FOOD AND NUTRITION IN COLLECTIVE HEALTH
DOI: 10.12957/demetra.2021.56822

DEMETRA
Alimentação, Nutrição & Saúde

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Funding and support: The funding of this study was granted by the Fundação de Amparo à Pesquisa do Estado de Minas Gerais - FAPEMIG (Research Support Foundation of the State of Minas Gerais) (21618/2013 - Research Promotion) and the Conselho Nacional de Pesquisa – CNPq (National Research Council) (476686/2013-0 - Promotion of research and productivity grant of ACSL). This work was carried out with the support of the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – CAPES (Coordination for the Improvement of Higher Education Personnel) (funding code 001).

Dimensions of the Brazilian food insecurity scale in primary health care

Dimensões da escala brasileira de insegurança alimentar na atenção primária à saúde

Abstract

Objective: The aim of the current study is to analyze the relevance of dimensions of the Brazilian Food Insecurity Scale (EBIA). ***Methods***: Baseline study conducted with sample representative of Health Academy Program (HAP) users in Belo Horizonte – MG. Food insecurity was measured based on EBIA. Factor analysis was used to identify EBIA dimensions relevant to HAP users. ***Results***: There was high prevalence of food insecurity (31.1%), mainly among families with members younger than 18 years (41.0%). Affirmative response rates have decreased depending on the food insecurity severity level involved in the question. Items associated with mild food insecurity (concerned with and access to healthy food) recorded higher affirmative response rates, whereas items associated with severe food insecurity (hunger and weight loss) recorded lower rates. Three relevant EBIA factors were identified for family members younger than 18 years, namely: concern, deprivation and children / adolescents, whereas relevant EBIA factors identified for other family members comprised concern, deprivation and hunger. ***Conclusion***: EBIA should be used in Primary Care in order to assess the risk of food insecurity and the design of more comprehensive health promotion actions.

Keywords: Food insecurity. Food. Primary Health Care. Primary Healthcare Service

Resumo

Objetivo: Analisar a relevância das dimensões da Escala Brasileira de Insegurança Alimentar (EBIA). ***Método***: Conduziu-se estudo a partir da linha de base com amostra representativa de usuários do Programa Academia da Saúde de Belo Horizonte-MG. A mensuração da insegurança alimentar foi obtida pela EBIA. Utilizou-se análise fatorial para identificar as dimensões da EBIA relevantes para os usuários do Programa. ***Resultado***: Verificou-se elevada prevalência de insegurança alimentar (31,1%), sobretudo entre as famílias com menores de 18 anos (41,0%). Foi identificada redução do percentual de respostas afirmativas segundo a gravidade de insegurança alimentar implicada na questão, sendo que itens relacionados à insegurança alimentar leve (preocupação e acesso à alimentação saudável) apresentaram maior percentual de respostas afirmativas, enquanto aqueles correlatos à insegurança alimentar severa (fome e perda de peso), menores percentuais. Foram identificados três fatores relevantes da EBIA para famílias com menores de 18 anos: preocupação, privação e crianças/adolescentes; e para as demais famílias: preocupação, privação e fome. ***Conclusão***: Sugere-se, assim, o uso da EBIA na Atenção Primária, visando avaliar o risco de insegurança alimentar e o delineamento de ações de promoção da saúde mais abrangentes.

Palavras-chaves: Insegurança Alimentar. Alimentação. Serviço de Saúde. Atenção Primária à Saúde.

INTRODUCTION

The food insecurity (FI) condition, either at home or at individual level, results from a set of interrelated factors that violate the Human Right to Adequate Food.[1-3] Food insecurity has multidimensional nature and encompasses social, psychological, quality of life and living conditions; thus, evaluating it is a complex and challenging task.[4] For years, food insecurity condition evaluations were based on economic indicators associated with food production and availability; however, these indicators were not enough to measure its multidimensionality. Thus, different scales have been suggested since the 1970s,[5] the Brazilian Food Insecurity Scale *(Escala Brasileira de Insegurança Alimentar - EBIA*) is the one adopted in nationwide.

EBIA was based on the United States' scale and it was validated in 2003. It has been used in different contexts, as well as by different fields and professionals.[4,6] It enables classifying food insecurity as follows: mild food insecurity, which is featured by family's concern about not to obtain food in the future; moderate food insecurity, which refers to family's need of reducing food amount, quality and variety to avoid lack of it; and severe food insecurity, which corresponds to lack of food and, consequently, to hunger.[7]

Thus, four food security and nutrition dimensions were evaluated. The first dimension concerned sufficient food availability; the second one concerned physical and financial access to food, i.e., individuals' ability to obtain enough food and nutritional quality through socially acceptable strategies. The third dimension referred to biological use of food, i.e., whether the used nutrient is affected by sanitary conditions, as well as by the microbiological quality of the food and by the environment it is produced in and- it may also be affected by food knowledge and choices. The last dimension concerned the stability, occurrence or lack of issues related to the availability of, access to, and use of food, as well as referred to the temporal element of other dimensions involving social, economic, environmental sustainability, and planning of by governments and families.[8]

Food insecurity prevalence in Brazil was investigated through the Brazilian Household Sample Survey (*Pesquisa Nacional por Amostra de Domicílios - PNAD)* based on EBIA. Results have shown that 34.9% of households living under food insecurity conditions were identified in the first national diagnosis (2004).[2] On the other hand, based on an adapted and updated version of EBIA, this prevalence was lower in 2009 and 2013 - 30.2% and 22.6%, respectively.[3] However, according to the last Brazilian Family Budget Survey (*Pesquisa de Orçamentos Familiares - POF17/18*), food insecurity rates have significantly increased, since 36.7% of households were living under some food insecurity condition.[9] Regional data from 2018 have evidenced higher food insecurity prevalence in the Northern (57.0%) and Northeastern (50.3%) regions than that in the Midwestern (35.2%) Southeastern (31.2%) and Southern (20.7%) ones.[9]

Another aspect analyzed in EBIA referred to the relevance of its different dimensions for a given population. Cross-sectional study was conducted with 742 households in the metropolitan region of Montevideo, Uruguay, based on the Latin American & Caribbean Household Food Security Scale (ELCSA), as well as on the United States' scale. It identified different important dimensions for households with, or without, children under the age of 18. The following dimensions were identified as relevant in households without children and adolescents: lack of food and concern about lack of food; whereas for other households, the main dimensions comprised lack of food, concern with lack of healthy food and with lack of food for children.[5]

Despite the relevance of food insecurity, mainly in middle-income countries such as Brazil, and the need of identifying the importance of EBIA dimensions for different population groups, few studies have assessed these dimensions.[5,10,11] However, Brazilian studies focused on conducting such an assessment were not identified in the literature. These studies become even more relevant when they are conducted in Primary Health Care (*Atenção Primária à Saúde - APS*), due to its wide scope and the privileged role played by it as priority locus for health promotion and care actions.[5] Moreover, acknowledging the most important EBIA dimensions for Primary Health Care users can help expanding actions focused on mitigating food insecurity. Thus, these investigations play important role in

tracking, monitoring and outlining actions capable of ensuring the Human Right to Adequate Food and health promotion. Thus, the aim of the current study was to analyze the most relevant EBIA dimensions among users of a health promotion service associated with the Brazilian Primary HealthCare system.

MATERIALS AND METHODS

Study design and site

Cross-sectional study based on data from the baseline of controlled and randomized community trial conducted with probabilistic and representative sample of Health Academy Program (HAP) (*Programa Academia da Saúde - PAS*) users in Belo Horizonte City, Minas Gerais State, Brazil.[12,13]

Health Academy Program is a Primary Healthcare hub and a national health promotion initiative. HAP units are equipped with infrastructure, equipment and qualified staff to promote healthy lifestyles, based on exercising and health promotion actions, as well as on adequate and healthy eating habits.[14] They are preferably located in vulnerable areas in Belo Horizonte City in order to help increasing individuals' access to health promotion actions.[15] Nowadays, the city holds 77 Health Academy Program units that serve approximately 19,000 users.

Study sample

Forty-two (42) of the 50 HAP units installed in the city at the time the current study was conducted were considered eligible in the conglomerate sampling process; each unit served from 104 to 294 users. Exclusion criteria comprised units located in low vulnerability areas and units previously investigated in other nutritional intervention studies. Six units located in low health vulnerability areas due to low representativeness in the city were excluded from the study; and two other units were excluded due to intensive intervention studies. Thus, 18 (42.8%) units were selected to participate in the study; they were located in areas presenting medium and high/very high vulnerability level and were distributed in all nine regions of the city, two units per region. This sample design enabled obtaining a sample representative of HAP units in the city, at 95% confidence level and 1.4% probability of error.[12,13]

The Health Vulnerability Index (*Índice de Vulnerabilidade à Saúde - IVS*), whose geographical unit lies on census tract, was the parameter used to classify the investigated areas based on their vulnerability degree. IVS is a composite index built based on socioeconomic and environmental variables, which assign different weights to items associated with sanitation, housing, education, income and health.[16]

All users in the sampled HAP units were evaluated during the data collection period, between 2013 and 2014. They met the following inclusion criteria: being 20 years old or older and being frequent HAP users (having participated in activities promoted by the service in the last month). Exclusion criteria comprised being pregnant and having cognitive impairment capable of preventing them from answering the questionnaire. More details on the sampling procedure and data collection process are described in specific publications.[12,13]

Of the total number of 3,778 users served in the sampled HAP units, 6.6% (n = 252) were excluded from the study and 3.0% (n = 112) refused to participate in it; thus, the final sample comprised 3,414 participants, who accounted for 90.4% response rate.[13] Collected data were subjected to statistical analyses, which compared sociodemographic data about the total sample to those of the sample in order to check sample representativeness maintenance - the adopted confidence level and probability of error remained unchanged. In addition, there was similarity in sociodemographic profile between participants in the current study and those of other studies conducted in other units in Belo Horizonte and in other Brazilian cities.[17-21]

Moreover, the following individuals were excluded from the analyses: individuals who were not accountable for purchasing and preparing the food (n=424) as requirement to respond to EBIA; those who reported to have chronic kidney disease (n=21) capable of affecting their food intake; individuals who did not answer the EBIA (n=24); and those who lived in the same household (n=128), in order to avoid duplicate household data.[8] Thus, 2,817 individuals were included in the analyses.

Data sources and investigated variables

Interviews were carried out in HAP units by Nutrition and postgraduate students who underwent periodic training to apply the research instruments. The herein adopted instrument addressed socio-demographic information, as well as questions associated with EBIA.

The investigated sociodemographic features comprised sex, age (years), schooling (years), marital status (married/stable union, separated/divorced, single and widowed), occupation (household, retired, employed and unemployed), and the sex and schooling of the head of the family. Material goods in the household and schooling of the heads of the household were used for participants' economic classification purposes, based on the Brazilian Criteria for Economic Classification (*Critério de Classificação Econômica Brasil – CCEB*).[22]

Food insecurity condition was measured based on EBIA. This scale consists of closed questions about individuals' dietary insufficiency experience, in the last three months, at different intensity levels, from the concern with lack of food at home to food deprivation for one day.[23] EBIA encompasses 15 questions focused on families with members younger than 18 years and 8 questions focused on families without children younger than 18 years at home (Box 1). The answer to each question was dichotomous (yes or no), and each positive answer scored 1 point. Thus, the final score ranged from 0 to 15 for families with members younger than 18 years, as well as from 0 to 8, for other families.[24]

Box 1. Items from the Brazilian Food Insecurity Scale (EBIA)

Item	In the last three months...
1	Did you ever worry that the food in your house would run out before you were able to buy more food?
2	Did the food run out before you could afford to buy more?
3	Did you run out of money for a healthy and varied diet?
4	You had to dispose of only a few food types to feed dwellers **younger than 18**, why did you run out of money?
5	Did you or any adult in your home ever reduce the amount of food at meals, or skipped meals, because there was not enough money to buy food?
6	Have you ever eaten less than you thought you should because there was not enough money to buy food?
7	Did you ever feel hungry, but you did not eat because you could not buy enough food?
8	Did you lose weight because you did not have enough money to buy food?
9	Did you or any other adult in your home ever go a whole day without eating or just have one meal a day, because there was no money to buy food?
10	You cannot offer someone younger than **18 years** a healthy and varied diet, why did you do not have any money?
11	Some dweller **younger than 18 years** did not eat enough, why was there not enough money to buy food?
12	Did you ever reduce the amount of food in the meals of a dweller **younger than 18 years** because there was not enough money to buy food?
13	Has a dweller **younger than 18 years** ever stopped eating, because there was not money to buy food?
14	No dweller **younger than 18 years** was hungry, but could you not just buy more food?
15	Some dweller **younger than 18 years** went without food for a whole day, why was there no money to buy food?

Note: questions 4 and 10 to 15 were only applied to families with members younger than 18 years.

EBIA enabled classifying households in four categories, namely: food security, mild food insecurity, moderate food insecurity and severe food insecurity. The final EBIA score in the current study was categorized as food security or (mild, moderate or severe) food insecurity for analysis purposes.

Data analysis

Database consistency was checked before the statistical analyses. Data were analyzed in STATA software, version 15.0 (Stata Corp., College Station, USA).

All EBIA items were analyzed to check the relevance of being subjected to factorial analysis process, based on the Kaiser-Meyer-Olkin (KMO) method. Total value of 0.71 was observed for families with, or without, children younger than 18 years, a fact that indicated correlation between values and the relevance of using the analysis.

Thus, Exploratory Factor Analysis was performed to determine the factorial structure of EBIA questions, based on orthogonal varimax factor rotation. Extracted factors were selected based on the Kaiser-Guttman criterion (eigenvalue >1), on the inflection point on the curve of the eigenvalue graph (Scree Plot) and on the interpretation of patterns. Items presenting factor loadings higher than 0.30 were considered significant.[25]

The present study was conducted in compliance with standards required by the Declaration of Helsinki. It was approved by the Research Ethics Committees of all institutions involved in it (Federal University of Minas Gerais - 0537.0.0203.000-11 and Belo Horizonte City Hall - 0537.0.0203.410-11A) and registered in the Brazilian Clinical Trials Registry (*Registro Brasileiro de Ensaios Clínicos)* (RBR-9h7ckx).

RESULTS

Most (90.7%) of the 2,817 participants were adult women with low schooling who belonged to economic class C. The heads of the households were mostly male and they had approximately 7 years of schooling (Table 1).

According to participants' responses to EBIA items, food insecurity was experienced by 41.0% of families with members younger than 18 years and by 26.4% of other families, which corresponded to total food insecurity prevalence of 31.1% (Table 1).

Table 1. Sociodemographic and economic features of families of Health Academy Program users. Belo Horizonte City, Brazil, 2013-2014.

	All (N=2,817)	Families with members younger than 18years (n=895)	Families without younger than 18 years (n=1,922)	*P* value
EBIA Score (%)				<0.001[1]
Food security	68.9	59.0	73.5	
Food insecurity	31.1	41.0	26.5	
Mild	27.1	34.6	23.5	
Moderate	3.2	4.9	2.5	
Severe	0.8	1.5	0.5	
Age (y)	56.9±11.2	50.2±11.5	60.0±9.5	<0.001[1]
Female (%)	90.7%	89.8%	92.6%	0.02[2]
Schooling (y)	7.2±4.1	7.9±3.9	6.9±4.1	<0.001[1]
Marital status (%)				<0.001[2]
Stable union	61.9	71.0	57.6	

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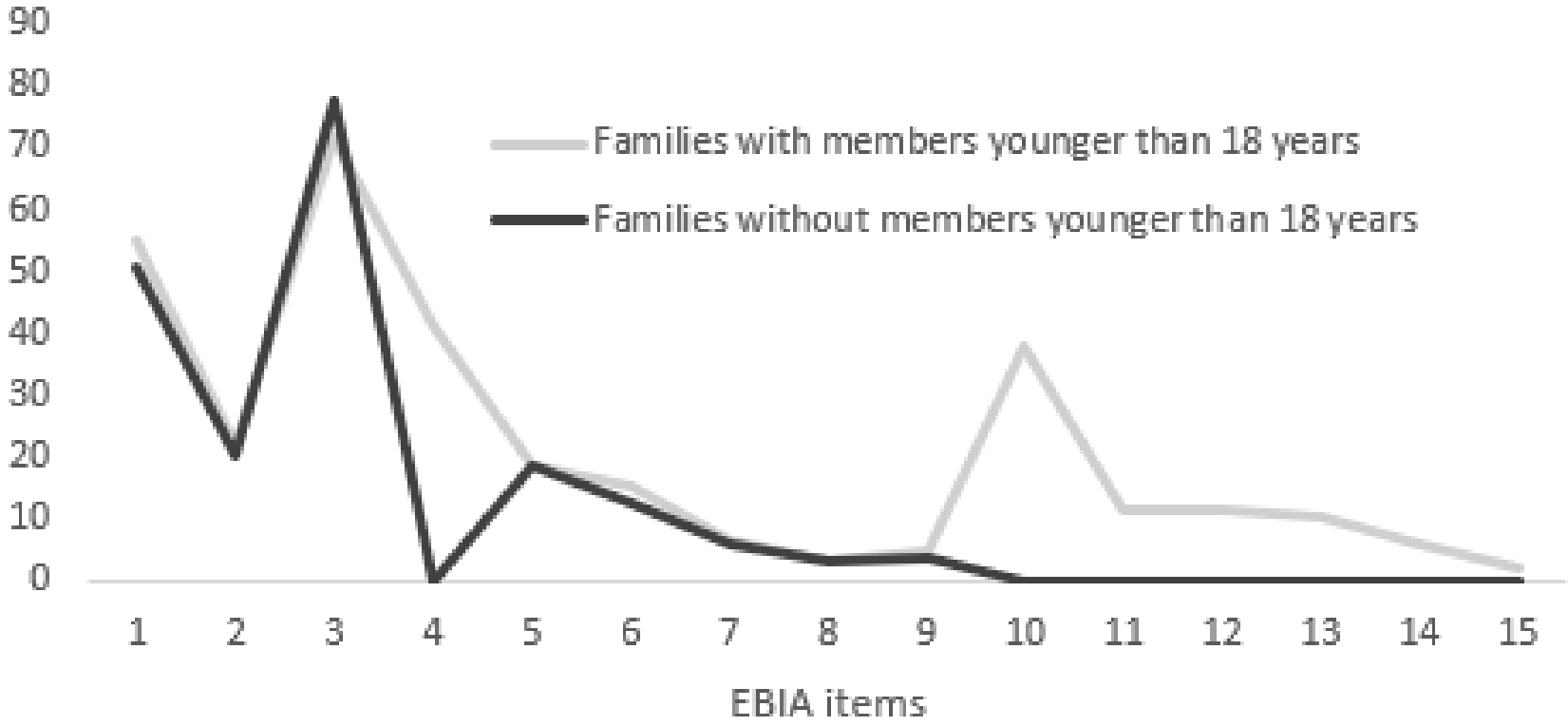
	All (N=2,817)	Families with members younger than 18years (n=895)	Families without younger than 18 years (n=1,922)	*P* value
Separated/widowed	25.5	18.7	28.7	
Single	12.6	10.3	13.7	
Employment status (%)				<0.001[2]
Housewife	29.8	34.2	27.7	
Retired	36.7	19.9	44.6	
Unemployed	1.8	2.9	1.3	
Employed	31.7	43.0	26.4	
Economic class (%)				<0.001[2]
A/B	29.4	32.9	27.7	
C	55.1	55.2	55.1	
D/E	15.5	11.9	17.2	
Sex of head of family (%)				<0.001[2]
Female	40.4	30.1	45.2	
Male	59.6	69.9	54.8	
Schooling of head of family (y)	7.3±4.3	7.9±3.9	7.1±4.4	<0.001[1]

Note: EBIA: Brazilian Food Insecurity Scale.
[1]*t* Student; [2] x^2 test.

Figure 1 shows the affirmative response rates recorded for each EBIA item. Items associated with lesser severe FI aspects (item 1: concerned with lack of food; and items 3 and 10: no money for a healthy and varied diet) recorded the highest affirmative response rates. Items associated with more severe FI recorded the lowest positive response rates (items 7 and 14: incidence of hunger; and item 8: individuals lost weight because they could not afford to buy food).

Figura 1. Affirmative response rates recorded for each item in the Brazilian Food Insecurity Scale (EBIA) applied to families of Health Academy Program users, Belo Horizonte City – Minas Gerais State, 2013-2014



Note: Items 4, and 10 to 15 do not apply to households without children younger than 18 years.

Exploratory factor analysis has indicated three relevant factors, both for families with members younger than 18 years and other families. Factor 2 was linked to items associated with food deprivation at home, in families with children/adolescents; factor 3 was linked to concern with lack of food or to the impossibility of keeping an adequate and varied diet; and factor 1 was associated with EBIA items concerning the existence of children/adolescents in the household. On the other hand, factor 1 was associated with food deprivation in families without children younger than 18 years; factor 3 was linked to hunger or lack of food at home; and factor 2 referred to concern with lack of food or adequate and varied diet and healthy eating (Table 2).

Table 2. Distribution of factorial loads of items in the Brazilian Food Insecurity Scale applied to families of Health Academy Program users. Belo Horizonte City, Brazil, 2013-2014.

Households with members younger than 18 years			
Item	Factor 1 ("Child and dolescent")	Factor 2 ("Deprivation")	Factor 3 ("Concern")
Eigenvalue	6.0	2.6	2.1
1	0.05	0.05	**0.78**
2	0.08	0.29	**0.65**
3	-0.01	0.10	**0.77**
4	**0.63**	0.05	0.10
5	0.02	**0.59**	0.49
6	0.07	**0.65**	0.46
7	0.03	**0.77**	0.14
8	0.03	**0.76**	-0.02
9	0.04	**0.72**	0.06
10	**0.96**	0.03	0.15
11	**0.96**	0.02	0.02
12	**0.97**	0.04	0.04
13	**0.95**	0.05	0.01
14	**0.99**	0.02	-0.03
15	**0.99**	-0.03	-0.05
Explained variance %*	40.3	17.2	14.3
Households without members younger than 18 years			
Item	Factor 1 ("Deprivation")	Factor 2 ("Concern")	Factor 3 ("Hunger")
Eigenvalue	2.3	1.7	1.5
1	0.12	**0.79**	0.10
2	**0.77**	0.38	-0.05
3	0.08	**0.79**	0.09
5	0.10	**0.47**	0.37
6	**0.86**	0.13	0.21
7	0.25	0.12	**0.77**
8	**0.92**	-0.08	0.13
9	0.07	0.07	**0.84**
Explained variance %*	28.7	20.9	18.9

Note: factorial loads of each factor (>0.30) are highlighted in bold.
* Explained variance rate recorded for each factor, after varimax orthogonal rotation.

DISCUSSION

There was high FI prevalence among Primary Healthcare users, mainly in families with members younger than 18 years. However, the rate of affirmative responses to EBIA items has decreased as the food insecurity severity in the question increased. Relevant factors were identified in the EBIA associated with mild ("Concern"), moderate ("Deprivation") and severe ("Hunger") food insecurity levels in families with members in the age group 0-18 years.

Food insecurity (FI) prevalence in Brazil was higher than in other Latin American countries,[26,27] as well as closer to the one reported by the Brazilian Family Budget Survey (*Pesquisa de Orçamentos Familiares - POF17/18*) (36.7%)[9] and Brazilian Household Sample Survey (*Pesquisa Nacional por Amostra de Domicílios - PNAD)* in 2004 and 2009 (34.8% and 30.2%, respectively) than that reported in 2013 (22.6%).[3] Given the economic and political condition experienced in Brazil for the last five years[28,29], as well as the recent pandemic - caused by the new human coronavirus (SARS-Cov-2) -, declared by the World Health Organization (WHO) in March 2020,[30] the FI context in the country got even worse, since the rate of families living under FI condition has increased.[31] The National Survey on Food Insecurity in the Brazilian COVID-19 Pandemic Context (*Inquérito Nacional sobre Insegurança Alimentar no Contexto da Pandemia da COVID-19 no Brasil*) has pointed out that 55.2% of interviewed families lived at some FI level. These are alarming data if one takes into consideration the current context experienced by the Brazilian population.[31]

Most of the investigated families (classified as living under FI conditions) recorded affirmative responses to EBIA items that were mostly focused on questions about concern with lack of food, and with lack of money to afford for a healthy and varied diet. Discussions about food security have historically focused on associating lack of food (quantitative) and hunger with poverty. However, FI is also effective because it assesses lack of access to adequate and healthy diet, as well as excessive unhealthy food intake, which are aspects that also violate the Human Right to Adequate Food and that must be addressed, monitored and controlled.[1,4,8,32]

Families or individuals living in FI have a hard time accessing adequate food environments, mainly when it comes to food quality, to the availability of production and procurement facilities, as well as to food price versus families' purchasing power. These issues are often pointed out as the main obstacles to adequate access to fresh and minimally-processed food, such as fruits, vegetables, legumes, farinaceous and cereals.[33-35] A study also conducted with HAP users in Belo Horizonte City has shown that FI has negatively affected fruit and vegetable intake among families with members in the age group 0-18 years, regardless of age, sex, marital status, schooling, and work status. On the other hand, it did not affect individuals ultra-processed food intake, which is considered unhealthy eating.[4]

Issues associated with healthy, sustainable and fair urban food systems should be monitored and addressed by civil society, governments, health managers and associated fields. Food market globalization enabled the supply of food produced at large scale, at low cost, with high energy density and poor in nutrients, such as ultra-processed food. This change in food chain has contributed to reduction in local food crops, to the emergence of a monotonous food-intake profile and to illnesses in the population.[36-38]

Based on the analysis of EBIA dimensions, both herein investigated family types recorded relevant factors linked to the concern (mild FI), deprivation (moderate FI) and hunger (severe FI) scopes. It is worth emphasizing that FI should be taken into consideration based on its multidimensionality, since its dimensions are related to different Human Right to Adequate Food severity and violation levels. Understanding these dimensions, as well as their impact on individuals, can help better understanding the factors determining FI in different populations.[5]

Lack of access to healthy food reinforces the violation to the Human Right to Adequate Food and to the two dimensions covered by food security and nutrition. The first dimension refers to food security linked to food

accessibility and availability; whereas the nutritional scope is associated with nutritional status, healthy eating practices, as well as with the preservation of food sovereignty and culture.[4,8,39] The implementation of intersectoral actions involving civil society, social control and managers from different sectors such as health, urban planning, social assistance, agroecological-based agriculture, and food security and nutrition can contribute to reverse this situation. Intersectoral interventions can be carried out, both through the implementation of food protection actions, such as low-income restaurants (*restaurantes populares*); and through programs aimed at food supply and market regulation - such as open air markets, agroecological-based family farming street markets and municipal grocery stores - in order to increase individuals' access to healthy food.[39,40]

In addition, EBIA should be applied to the routine of Primary Health Care teams, mainly in the care provided to families living in vulnerable areas, in order to identify early FI risks, perform interventions to minimize this condition and to promote health. EBIA remains poorly used by health services, despite its wide and easy application. However, the identification of families living under FI conditions may help Family Health teams to establish intersectoral action plans, mainly for the most severe cases, in order to reverse this condition.

The sooner the FI is identified, the more faster the subject of law may have access to information on strategies to combat the violation to the Human Right to Adequate Food. These actions should be ruled by the principle of equity prevalence to provide the most vulnerable groups with better access to adequate and healthy food. In addition, they should be in line with the expansion and improvement of public food security and nutrition equipment, in order to ensure adequate and healthy food supply to all.

Despite the relevant results, the current study presented some limitations. No indicator used to evaluate FI alone was capable of encompassing its multidimensionality, due to its complexity and to the amplitude of associated factors. The instrument used to assess food insecurity - EBIA - restricts the accessibility to and availability of food at home, it does not address other food security and nutrition aspects, or aspects associated with the nutritional status and health quality of the food consumed by individuals.[23]

The positive point of the current study lies on having used a sample representative of a health promotion service belonging to the Primary Healthcare system in the third largest Brazilian metropolis to favor the design of actions focused on meeting the needs of the population using the Brazilian Unified Health System (*Sistema Único de Saúde - SUS*). In addition, the present study may help improving professionals' knowledge about food security issues; as well as contribute to guide the monitoring and propositions of intersectoral actions with potential to meet the needs of families facing difficulties concerning food accessibility and availability at home level.

CONCLUSION

There was high FI prevalence among HAP users, mainly in families with member younger than 18 years. The most prevalent domains were the ones referring to concern with lack of food and money to purchase healthy and varied food. The current context in the country is one of severe health, political and social security crises, which point towards likely increase in the risk of FI and violations to the Human Right to Adequate Food. Thus, within the scope of the Brazilian Unified Health System (*Sistema Único de Saúde - SUS*), and for early intervention and health promotion purposes, it is essential continuously monitoring FI levels, as well as acknowledging the most prevalent domains capable of contributing to more assertive actions focused on helping families living under food insecurity conditions.

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Contributors

Araujo ML. participated in study design, data collection, statistical analysis, and in manuscript writing and review. Mendonça RD participated in study supervision, data collection and analysis, and in manuscript writing and review . Pereira SCL participated in manuscript design, writing and review; Lopes ACS has planned the study design, captured the resources for the project, coordinated data collection, and participated in manuscript writing and review.

Conflicts of Interest: The authors declare no conflict of interest.

Received: December 26, 2020
Accepted: June 10, 2021