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Access to food and food and nutrition security: assessment of situation in municipalities in Bahia, Brazil

Acesso aos alimentos e segurança alimentar e nutricional: avaliação da situação em municípios baianos

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Abstract

Objective: To evaluate the situation of food and nutrition security at the municipalities of Bahia state and the main determinants in the dimension of access to food. *Methods:* We used a protocol of indicators that evaluates food and nutrition security covering four dimensions (availability, food access, food consumption and biological use of nutrients). Secondary data on Bahia municipalities (available in public online databases) were used. Prevalence measures were calculated and associations were verified between the variables of the study. *Results*: In the municipalities evaluated, it was noted that 119 municipalities (28.7%) were in light Food Insecurity and 286 (69.1%) were in moderate Food Insecurity. For the Access to Food dimension, there was a predominance of moderate Food Insecurity (71.5%), and the indicators that contributed most to this situation were the proportion of people with low income and percentage of population aged 15 years or more and less than 4 years of schooling. There was a significant association between Food Insecurity in the municipalities, considering all dimensions and the status of Food Insecurity at the dimension of Access to Food ($p<0.000$), and between the situation of Food Insecurity at the dimension of Access to Food and the lowest Municipal Human Development Index ($p<0.000$). *Conclusion*: Although the dimension Access to Food was strongly related to Food Insecurity, it was not enough to explain it individually in Bahia municipalities. The protocol used can help managers to define strategical actions to face the problem.

Keywords: Food and Nutrition Security. Access to Food. Bahia Municipalities. Indicators.

Resumo

Objetivo: Avaliar a situação de Segurança Alimentar e Nutricional nos municípios do Estado da Bahia e seus principais determinantes na dimensão de Acesso aos Alimentos**.** *Métodos:* Aplicou-se um protocolo de indicadores que avalia a Segurança Alimentar e Nutricional em âmbito municipal, englobando quatro dimensões (disponibilidade, acesso e consumo de alimentos e utilização biológica de nutrientes). Foram utilizados dados secundários dos municípios baianos, disponíveis em bases de dados *on-line* de acesso público. Foram calculadas medidas de prevalência e verificada a associação entre as variáveis do estudo. *Resultados:* Nos municípios avaliados, observou-se que 119 (28,7%) estavam em Insegurança Alimentar leve e 286 (69,1%), em Insegurança Alimentar moderada. Na dimensão Acesso aos Alimentos houve predominância de Insegurança Alimentar moderada (71,5%), e os indicadores que mais contribuíram para esse quadro foram proporção de pessoas com baixa renda e percentual da população com 15 anos ou mais e menos de 4 anos de estudo. Houve associação significativa entre a situação de Insegurança Alimentar nos municípios, considerando todas as dimensões, e o estado de Insegurança Alimentar na dimensão de Acesso aos Alimentos ($p<0,000$). E entre a situação de Insegurança Alimentar na dimensão de Acesso aos Alimentos e menores Índices de Desenvolvimento Humano Municipal ($p<0,000$). *Conclusão:* Apesar da dimensão de Acesso aos Alimentos ter forte relação com Insegurança Alimentar, não se mostrou suficiente para explicá-la isoladamente nos municípios baianos. A aplicação do protocolo adotado pode auxiliar gestores a definir ações estratégicas para enfrentamento do problema.

Palavras-chave: Segurança Alimentar e Nutricional. Acesso aos Alimentos. Municípios baianos. Indicadores.

Introduction

In the last decades, the debate on Food and Nutrition Security (FNS) in Brazil has become more prominent, being discussed by the State and sectors of the organized civil society.[1,2]

FNS in Brazil is defined by the Food and Nutrition Security Law as

> the secured fulfillment of everyone's right to regular and permanent access to quality foods, in sufficient amount, without hindering access to other essential needs, based on health-promoting food practices that consider cultural diversities and are environmentally, culturally, economically and socially sustainable.[3] (Our translation)

This concept is the result of several achievements related to the assurance of citizenship and human rights to food and is designed to approximate the four FNS dimensions, which are: foods availability (FA), access to foods (AF), foods consumption (FC), and biological use of nutrients (BUN), also considering their inter-relations.[4,5]

In this context, FNS has been the focus of development of actions and public policies in Brazil aiming to an integrated operations logic and comprises several government sectors such as health, agricultural production, food supply, employment and income generation, food education, food safety and quality, as well as direct actions to expand access to foods and direct income transfer.[4,6]

Studies on the prevalence of Food Security and Food Insecurity (FI) have been conducted in Brazil. According to the latest data of the National Household Sample Survey (PNAD), carried out by the Brazilian Institute of Geography and Statistics (IBGE) in 2013, which adopted the Brazilian Food Insecurity Scale (EBIA), private FNS situation of households rose to 77.4%, compared to 65.1% and 69.8% in 2004 and 2009, respectively. However, FI, to some degree, still reaches about 14.7 million of Brazilian households (22.6%), and the most worrying conditions are in the North and Northeast regions of the country (36.1% and 38.1%, respectively). In Bahia, prevalence of FI reaches 37.8% of households, that is, this problem still affects a large share of Brazilian and Bahia populations.[7]

A decisive factor for the FI situation that still exists in Brazil is the difficulty to regular and permanent access to foods.[8] Material and economic access to foods is achieved when all citizens have the possibility to obtain them by licit means of production, purchase, hunt or exchange. This FNS dimension is extremely complex and requires the availability of resources to ensure that families can buy foods and meet all other basic needs required for FNS assurance, added to the factors that affect the available resources.[9]

National FNS evaluations conducted by IBGE, using the EBIA tool, estimate prevalence of food security.[7] However, this method does not cover all FNS dimensions, and the resulting data do not reach the municipal level, locus for implementation of diverse public policies to cope with FI. In this regard, the Center for Nutrition and Public Policies at the Federal University of Bahia has encouraged studies aiming to the development and use of a methodology for FNS and FI at a municipal level, covering all four dimensions, as described by Panelli-Martins, Santos & Assis and Pereira, another option to assess a phenomenon of such complexity.[1,5]

All dimensions mentioned above are important in determining the FNS condition of a population or municipality. However, studies have emphasized the importance of the access-to-food dimension, where monthly income is a key factor for obtaining foods. So, knowing the prevalence of FI and FNS at a municipal level and the importance of conducting in-depth studies on the determinants of the access-to-food dimension may support the establishment of priority goals in

planning and developing public policies at a municipal level, as well as to monitor the effectiveness of these actions. All this will contribute to ensure favorable conditions to achieve FNS, especially in the most vulnerable locations.[10]

Given the above, using a methodology that employs a protocol of indicators, the present study evaluated the situation of FNS in the municipalities in the Bahia state and the key determinants in the access-to-food dimension.

Methodology

This study is part of a larger project entitled Bahia Network for the Development and Use of Social Technologies for Assessment of FNS (REDE-TECSAN/BA), which is developed by researchers of the Center of Nutrition and Public Policies of the School of Nutrition, Federal University of Bahia (ENUFBA), with the financial support of the Bahia Research Foundation (Fapesb).

Study scenario

The study was proposed for the municipalities located in the state of Bahia (417 municipalities). However, it was not possible to find all secondary data necessary for employing the indicators protocol to all municipalities in Bahia.

Instrument of analysis

The FNS situation in the municipalities was assessed using the protocol of indicators proposed by Panelli-Martins and updated by Pereira.[1,11] This protocol is designed to assess FNS in all its magnitude, being a low-cost, effective tool for FNS and FI assessment at a municipal level. It originally comprised 25 indicators, grouped into four dimensions for FNS analysis, as follows:[1]

- Foods availability (FA), five indicators to assess foods transportation, production and marketing;
- Access to foods (AF), 11 indicators covering social, economic and cultural factors that affect foods acquisition;
- Foods consumption (FC), five indicators to assess health and nutrition conditions that reflect on the nutritional pattern;
- Biological use of nutrients (BUN), four indicators, covering access conditions to social, sanitation and healthcare services, and their reflections on the individual's or population's food and nutrition.

Two indicators of the FC dimension were excluded, namely: rate of prevalence of height-for-age deficit in children aged < 5 years and overweight in women, due to unavailable information in the public databases. Thus, 23 indicators of the original protocol were calculated.

According to the authors cited, the indicators that integrated the protocol cover diverse aspects of society, such as health, nutritional status, educational level, income, employment, climate, sanitation, water, access to land, agriculture, and others. These indicators were the ones that fit best the required properties, namely social relevance, reliability and construct validity, and the desirable features such as sensitivity, specificity, intelligibility, periodicity, viability and historicity.[1,12]

With an overview of the FNS situation in the municipalities, this study makes an in-depth analysis of the results obtained in the access-to-food dimension, its determinant factors and its relation to the Municipal Human Development Index (MHDI).

Data collection

The indicators were calculated based on secondary data relating to the 2010-2014 period, available on the following public online databases*:* Department of Computerized Systems of the Public Healthcare Service (DATASUS), Brazilian Institute of Geography and Statistics (IBGE), Basic Healthcare Information System (SIAB), and social reports of the Secretariat for Assessment of Information and Management (SAGI), Ministry of Social Development and Fight against Hunger (MDS). All data collected were saved in a protocol spreadsheet, using the Microsoft Office Excel software, version 2007.

Data analysis and processing

The ranking parameter used and the indicators scoring were performed according to the protocol methodology developed by Pereira, and scores from 0 to 10 were assigned to each indicator.[1] Score 0 is assigned when the result is considered inadequate, indicative of risk for FI; score 5 for acceptable results, and score 10 when results are considered appropriate for FNS assurance. Some indicators have dichotomous results, i.e. the indicator scores the minimum for negative response (0 point) and the maximum in case of positive response (10 points). Therefore, the indicators scores were grouped by dimension: FA, 0 to 50 scores; AF, 0 to 110 scores; FC, 0 to 30 scores; and finally, BUN, 0 to 40 scores. In order to make the importance between dimensions equivalent, which have a different number of indicators, and therefore add up diverse scores, the relative frequency per dimension and the weighted average of the same were calculated. This was assumed based on the understanding that each of the four dimensions has the same strength in

the FNS construction. Thus, the higher the number of scores in each dimension, the better the FNS conditions.

Using this score system, it was adopted the FNS/FI rating scale relating to the performance percentage per quartiles, in which each interval corresponds to different FNS or FI gradients (Chart 1).

Chart 1. Scoring scale (percent) and categories for assessment of municipal FNS using a protocol of indicators. Salvador – BA, 2015.

FNS RATING SCALE			
SEVERE FI	MODERATE FI	LIGHT FI	FNS
0 to 24.99%	25 to 49.99%	50 to 74.99%	75 to 100%
Results of indicators point to the existence of many factors that hinder FNS, implying exposure to food deprivation and hunger.	Results of indicators point to the existence of some factors that hinder FNS, with risks for a situation of food deprivation and hunger.	Results of indicators point to the existence of some factors that hinder FNS but without implying risks for foods deprivation and hunger.	Results of indicators point to favorable conditions for the promotion of FNS in the municipality.

Source: Pereira.[1]

MHDI is an indicator that follows the same three dimensions (health, education, income) of the global Human Development Index, but adapting the global methodology to the Brazilian context and the national indicators available. It is comprised of three components: Life expectancy MHDI, Education MHDI and Income MHDI. It is measured by a scoring scale ranging from 0 to 1, where the scores closer to 1 indicate high human development in a municipality.[13] For MHDI ratings, it was used the parameter published by the United Nations Development Program (UNDP), where the Municipal Human Development Ratings are: very low (0 to 0.499), low (0.500 to 0.599), medium (0.600 to 0.699), high (0.700 to 0.799) and very high (0.800 to 1).[13]

With the Statistical Package for the Social Sciences (SPSS) for Windows (version 17.0), a descriptive analysis was carried out to measure the frequency of the study variables. Then, to verify association between the AF dimension and FI dimension in the Bahia municipalities,

and the association between the FI in the Access-to-Food dimension and the Municipal Human Development Index, the chi-square test was used, considering a significant association when p-value ≤0.05. In addition, to perform the association, the moderate FI and severe FI variables and the very low, low, high and very high Human Development Indices were grouped.

Results

Overview of Food and Nutrition Security in the municipalities

In the municipalities examined, it was found that two of them were in FNS situation, 119 (28.7 %) in light FI, 286 (69.1%), in moderate FI and 7 (1.7%), in severe FI (Table 1).

The FNS situation per dimension and its influence on the overall result can be observed in the results described in Table 2.

Table 1. Prevalence of FNS and FI in Bahia municipalities. Salvador – BA, 2015.

Variable	N	%
Food and Nutrition Security	2	0.5
Light Food Insecurity	119	28.7
Moderate Food Insecurity	286	69.1
Severe Food Insecurity	7	1.7
Total	414	100.0

Table 2. Prevalence of FNS and FI in municipalities according to FNS evaluation dimensions. Salvador – BA, 2015.

Variable	Availability	Access	Consumption	Utilization
	n (%)	n (%)	n (%)	n (%)
FNS	38 (9.2)	0 (0.0)	38 (9.2)	54 (13.0)
Light FI	150 (36.2)	60 (14.5)	222 (53.6)	188 (45.4)
Moderate FI	140 (33.8)	296 (71.5)	88 (21.3)	153 (37.0)
Severe FI	86 (20.8)	58 (14.0)	66 (15.9)	19 (4.6)
Total	414 (100.0)	414 (100.0)	414 (100.0)	414 (100.0)

In the FA dimension, the majority of the municipalities exhibited light FI (36.2%) and 33.8% moderate FI. This was the dimension that had the highest prevalence of severe FI (20.8%).

On the other hand, the FC and BUN dimensions exhibited the highest prevalence of FNS (9.2% and 13% respectively) and the lowest FI (53.6% and 45.4%, respectively).

Analysis of Food and Nutrition Security with a focus on the Access-to-Food Dimension

There was moderate FI in the AF dimension (71.5%). Percentages of light FI (14.5%) and severe FI (14%) were very similar. There was no municipality in this dimension in favorable conditions to ensure FNS. These results can be explained by the indicators percentages in the access-to-food dimension described in Table 3.

The indicators relating to the percentage of population with low income and percentage of population aged 15 years or more and less than 4 years of school can explain this situation, in view of their percentages of inadequacy: 89.9% and 89.6%, respectively. The negative results for the existence of FNS public equipment (88.6%) and percentage of female-headed households (84.8%) also contributed to this result. Other two indicators of this dimension, number of people living in the same house and literacy rate, also had unfavorable results in more than 50% of the municipalities.

Average *per capita* income and income ratio were scored as appropriate in most of the municipalities. The *Bolsa Familia* Program (government's financial aid to poor families) contributed to an appropriate result in 46.9% of the municipalities and to an acceptable result in other 43.5% of the municipalities. These results contributed to a higher percentage of municipalities at light and moderate FI, compared to severe FI, in this dimension.

Table 4 shows the existing association in the FI situation in Bahia municipalities, in view of the result of all dimensions and the FI situation in the AF dimension. Of the municipalities that were at moderate and severe FI in the AF dimension, 75.9% (268/353) were at the same situation in the FNS overall evaluation; of the municipalities that were at light FI in the AF dimension, 57.6% (34/59), were at light FI in the evaluation of all dimensions. Therefore, there was a statistically significant association ($p < 0.000$) between being at the most severe FI situations in the AF dimension and the overall moderate and severe FI in the municipalities.

Table 3. Analysis of indicators of the Access-to-Food dimension in Bahia municipalities. Salvador – BA, 2015.

Indicator/dimension	Appropriate %	Acceptable %	Inappropriate %
Access to Foods			
Average *per capita* household income	58.0	-	42.0
Gini index of household income	24.2	75.4	0.5
Income ratio	72.0	17.4	12.8
% of persons with monthly per capita household income < ½ MW*	0.7	9.4	89.9
% of unemployment in the economically active population aged 16 years and over	17.6	78.7	3.6
% of low-income households that are beneficiaries of the BFP**	46.9	43.5	9.7
Literacy rate of population aged 15 years or above	2.7	37.9	59.4
% of population aged 15 years or over with less than 4 years of school	3.4	7.0	89.6
No. of people living in private residences	22.5	-	77.5
% of female-headed households	5.8	9.4	84.8
Existing public FNS equipment	2.7	8.7	88.6

*Minimum wage. ** *Bolsa Familia* Program (financial aid to poor Brazilian families)

Table 4. Association between the FI situation in Bahia municipalities considering all dimensions and the Access-to-Food dimension. Salvador – BA, 2015.

FI situation in the Access-to-Food dimension		FI situation considering all dimensions			
		Moderate and severe FI n (%)	Light FI n (%)	Total n (%)	P- value
Access to Foods	Moderate and severe FI	268 (75.9)	85 (24.1)	353 (100)	0.000
	Light FI	25 (42.4)	34 (57.6)	59 (100)	
Total		293 (71.1)	119 (28.9)	412 (100)	

In this study, there was an association between the FI situation in the Access-to-Food dimension and the Municipal Human Development Index in Bahia municipalities (Table 5). Of the municipalities that were ranked with moderate and severe FI in the AF dimension, 60.1% had a very low and low MHDI, and 24.6%, a medium MHDI. Thus, there was a statistically significant association ($p < 0.000$) between being at a moderate and severe FI situation and having a very low and low MHDI.

Table 5. Association between the FI situation in the Access-to-Food dimension and the Human Development Index in Bahia municipalities. Salvador – BA, 2015.

FI situation in the Access-to-Food dimension		Access to Food			
		Moderate and Severe FI (%)	Light FI n (%)	Total n (%)	P- value
Municipal Human Development Index	Very low and low	247(60.1)	12 (2.9)	259 (63.0)	0.000
	Medium	101(24.6)	41(10.0)	142 (34.6)	
	High and very high	3 (0.7)	7 (1.7)	10 (2.4)	
Total		351 (85.4)	60 (14.6)	411 (100)	

Discussion

Household FNS evaluation surveys in Brazil use the Brazilian Food Insecurity Scale (EBIA), which has contributed to a better understanding of the situation and its determinants.[7] Its application, however, does not include all dimensions of FNS evaluation, focusing especially on the variables of the AF dimension, and the data generated do not reach the municipality level. Therefore, the use of the indicators protocol is another option to evaluate a complex phenomenon such as FNS, thus complementing the EBIA methodology.

In Brazil, according to the latest PNAD data (2013), which employs the EBIA tool, there was an improved FNS situation in the households, up to 77.4% from 65.1% and 69.8% in 2004 and 2009, respectively.[7]

However, FI, to a certain degree, still affects 14.7 million of Brazilian households (22.6%), and the most worrying condition is in the North and Northeast regions (36.1% and 38.1%, respectively). In Bahia, FI prevalence is found in about 38% of the households, that is, this problem still affects a large portion of the Brazilian and Bahia population.[7]

The EBIA protocol was used in the studies conducted in the northeastern municipalities, which indicated high prevalence of food insecurity.[14-16] Bittencourt et al. found in their study carried out in Salvador in 2007 food insecurity in 71.3% of the houses of public school children. [14]

Studies conducted in other countries such as Nigeria and India, which have a socioeconomic profile similar to Brazil, have shown high FI prevalence.[17,18] According to the FAO, 805 million of people in the world are in a condition of chronic hunger, which is the most severe form of food insecurity.[9]

In the present study, it was observed in the overall analysis that most of the municipalities in Bahia are in FI condition, and only two are in FNS condition. The highest prevalence found was of moderate FI, i.e. a situation of greater vulnerability to foods deprivation and hunger. Similar results were found in Pereira' study, where the indicators protocol used for 57 Bahia municipalities with diverse population sizes showed that 100% of the municipalities were in FI condition, from the lightest ones to the most severe, with higher prevalence of moderate FI.[1]

In the FNS evaluation by dimensions, the AF and FA dimensions indicated high prevalence of municipalities with moderate and severe FI conditions. In the AF dimension, most of the municipalities are in moderate FI condition. In this dimension, aspects such as income, employment, educational level, number of people per household, low-income families receiving the BFP, female-headed households, and the existence of public FNS equipment in the 2010-2014 period were evaluated.

When evaluating whether the AF dimension is determinant for the FI situation in Bahia municipalities, it was found a statistically significant association. Chatterjee observed similar results in a study which revealed that severe food insecurity was significantly associated with lower monthly income and other measures of socioeconomic status.[17] The AF dimension is very complex and is related to socioeconomic and material aspects that interfere with the acquisition of foods by the population/family, including the availability of resources for the purchase of foods and all basic needs for the FNS assurance, besides the factors that affect the available resources. [9,19]

In this study, there was an association between the FI situation in the AF dimension and the MHDI of the Bahia municipalities. The poverty in the municipalities, as indicated by the MHDI, can be chiefly attributed to income, education and health variables. According to Janvry & Sadoulet, poverty is multidimensional, being associated not only with income, but with other elements, especially inadequate education and health conditions.[20] Hoffmann states that education is one of the key routes to rise socially and diminish income inequality in Brazil.[21]

In the Brazilian economy, permanent access to foods is determined by the people's purchasing power, i.e. having money to buy foods. Thus, hunger in Brazil is associated with poverty in a great part of the population that has very low income.[21] FI emerges in this context and is directly associated with hunger, and poverty is one of the structural causes of FI in the Bahia municipalities.[22]

The indicators relating to the percentages of low-income people, people aged 15 years or more and with less than 4 years of education in the Bahia municipalities indicated high inappropriate percentages, followed by the indicators relating to the existence of FNS public equipment and female-headed families. In a study conducted by Chatterjee, female-headed families whose largest share of income comes from less schooled people were more prone to severe food insecurity.[17]

People' schooling has an influence on the foods choice and preparation and, especially, in the qualification levels to achieve better salaries, which in turn, ensure greater access to foods.[4] Studies have shown that income is directly proportional to the educational level.[23-25] According to Tannen, the salary increase for each additional year was 12.8% for the primary education and 8.1% for lower secondary education; for upper secondary education and higher education it was 15.7% and 23.4%, respectively. But an additional year of higher education has a larger increase in salaries. [24]

Salvato et al. state that income inequality and schooling are strongly correlated and that the average education years in poor regions is about three years less than in wealthier regions.[23] This study corroborates the results found in the present work for the indicators relating to the percentage of low-income people and the percentage of population aged 15 and over and with less than four years of school in the municipalities studied.

Other indicators of the AF dimension, e.g., number of people per household, have an effect on income distribution, reducing the *per capita* income for the purchase and use of goods and services that are essential to maintain good health, especially foods. This factor, associated with the occurrence of income concentration in the municipality, indicates inequality, in which the minority of the population has accumulated capital and the majority has low income, insufficient to meet their basic consumption needs as well as the purchase of foods in satisfactory amounts and quality. These situations are directly related to FI.[4]

Actions oriented to increase income of the poorest populations through policies designed to diminish poverty and social inequalities, educational and qualification policies and access to credit programs are necessary to increase FNS, especially with respect to acute nutritional needs.[8]

Conclusion

The results of the present study indicate a high prevalence of moderate and light FI in Bahia municipalities. The overall FI in these municipalities indicated that there was association with the occurrence of FI in the AF dimension. The indicators of the AF dimension that contributed most to this condition were the number of low- income people and population aged 15 or more and less than 4 years of educational attainment.

The indicators protocol used in this work can be used to collect information in of various kinds of research that aim to study a phenomenon so large as FNS. It may also lead to understand better the causes of FI, providing information that assist in the development of actions and policies to cope with FI at the municipal level more effectively. It is also a low-cost instrument that can be easily used and sensitive to the different FNS situations because it considers four dimensions.

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