals, represented by a lower dependency ratio, tend to exhibit a higher family gross income.

This result is consistent with the conclusions drawn from the analysis in **Graphic 8**. The available income can directly influence the diversity of the diet.

Graphic 10 – FCS of each gender
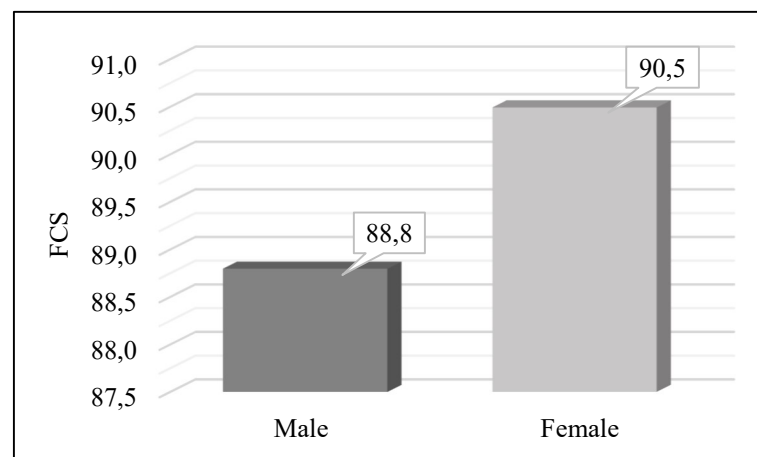
Source: own elaboration

Graphic 10 shows that the FCS was considerably different between the genders. Female household heads demonstrated a higher score, indicative of better food consumption, in the

survey questionnaires, which demonstrates a higher level of care and attention this group gives to the consumed food in their household.

       This result can be associated with the statistics in **Graphic 4**. Female headed households exhibited a higher average consumption in six of the eight food groups (exempting "main staples" and "meat and fish", where the difference was 0,1 and 0,2, respectively, to male headed households), showing a higher diversity and variety.

Graphic 11 – Reflection of educational level in the FCS – **male** respondents
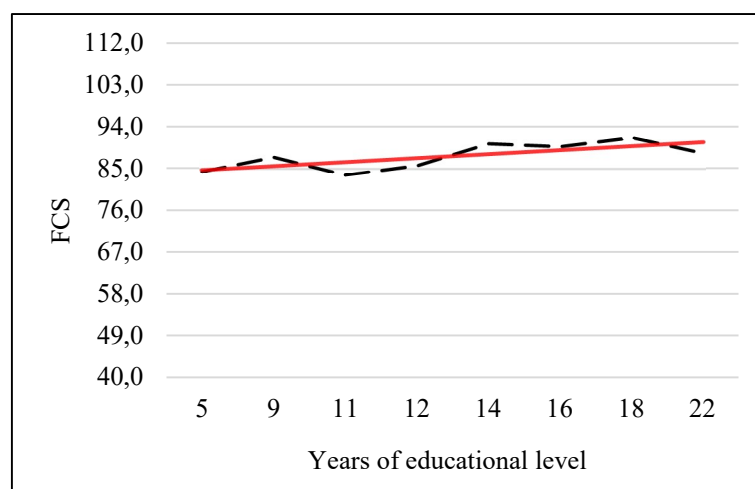
Source: own elaboration

Graphic 12 – Reflection of educational level in the FCS – **female** respondents
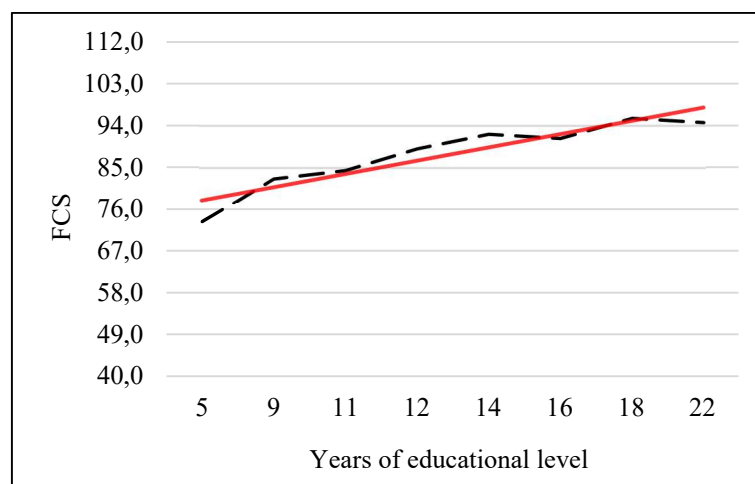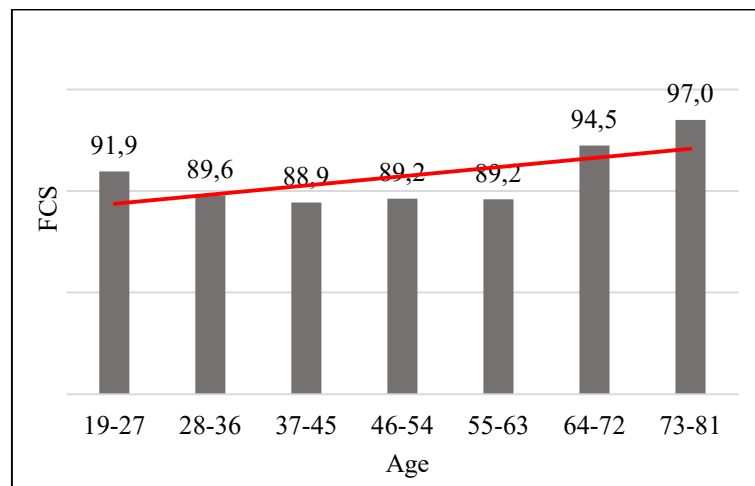

Source: own elaboration

       In both **Graphic 11** and **Graphic 12**, it is possible to observe that there is an upward trend between the FCS and the number of years of formal education on the sample, which

indicates that a higher level of education tends to reflect on better eating habits – a positive correlation with a coefficient of 0,6616 and 0,9235, respectively.

This result agrees with Schott (2020), where it was found a positive relationship between low level of schooling of the household head and food insecurity.

It is also relevant to note that the arising trend was even more visible with female respondents (**Graphic 12**) than with male respondents (**Graphic 11**), which agrees with the result and the conclusions previously found (**Graphic 10**) that female respondents, in average, showed a higher FCS than male.

Graphic 13 – Reflection of age on the FCS

Source: own elaboration

**Graphic 14** – Scatter plot of age vs. FCS
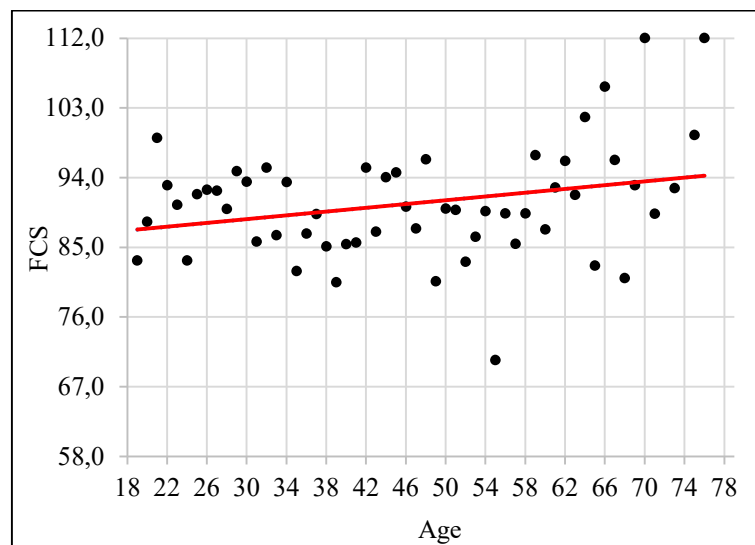
Source: own elaboration

It is also pertinent to examine the correlation between the FCS and the variable "age". This analysis revealed a positive correlation with a coefficient of 0,2760: an increase in age is associated with a tendency for a higher FCS. This is visually represented on the scatter plot in **Graphic 14**, while **Graphic 13** provides a comprehensive illustration of the results within the sample space.

Graphic 15 displays the distribution of income based on the age of the household head. It reveals a positive correlation between these two variables, which indicate that, on average, older respondents who are household heads tend to have higher household monthly incomes.

The conclusion that older participants tend to have better eating habits (i.e. higher FCS) than younger ones can be supported by several explanations. In summary, a combination of different factors, including a greater emphasis on health, experience, and higher income levels among older participants (as shown in **Graphic 14**), can provide household heads with the means to access a wider variety of nutritious foods, which can contribute to those better eating habits and, by consequence, higher FCS compared to younger household heads in the study. This finding aligns with the positive correlation between income and FCS, as previously analyzed.

Graphic 15 – Age and income
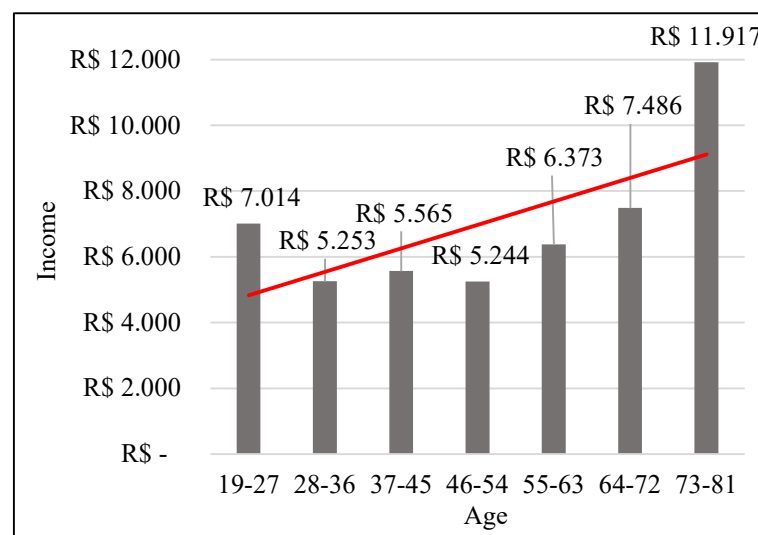
Source: own elaboration

Graphic 16 – Income and marital status x FCS
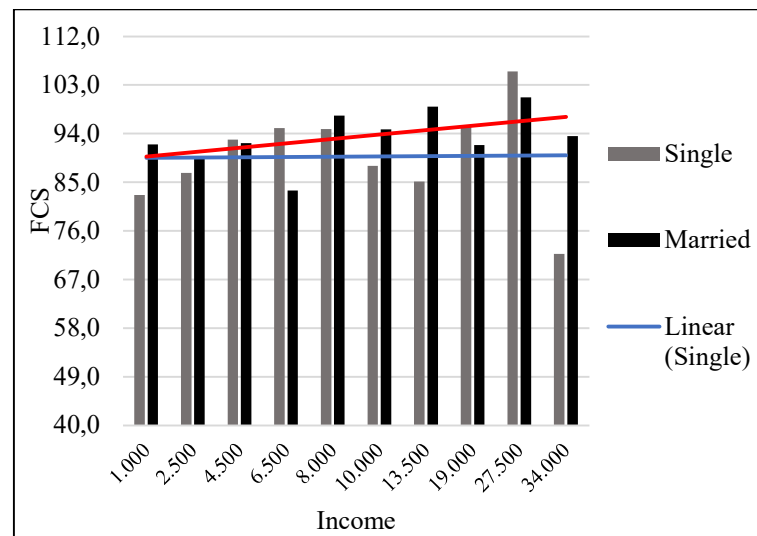
Source: own elaboration

Another relevant analysis of the socioeconomic variable "income" is when it is examined in conjunction with the marital status of the respondent. This analysis exhibited a dual behavior, as demonstrated in **Graphic 16**. Among respondents with "single" marital status, a negative correlation between income and the FCS was observed, with a coefficient of -0,0916. In contrast, among married respondents, a positive correlation was observed, with a coefficient of 0,4288.

5. FINAL COMMENTS

The fact that the entire sample of 456 surveys was considered "food secure" according to their FCS and the FAO classification could be attributed to the composition of the sample. As the survey was administered online, all respondents had internet access and were capable of reading.

Overall, this particular characteristic of the sample did not impact the extent of the study, as the FCS was employed not solely for categorization means. In other words, the focus of the study was on evaluating the degree of food consumption and food security within households, rather than simply categorizing the households on an insecure-secure scale.

The findings of this study suggest that the socioeconomic variable "gender" proved to be very relevant to the food security level of the families. The results show that female headed households exhibited higher level of FCS and, by consequence, higher dietary variety and nutrient-rich foods. The variable "education" and "age" also had a significant positive correlation.

The consumption patterns of the food groups from the FCS calculus showed some clear results. All income groups exhibited similar consumption of main staples and fish and meat, but that behavior did not extend to other groups such as fruits and vegetables, as lower-income households maybe could not include those in their diet due to budget limitations.

This case study can contribute to the analysis of the food security within households as it shows an extent description of the results and its statistics and how they relate to a widely used proxy indicator of food security (the FCS).

It could be interesting and enriching to make a wider sample size, including more respondents with lower educational level, to have an even deeper understanding of how the socioeconomic variables described in this paper also behave in this context.

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