

Household appliances and food insecurity: gender, referred skin color and socioeconomic differences

Bens de consumo e insegurança alimentar: diferenças de gênero, cor de pele autorreferida e condição socioeconômica

Leticia Marin-Leon¹

Priscila Maria Stolses Bergamo Francisco¹

Ana Maria Segall-Corrêa¹

Giseli Panigassi¹

¹Departamento de Medicina Preventiva e Social da Faculdade de Ciências Médicas da Universidade Estadual de Campinas – Campinas (SP), Brasil

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Correspondência: Leticia Marin-Leon – Rua dos Alecrins 234 apto. 62 – Cambui – CEP: 13024-410 – Campinas (SP), Brasil – E-mail : leticia@fcm.unicamp.br

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Abstract

Objective: Data from the National Household Survey 2004 was analyzed to compare differences in prevalence among moderate or severe food insecurity. Also, it was compared food security or mild food insecurity households in relation to the assets and other socioeconomic and demographic conditions of the household. **Method:** Private permanent households, with *per capita* monthly income of up to one minimum wage and with the Brazilian Food Insecurity Scale answered by a household resident were studied (n=51,357). Association of variables with the dependent variable (food security) was verified using χ^2 test, with 5% significance level. Crude prevalence ratio, respective 95% confidence interval and adjusted analyses were carried out using Poisson multiple regression Stata 8.0. It considers the weights of the complex sampling design of the survey. **Results:** The *per capita* monthly household income was the variable with strongest association to food security. Both in urban and rural areas, there were higher risk of moderate or severe food insecurity prevalence ratio when the head of the household was a female, black color, presence of six or more members in the household, metropolitan area and with absence of some specific assets (stove, water filter, refrigerator, freezer, washing machine and cellular phone). In a model that, among assets, included just the refrigerator, it was observed the highest prevalence ratio for household income of up to $\frac{1}{4}$ of a minimum wage and after this, the absence of refrigerator among households headed by white and black males and white or black female. Although female and black headed households have greater food restriction, internal differences among these groups were higher for households headed by white males and lower for those headed by black females. **Conclusion:** At national level and households with monthly income of up to one minimum wage, poor socioeconomic conditions are associated to household food insecurity. This situation is worse

among those headed by women and black people. Among poor people, the absence of assets identifies the most vulnerable population to food insecurity and may be used as complementary indicator, mainly in local studies with poor technical resources for data collection and more sophisticated analyzes.

Keywords: social conditions; food security; social inequality; poverty; family characteristics; socioeconomic factors.

Resumo

Objetivo: Com base nos dados da Pesquisa Nacional por Amostra de Domicílios (PNAD, 2004), foram comparadas as diferenças na prevalência de insegurança moderada/grave em relação à segurança alimentar, e insegurança leve quanto à posse de bens de consumo e outras condições socioeconômicas e demográficas.

Métodos: Foram estudados os domicílios particulares permanentes, com rendimento domiciliar *per capita* de até um salário mínimo, utilizando-se a Escala Brasileira de Insegurança Alimentar respondida por morador do domicílio (n=51.357). A associação entre as variáveis e a variável dependente (segurança alimentar) foi verificada pelo teste do χ^2 com nível de significância de 5%. Foram calculadas razões de prevalência brutas e intervalos de confiança de 95% e a análise ajustada foi conduzida por meio de regressão múltipla de Poisson, utilizando Stata 8.0, que incorpora as ponderações do desenho amostral com delineamento complexo.

Resultados: A renda domiciliar mensal *per capita* foi a variável com maior força de associação com a segurança alimentar. Tanto em áreas urbanas quanto rurais, foram encontradas elevadas razões de prevalência para insegurança alimentar moderada ou grave nos domicílios chefiados por mulheres, de cor negra, presença no domicílio de seis ou mais moradores, localização metropolitana e com ausência de alguns bens específicos (fogão, filtro, geladeira, freezer, máquina de lavar roupa e telefone celular). Em modelo que incluiu, entre os bens, apenas a posse de geladeira, a maior razão de prevalência ocorreu na renda de até $\frac{1}{4}$ de salário mínimo, seguindo-se a ausência de posse de geladeira, tanto nos domicílios chefiados por homens brancos, como por negros e mulheres brancas ou negras. Embora os domicílios chefiados por mulheres e por negros apresentem maior insegurança alimentar, as diferenças intragrupo foram maiores em domicílios chefiados

por homens brancos e menores nos de mulheres negras. **Conclusão:** Em nível nacional e em domicílios com renda de até um salário mínimo, condições socioeconômicas mais precárias estão associadas à insegurança alimentar, sendo a situação agravada naqueles chefiados por mulheres e onde residem pessoas de cor autorreferida como negra. A ausência de bens identifica, entre os pobres, a população mais vulnerável à insegurança alimentar e pode se constituir em indicador complementar, sobretudo em estudos locais, onde há escassez de recursos técnicos para coleta de dados e análises mais sofisticadas.

Palavras-chave: condições sociais; segurança alimentar e nutricional; desigualdade social; pobreza; características da família; fatores socioeconômicos.

Introduction

The Brazilian Food Insecurity Scale (EBIA), used in the National Household Sample Survey (PNAD) 2004¹ is a direct measure of the interviewee's food insufficiency and his family in the three months preceding the survey at several levels of relative intensity².

EBIA is an adaptation and validation for Brazil of the Household Food Security Scale Measurement³ that was built in the United States from qualitative and quantitative surveys of the 1980s⁴⁻⁶. It is an instrument that by enquiring for daily life access to food leads the respondents to the symbolic, cultural and social aspects of feeding, but does not replace the indirect instruments to measure food insecurity vulnerability, such as income and other social conditions linked to poverty.

The inclusion of this scale in the PNAD-2004 answers the need for information on the dimension of food insecurity and its population distribution. Using EBIA, the various spheres of government can identify the most vulnerable population and propose actions to assure permanent access to enough quantity and adequate quality of food, which has been recognized as a fundamental human right by the Brazilian legislation⁷.

In Brazil, using simple descriptive analysis of PNAD 2004 data, it was observed a higher prevalence of moderate or severe food insecurity (MSFI) in households: with low *per capita* monthly income, those located in rural areas, with at least, one resident under 18 years, female-headed, with low schooling and self-referred black (black or brown)¹.

Usually, family income and schooling of heads of household are the most used indicators to define socioeconomic conditions. However, income is a questionable reliability variable because informants may refuse to report it or ignore the income of other household members. Some publications have used an index that includes the possession of some home

appliances and the schooling of heads of household, as an indicator of socioeconomic status^{8,9}, enabling the classification of the population into categories of economic classes. In 1997, ABA (Brazilian Association of Advertisers), ABIPEME (Brazilian Association of Market Research Institutes) and ANEP (National Association of Research Companies) published "Criterion Brazil", which in 2008 edition, published by ABEP (Brazilian Association of Research Companies), has five classes ranging from A (the wealthiest) to E (the poorest), and classes A, B and C have two subclasses¹⁰. The questions on household goods in PNAD-2004 are insufficient for the construction of the economic index of ABIPEME because, although some specific home appliances are listed, it does not quantify each of them and does not report the existence of a housemaid.

By studying families with familiar *per capita* monthly income of up to ½ minimum wage (MW), living in metropolitan areas, Torres et al¹¹ pointed out that between 1995 and 2004 access to household goods increased primarily for telephone, washing machine and refrigerator. For these authors, the increase in consumption could be explained by the relative reduction in prices of food and home appliances and increase in consumer credit. The "marketing" of the household appliance industry and retailers that have used strategies aimed at stimulating consumption in low income population¹², would be an explaining factor for increase of home goods in this social group.

One advantage of individually analyzed home appliances information would be its use as an indicator of the economic condition of poor population, particularly in cities with limited resources for more complex analysis, as the assembly of an index. It is therefore justified to study the role that household goods have on food security, assuming that home appliances could be related to both food security and food insecurity among poor population.

The aim of this study was to compare, based on PNAD 2004 data, the differences in MSFI prevalence by ownership of home appliances and other demographic and socioeconomic conditions in households with an income of up to one minimum wage *per capita* by month.

Methods

In PNAD-2004 interviews were conducted in 112,716 households, from which were selected 51,357 permanent private households with a *per capita* monthly income up to 1 MW, and those where the Brazilian Food Insecurity Scale (EBIA) was answered by a household resident.

The dependent variable was food security, although it is defined in four categories by EBIA², for this analysis it was dichotomized joining the categories with the greatest similarity among themselves, which are food security and mild insecurity (FS/mFI) against moderate and severe insecurity (MSFI). The criterion used to link the categories was the construct similarity between food security, which is the condition of absence of any restriction, and mild insecurity, that can only represent the concern that food may come to lack or decrease the quality of diet, in other words, monotonous diet due to lack of money for greater variety of foods. Moderate insecurity is characterized not only by monotony of the diet but also by reduced amount of food at each meal, while severe insecurity also includes reduction in the number of meals representing the experience of hunger. The similarity of the categories that composed the dependent variable is even supported by the psychometric characteristics of the scale, where low severity items have high frequency of positive answers and as the question severity increases towards hunger direction, it reduces the frequency of positive answers¹³.

The independent variables analyzed were: *per capita* monthly household

income dichotomized in to up to ¼ of MW and more than ¼ up to 1 MW; place of residence (urban *vs* rural); metropolitan location (yes *vs* no); characteristics of heads of household (gender, schooling up to 4 years and 5 years or more, self-referred color (white *vs* black/brown), age (up to 44 years and 45 or more); family characteristics – size (up to 5 vs 6 and more residents) and composition (with children and adolescent under 18 years or without residents under 18 years); elderly residents (60 and more – yes *vs* no) and home appliances possession (stove of two or more burners, water filter, color television, refrigerator, freezer, washing machine, cell phone, landline phone and microcomputer).

Crude prevalence and 95% confidence intervals of lack of specific home appliances were calculated, stratified by income, chi-square test was also used for statistical significance.

Also MSFI crude prevalence and their 95% confidence intervals were estimated, stratified by gender and color of heads of household and possession of a refrigerator, controlled by household income, place of residence, family size and schooling level of heads of household.

The association between independent variables and the dependent variable was tested by chi-square test with significance level of 5%. Crude prevalence ratios and 95% confidence intervals were calculated and adjusted analysis was conducted using Poisson multiple regression¹⁴.

In the multivariate model, the inclusion criterion was the association with moderate or severe food insecurity (MSFI) at $p=0.20$ in bivariate analysis, controlled for income range (up to ¼ of MW and more than ¼ up to 1 MW). As besides the *per capita* monthly household income it also has been described the associations of severe insecurity^{1,15} with some socioeconomic characteristics of the family and heads of households, these independent variables were included in the model as confounding variables.

Backward selection procedure was used to exclude not significant variables and in the final model only remained those with $p<0.01$.

We decided to build yet another final model excluding the household goods except the refrigerator, considering the comments of a Rio Grande do Sul study¹² which described that for the urban poor population the basic appliances are the stove and refrigerator, its absence was perceived as inconceivable. Although the refrigerator represents a monthly expense for the energy it consumes, allows, however, the purchase of perishable foods and their fractionated availability. Stove has an almost universal presence and the refrigerator is present with an intermediate frequency in the population studied. Finally, we present separate models for the four categories of households by color and gender of the heads. It is noteworthy that the number of non-response to the specific questions used in this study, the highest value was found for schooling (0.6%), other variables do not exceed 0.4%. These records were excluded from multivariate procedures.

Data analysis were performed using STATA 8.0 for analysis procedures whose population survey commands incorporate the weights required to correct the unequal selection probabilities derived from the complex sampling design.

Being an examination of a public database, managed and executed by IBGE, and the data available without identifying the respondents, the research plan of this study was not submitted to the Ethics Committee in Research, FCM-UNICAMP. The authors declare no conflicts of interest.

Results

Most households were headed by men (74.3%) which mainly had 5 or more years of schooling. This category of schooling accounted for 41.2% in male headed households and 42.4% in female headed

households. For each gender and range of schooling, households with no income and with up to ¼-MW showed the highest MSFI prevalence (data not mentioned in tables).

Table 1 shows the percentage of absence of specific home appliances according to *per capita* monthly household income and food security conditions. MSFI households had a greater proportion than FS/mFI households of absence of each specific home assets and still higher rates of lack of ownership of these assets were observed in households where the per capita monthly income was up to ¼ MW in comparison with households with income >1/4-1 (p<0.001). In households with up to 1 MW, the lack of stove was rare, refrigerator was intermediate, washing machine and phones high, and the presence of a computer was exceptional. Table 2 presents three explanatory models of MSFI. Although *per capita* monthly income is the variable that presents the

highest prevalence ratio, all variables of specified home appliance remained in the model for Brazil as a whole. In the model for rural households some variables were not significantly different: “lack of resident younger than 18 years”, “lack of elderly”, lack of television, telephone and computer (p>0.01). Both in urban and rural areas, the highest prevalence ratio of MSFI were: in female headed households, black headed, with six or more residents and metropolitan location.

Table 3 shows that households without a refrigerator had a higher prevalence of the MSFI than those with refrigerator, especially those headed by black women (p=57.9%; 95%CI 55.4–60.3). When stratified by several variables it was observed among households headed by men and those female-headed and with no refrigerator, that the households with the highest MSFI prevalence were those with *per capita* monthly income up to ¼ MW (59.2% for white male-headed and 76.2 for

Table 1. Absence of specific assets by household monthly per capita income bracket and food security condition in Brazil
Tabela 1. Ausência de bens específicos segundo faixa de renda domiciliar mensal per capita e condição de segurança alimentar no Brasil

Specific assets	Income<1/4 MW		Income>1/4 – 1 MW	
	Food Security/ Mild Food Insecurity	Moderate/Severe Food Insecurity	Food Security/ Mild Food Insecurity	Moderate/Severe Food Insecurity
	% (95%CI)	% (95%CI)	% (95%CI)	% (95%CI)
Stove	5.7 (4.9–6.5)	12.5 (11.6–13.5)**	1.9 (1.8–2.1)	4.8 (4.4–5.3)*
TV	31.3 (29.7–33.0)	44.7 (43.3–46.2)**	14.9 (14.5–15.3)	25.9 (25.0–26.8)*
Refrigerator	33.9 (32.2–35.5)	49.4 (47.9–50.8)**	13.7 (13.3–14.1)	26.2 (25.3–27.1)*
Freezer	93.1 (92.1–94.0)	97.9 (97.4–98.2)**	90.1 (89.7–90.4)	96.0 (95.6–96.3)*
Water Filter	56.7 (54.9–58.4)	64.9 (63.5–66.3)**	49.8 (49.2–50.4)	57.4 (56.4–58.4)*
Washing machine	89.8 (88.6–90.9)	96.8 (96.2–97.3)**	81.1 (80.6–81.6)	91.6 (91.0–92.2)*
Cellular Phone	79.4 (78.0–80.8)	87.7 (86.8–88.7)**	64.4 (63.8–65.0)	74.3 (73.4–75.2)*
Landline Phone	85.0 (83.7–86.3)	92.2 (91.4–92.9)**	67.0 (66.4–67.6)	77.7 (76.8–78.5)*
Computer	97.5 (96.8–98.0)	99.6 (99.4–99.8)**	95.8 (95.6–96.1)	98.7 (98.4–98.9)*

Source: PNAD, 2004.

*p<0,001; **p<0,001 in the comparison between income groups in moderate/severe food insecurity.

Fonte: PNAD, 2004.

*p<0,001; **p<0,001 na comparacao entre faixas de renda da proporcao em inseguranca moderada/grave

Table 2. Prevalence, prevalence ratio (PR) and Poisson Regression Model for moderate/severe food insecurity by characteristics of the head of the household and residence situation. Brazil, PNAD 2004

Tabela 2. Prevalência, razão de prevalência e modelo de regressão de Poisson para insegurança moderada ou grave segundo características da pessoa de referência (PR) e situação de residência. Brasil, PNAD 2004

BRAZIL	Category	% in MSFI	PR	95%CI		p
per capita monthly income	up to ¼MW	59.5	1.77	1.72	1.81	0.000
Sex of head of household ^b	Female	37.9	1.30	1.27	1.33	0.000
schooling of head of household ^c	<5 years	35.9	1.14	1.11	1.17	0.000
color of head of household ^d	black	36.8	1.25	1.22	1.29	0.000
Age of head of household ^e	45 years or +	32.4	1.08	1.05	1.11	0.000
number de residents ^f	6 or +	44.6	1.22	1.18	1.26	0.000
Without residents less than 18years ^g	Yes	32.4	1.10	1.07	1.14	0.000
Metropolitan area ^h	Yes	31.3	1.32	1.29	1.36	0,000
With elders ⁱ	No	31.8	1,13	1,08	1,18	0.000
stove ^j	No	59.2	1.13	1.08	1.17	0.000
tv ^k	No	46.9	1.10	1.07	1.13	0.000
refrigerator ^l	No	49.4	1.23	1.19	1.27	0.000
freezer ^m	No	32.8	1.51	1.41	1.62	0.000
water filter ⁿ	No	35.1	1.16	1.13	1.19	0.000
washing mashine ^o	No	34.2	1.50	1.42	1.59	0.000
cellular phone ^p	No	35.3	1.14	1.10	1.18	0.000
landline phone ^q	No	35.3	1.16	1.12	1.20	0.000
computer ^r	No	32.0	1.72	1.48	2.01	0.000
URBAN						
per capita monthly income ^a	up to ¼MW	62.0	1.74	1.69	1.80	0.000
Sex of head of household ^b	Female	38.0	1.24	1.21	1.28	0.000
schooling of head of household ^c	<5 years	37.0	1.18	1.15	1.22	0.000
color of head of household ^d	black	36.7	1.24	1.21	1.28	0.000
Age of head of household ^e	45 years or +	33.0	1.11	1.07	1.14	0.000
number de residents ^f	6 or +	44.1	1.24	1.20	1.29	0.000
Without residents less than 18years ^g	Yes	33.9	1.11	1.07	1.15	0.000
Metropolitan area ^h	Yes	31.6	1.25	1.22	1.29	0.000
With elders ⁱ	No	31.5	1.14	1.09	1.19	0.000
stove ^j	No	64.8	1.09	1.03	1.14	0.001
tv ^k	No	52.1	1.17	1.14	1.21	0.000
refrigerator ^l	No	55.7	1.28	1.24	1.32	0.000
freezer ^m	No	32.4	1.33	1.23	1.44	0.000
water filter ⁿ	No	35.2	1.14	1.11	1.18	0.000
washing mashine ^o	No	34.6	1.49	1.40	1.58	0.000
cellular phone ^p	No	35.6	1.14	1.10	1.18	0.000
landline phone ^q	No	36.7	1.22	1.17	1.26	0.000
computer ^r	No	32.0	1.73	1.48	2.02	0.000
RURAL						
per capita monthly income ^a	up to ¼MW	55.1	1.86	1.76	1.97	0.000
Sex of head of household ^b	Female	37.4	1.28	1.20	1.38	0.000
schooling of head of household ^c	<5 years	33.7	1.13	1.05	1.23	0.002
color of head of household ^d	black	37.2	1.26	1.18	1.34	0.000
number de residents ^f	6 or +	45.5	1.20	1.13	1.27	0.000
Metropolitan area ^h	Yes	26.7	1.20	1.07	1.35	0.001
stove ^j	No	54.0	1.23	1.15	1.31	0.000
refrigerator ^l	No	42.8	1.30	1.28	1.38	0.000
freezer ^m	No	34.2	1.89	1.62	2.22	0.000
water filter ⁿ	No	34.8	1.20	1.14	1.27	0.000
washing mashine ^o	No	32.9	1.68	1.33	2.12	0.001
cellular phone ^p	No	34.3	1.24	1.11	1.39	0.000

Prevalence Ratio (PR) was calculated in relation to the reference category food security/ mild insecurity and the other reference categories ">1/4 to <1 minimum wage (MW) ^a," "male^b," "5 years or more of schooling^c," "white color^d," "head of household with up to 44 years old^e," "up to 5 people in the household^f," "with residents of <18 years^g," "not metropolitan area^h," "without elders in the householdⁱ" and "presence of each asset^{jklmnopqr}."

A razão de prevalência (PR) foi calculada em relação à categoria de referência SA/IL e as respectivas categorias de referência ">1/4 a <1 SM^a," "sexo masculino^b," "5 anos ou mais de estudo^c," "cor branca^d," "pessoa de referência com até 44 anos^e," "até 5 moradores no domicílio^f," "com moradores <18 anos^g," "área não metropolitana^h," "sem idosos no domicílioⁱ" e "presença de cada bem^{jklmnopqr}."

black female-headed) and those with 6 or more residents (54.2% and 70.0% for white male and black female-headed respectively). Besides these variables, households headed by women and located in metropolitan areas also had high MSFI prevalence (56.6% among white-headed and

68.5% among black-headed). In this table the statistical significance between types of households with different characteristics of gender and color of heads of household and possession of a refrigerator was verified by lack of overlap of the 95% confidence interval of the MSFI prevalence. Among

Table 3. Prevalence of moderate or severe food insecurity by sex and color of the head of the household and refrigerator ownership and other socioeconomic and demographic characteristics

Tabela 3. Prevalência de insegurança moderada ou grave segundo sexo, cor autorreferida da pessoa responsável, posse de geladeira no domicílio, e outras características socioeconômicas e demográficas

Variable		Male				Female			
		White		Black		White		Black	
		Refrigerator		Refrigerator		Refrigerator		Refrigerator	
		%Yes	%No	%Yes	%No	%Yes	%No	%Yes	%No
		95%CI	95%CI	95%CI	95%CI	95%CI	95%CI	95%CI	95%CI
Per capita monthly Income	None	18.1	40.9	28.5	50.6	27.5	46.8	39.0	57.9
		17.4–18.9	38.7–43.1	27.8–29.3	49.2–51.9	26.0–29.0	42.8–50.9	37.7–40.4	55.4–60.3
	>¼-1MW	15.4	31.6	24.0	39.8	24.7	36.6	34.4	48.8
		14.7–16.1	29.2–34.1	23.2–24.8	38.1–41.4	23.2–26.3	32.3–41.2	32.9–35.8	45.8–51.7
up to ¼SM		43.0	59.2	54.5	68.5	51.8	78.0	64.5	76.2
		40.1–46.0	55.4–63.0	52.4–56.6	66.5–70.5	46.6–57.0	70.6–84.0	61.0–67.9	72.4–79.6
Schooling of Head of Household	5 years or +	15.1	36.1	23.0	45.7	24.2	51.5	34.5	55.1
		14.1–16.1	31.8–40.5	22.0–24.1	42.8–48.7	22.2–26.4	43.7–59.2	32.6–36.5	50.2–60.0
	0-4 years	21.3	42.4	32.6	51.6	30.0	44.8	42.2	58.6
		20.2–22.4	39.9–44.9	31.6–33.7	50.2–53.1	27.9–32.1	40.2–49.6	40.4–44.1	55.8–61.4
Metropolitan Area	No	17.5	40.3	28.0	50.0	26.2	45.0	38.1	55.7
		16.6–18.3	38.0–42.6	27.2–28.9	48.6–51.4	24.5–28.1	40.6–49.5	36.4–39.8	52.9–58.4
	Yes	20.1	47.6	29.8	56.5	29.8	56.6	40.6	68.5
	18.6–21.6	41.2–54.2	28.4–31.2	52.7–60.3	27.4–32.4	47.3–65.4	38.4–42.8	63.8–72.8	
Residence Situation	Rural	14.9	35.7	27.0	45.2	24.1	36.6	36.4	47.0
		13.4–16.4	32.8–38.6	25.4–28.7	43.4–47.1	19.1–29.9	29.3–44.6	31.8–41.3	42.3–51.7
	Urban	18.9	47.2	28.9	57.0	27.8	50.5	39.2	62.2
	18.1–19.8	44.0–50.5	28.1–29.7	55.1–58.9	26.3–29.3	45.8–55.2	37.8–40.7	59.4–64.9	
Number of Residents	1-5	16.8	38.2	26.6	47.6	27.1	44.8	38.3	56.5
		16.1–17.6	35.9–40.6	25.8–27.4	46.1–49.1	25.6–28.6	40.6–49.1	36.9–39.7	53.9–59.0
	6 or +	31.1	54.2	38.8	61.7	36.8	67.2	47.7	70.0
	28.3–34.0	48.8–59.5	36.8–40.9	58.9–64.5	29.2–45.2	53.1–78.7	42.8–52.7	62.3–76.7	

Table 4. Poisson multiple regression model for moderate or severe food insecurity by sex, color of the head of the household, refrigerator ownership and some characteristics of the head of the households and residence. Brazil, PNAD 2004

Tabela 4. Modelo múltiplo de regressão de Poisson para insegurança moderada ou grave segundo sexo, cor autorreferida da pessoa de referência (PR), posse ou não de geladeira e algumas características da pessoa de referência e situação de residência. Brasil, PNAD 2004

	Category	PR	95%CI	p
BRAZIL				
gender of Head of Household	Female	1.29	1.25–1.33	0.000
color of Head of Household	black	1.23	1.20–1.28	0.000
<i>per capita</i> monthly income	up to ¼ MW	1.90	1.85–1.96	0.000
schooling of Head of Household	<5 years	1.31	1.27–1.35	0.000
number of residents	6 or +	1.18	1.14–1.22	0.000
residence situation	Urban	1.34	1.30–1.39	0.000
metropolitan area	Yes	1.17	1.13–1.20	0.000
region	North	1.34	1.26–1.43	0.000
	Northeast	1.38	1.31–1.46	0.000
refrigerator	No	1.42	1.38–1.46	0.000
Male White Head of Household				
<i>per capita</i> monthly income	up to ¼ MW	2.20	2.04–2.36	0.000
schooling of Head of Household	<5 years	1.39	1.29–1.49	0.000
number of residents	6 or +	1.37	1.26–1.48	0.000
residence situation	Urban	1.55	1.43–1.68	0.000
metropolitan area	Yes	1.20	1.11–1.31	0.000
region	North	1.36	1.20–1.55	0.000
	Northeast	1.52	1.39–1.67	0.000
refrigerator	No	1.60	1.48–1.73	0.000
Male Black Head of Household				
<i>per capita</i> monthly income	up to ¼ MW	1.85	1.77–1.92	0.000
schooling of Head of Household	<5 years	1.31	1.26–1.38	0.000
number of residents	6 or +	1.14	1.09–1.19	0.000
residence situation	Urban	1.33	1.27–1.39	0.000
metropolitan area	Yes	1.19	1.13–1.24	0.000
region	North	1.27	1.14–1.41	0.000
	Northeast	1.32	1.19–1.46	0.000
refrigerator	No	1.42	1.37–1.48	0.000
Female White Head of Household				
<i>per capita</i> monthly income	up to ¼ MW	2.13	1.94–2.34	0.000
schooling of Head of Household	<5 years	1.24	1.12–1.36	0.000
residence situation	Urban	1.28	1.09–1.51	0.002
geladeira	No	1.49	1.34–1.66	0.000
Female Black Head of Household				
<i>per capita</i> monthly income	up to ¼ MW	1.73	1.65–1.83	0.000
schooling of Head of Household	<5 years	1.23	1.16–1.31	0.000
residence situation	Urban	1.24	1.13–1.35	0.000
metropolitan area	Yes	1.10	1.04–1.16	0.001
region	North	1.26	1.09–1.47	0.002
	Northeast	1.22	1.06–1.41	0.006
refrigerator	No	1.27	1.20–1.34	0.000

households in metropolitan areas and with six or more residents no significantly different MSFI prevalence were observed between black and white-headed households without a refrigerator.

The multiple logistic model for MSFI presented in Table 4 differs from model in Table 2 in that the only home appliance included was the refrigerator. The categories with no significative values ($p \geq 0.01$) were excluded from this table. For Brazil as a whole and considering gender and color of the heads, the highest prevalence ratio were observed in *per capita* monthly income of up to ¼ MW (PR=1.90; 95%CI 1.85-1.96) and lack of refrigerator (PR=1.42; 95%CI 1.38-1.46). Comparing to the other gender and color groups, white male-headed households had the highest PR for MSFI. Among white and black female-headed households, the number of residents equal or higher than 6 was not a determinant of MSFI. Living in the North and Northeast regions and in metropolitan areas, were also not determining factors of MSFI among white female-headed households.

Discussion

The main limitation of this study is the cross-sectional design of the PNAD restricting the inference of causality.

Whereas the prevalence of MSFI for Brazil was 18.8%¹, it was found that among households with up to 1 MW, and whose heads had 4 years of schooling or less the MSFI prevalence was higher than the national average. Households without any specific home appliances showed higher MSFI prevalence than the national average, regardless of gender and schooling level of heads of household.

In the model developed for the general population of Brazil, the *per capita* monthly household income was the variable with strongest association with food security, both in urban and rural areas, experiencing high prevalence ratio for moderate or severe food insecurity

in households headed by women, black, with six or more residents, metropolitan location and with lack of specific home appliances (stove, water filter, refrigerator, freezer, washing machine and cell phone). The income importance was pointed in a study that also used PNAD 2004 data, noting that every R\$10.00 (ten reais) added to the family income, from some social income transfer program, the household chances of food security increased in 8%¹⁶.

Comparing urban with rural households it was observed that the lower food restriction in rural location is probably related to food production for self-consumption, and lower spending on non-food items such as housing, transportation, clothing, purchase of vehicles, health care, and home maintenance. In the Household Budget Survey (POF) 2008-2009¹⁷ it was observed that total rural expenditures represented one-tenth of urban expenditure. It was also observed that housing expenses were much higher than food expenses in urban areas (36 *vs* 18.8%) than in rural ones (29.5 *vs* 26.5%)¹⁷. The non-monetary expenses, those obtained through own production, hunting, fishing, gathering, exchange, donation or business withdrawal, reached 20.8% in rural areas while in urban areas was 14.7%¹⁷.

It also contributes to the urban/rural differences, the family composition, such as having elderly member and younger than 18 years. As noted by a study with an urban population in Campinas¹⁸, households with elderly residents benefit from their income, from pensions, as well as the benefits from income transfer programs¹⁹. In urban areas the risk of MSFI increased in households without elderly. Children less than 18 years in urban areas represent a higher expenditure on food and non-food items. Probably the higher risk of MSFI in urban households headed by a person 45 years or more is related to the greater difficulty of remaining employed¹⁹, while another study of PNAD-2004 noted the

highest unemployment (16.8%) and lowest proportion of formal work contract among the population with the lowest tenth of *per capita* monthly household income²⁰. It is noteworthy that, considering only poor population, inequality is still evident and it is related to self-referred color, as described by Pinheiro et al.¹⁹, these differences are greater when the home lacks in refrigerator, washing machine, TV and telephone.

In relation to gender differences, it is important to point out that even though household appliances integrate the feminine symbolic space¹², the greater lack of these items on female-headed households may point out to the existence of higher responsibility toward the cost of maintaining the equipment or, less debt capacity to acquire them.

Core families, or arrangements with few residents, though they may have lower total household income, generally they have higher resources for food. In this study, was observed a higher risk of MSFI in households with six or more residents in both urban and rural areas. The vulnerability of large families or extended with aggregates, was also observed by Torres et al.¹¹.

Panigassi et al.²¹ suggested the possibility of using the direct measure of food security assessed by EBIA to complement social indicators and identify groups with social vulnerability. To the traditional indicators, it was added, in this study, the possession of some specific home appliances.

Gender inequality is marked by food restriction of female-headed households, being higher in households that do not have the specific home appliances studied. Even within a poor population, households with a *per capita* monthly income of less than ¼ of MW had higher MSFI prevalence and even higher among female-headed households. Although income inequality is the most important factor in determining food restriction, low schooling and being black contributed

to differences in MSFI. Still other conditions that contribute to inequalities in access to food are: living in urban areas and large size family. By stratifying households by gender and skin color of heads of household the MSFI inequality is more evident. Households with a refrigerator and white male-headed had the lowest restriction and those without a refrigerator and headed by black women the highest. White female-headed households and those headed by black men had a similar condition of food restriction. Among the four groups of households, low income was the condition of greatest risk for MSFI and in all groups the risk of food restriction related to lack of refrigerator was also noteworthy.

The use of household goods individually, enabled more detailed findings than if a consumption index had been used. But when the goal is the assessment of socioeconomic status and analysis of food security conditions, the use of an indicator of family income is still indispensable.

As noted by Panigassi et al.²² and Salles-Costa et al.⁹ households in food insecurity have a reduced consumption of fruits, vegetables and meats. Thus the income has the explanatory power of FI and could not be otherwise since the Brazilian society is very monetized and, most of the questions in EBIA inquire the situation of food restriction related to lack of money.

It was not confirmed, based on data from PNAD 2004, that household goods that represent an operation cost or monthly expenses would compete with the purchase of food and thus would be associated with MSFI. Rather, it was the absence of specific appliances that was associated with this condition and reflects the current and past poverty situation of these families.

It can thus be assumed that, in general, the consumption behavior of poor people gives priority to food and other essential needs. Precarious socioeconomic

conditions are associated with food insecurity in households, and the situation is worsened in those headed by women and people self-reported as black. The absence of household goods identifies, among the poor, the most vulnerable population to food insecurity and may constitute an additional indicator, mainly in local studies, where there is shortage of technical resources for data collection and more sophisticated analysis.

Collaborators

L. Marín-León developed and wrote the body of this article. P.M.S.B. Francisco, designed and performed the statistical analysis and participated in the final revisions. A.M. Segall-Corrêa and G. Panigassi participated in the review of the various versions of the article. None of the authors presented conflict of interest related to the topic discussed.

References

1. Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa Nacional por Amostra de Domicílios: PNAD 2004: suplemento de segurança alimentar. Rio de Janeiro: IBGE; 2006.
2. Pérez-Escamilla R, Segall-Correa AM, Maranhã LK, Sampaio MF, Marín-León L, Panigassi G. An adapted version of the US Department of Agriculture Food Insecure Module is a valid tool for assessing food insecurity in Campinas, Brasil. *J Nutr*. 2004;134:1923-8.
3. Bickel GW, Nord M, Hamilton W, Cook J. Guide to measuring household food security in the United States. Revised 2000. Washington, DC: USDA Economic Research Service; 2000.
4. Radimer KL, Olson CM, Campbell CC. Development of indicators to assess hunger. *J Nutr* 1990; 120: 1544-8.
5. Wehler, C. Community Childhood Hunger Identification Project: New Haven Risk Factor Study. Connecticut Association for Human Services, Hartford, CT; 1987.
6. Campbell C. Food Insecurity: a nutritional outcome or a predictor variable? *J Nutr*. 1991;121:408-15.
7. Brasil. Presidência da República Casa Civil Subchefia para Assuntos Jurídicos Lei Nº 11.346, de 15 de Setembro de 2006. Cria o Sistema Nacional de Segurança Alimentar e Nutricional - SISAN com vistas em assegurar o direito humano à alimentação adequada e dá outras providências [internet]. [citado 04 set 2010]. Disponível em: <<https://www.planalto.gov.br/Consea/3Conferencia/Static/Documentos/LOSAN%2520FINAL.pdf>>.
8. Dachs JN, Santos W, Rocha AP. Auto-avaliação do estado de saúde no Brasil: análise dos dados da PNAD/2003. *Ciênc Saúde Coletiva*. 2006;11:887-94.
9. Salles-Costa R, Pereira RA, Vasconcellos MTL, Veiga GV, Marins VMR, Jardim BC, et al. Associação entre fatores socioeconômicos e insegurança alimentar: estudo de base populacional na Região Metropolitana do Rio de Janeiro, Brasil. *Rev Nutr*. 2008;21(Suppl):99s-109s
10. Associação Brasileira de Empresas de Pesquisas (ABEP). Critério padrão de classificação econômica Brasil 2008 [internet]. Junho 2007 [citado 12 fev 2009]. Disponível em: <www.abep.org/codigosguias/Criterio_Brasil_2008.pdf>.
11. Torres HG, Bichir RM, Carpim TP. Uma pobreza diferente? Mudanças no padrão de consumo da população de baixa renda. *Novos Estudos Cebrap*. 2006;74:17-22.
12. Rocha A, Silva JF. Inclusão social e marketing na base da pirâmide: uma agenda de pesquisa. *RAE-eletrônica*, v. 7, n. 2, art. 23, jul./dez. 2008 [citado 14 set 2009]. Disponível em: <<http://www16.fgv.br/rae/electronica/index.cfm?FuseAction=Artigo&ID=5367&Secao=ARTIGOS&Volume=7&Numero=2&Ano=2008>>.
13. Hackett M, Melgar-Quiñonez H, Pérez-Escamilla R, Segall-Corrêa AM. Gender of respondent does not affect the psychometric properties of the Brazilian Household Food Security Scale. *Int J Epidemiol*. 2008;37:766-74.
14. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Med Res Methodol*. 2003;3:21.
15. Segall-Corrêa AM, Marín-León L, Sampaio MFA, Panigassi G, Pérez-Escamilla R. Insegurança alimentar no Brasil: do desenvolvimento do instrumento de medida aos primeiros resultados nacionais. In: Brasil. Ministério do Desenvolvimento Social e Combate à Fome (Org). Avaliação de políticas e programas do MDS: resultados Vol. I. Segurança alimentar e nutricional. Brasília DF: Ministério do Desenvolvimento Social e Combate à Fome; 2007. p. 385-407.
16. Segall-Corrêa AM, Marín-León L, Helito H, Pérez-Escamilla R, Santos LMP, Paes-Sousa R. Transferência de renda e segurança alimentar no Brasil: análise dos dados nacionais. *Rev Nutr*. 2008;21(Suppl):39s-51s.
17. IBGE. Coordenação de Trabalho e Rendimento. Pesquisa de orçamentos familiares 2008-2009: despesas, rendimentos e condições de vida. Rio de Janeiro: IBGE; 2010.

18. Marín-León L, Segall-Corrêa AM, Panigassi G, Maranhã LK, Sampaio MFA, Pérez-Escamilla R. A percepção de insegurança alimentar em famílias com idosos em Campinas, São Paulo, Brasil. *Cad Saúde Pública*. 2005;21:1433-40.
19. Pinheiro L, Fontoura N, Prata AC, Soares V. Retrato das desigualdades 2ª edição. Brasília: Instituto de Pesquisa Econômica Aplicada (IPEA) e Fundo de Desenvolvimento das Nações Unidas para a Mulher (UNIFEM) setembro 2006. [citado 10 jul 2009]. Disponível em: <http://www.ipea.gov.br/sites/000/2/pdf/retrato_segundaedicao.pdf>.
20. Schwartzman S. Redução da desigualdade, da pobreza, e os programas de transferência de renda. Rio de Janeiro: Instituto de Estudos do Trabalho e Sociedade (IETS) [internet]. Fev 2006. [citado 4 set 2010]. Disponível em: <http://www.desenvolvimentosocial.sp.gov.br/usr/File/2006/imprensa/Simon%20Schwartzman_2006.pdf>.
21. Panigassi G, Segall-Corrêa AM, Marín-León L, Perez-Escamilla R, Sampaio MF, Maranhã LK. Insegurança alimentar como indicador de iniquidade: análise de inquérito populacional. *Cad Saúde Pública*. 2008;24:2376-84.
22. Panigassi G, Segall-Corrêa AM, Marín-León L, Perez-Escamilla R, Maranhã LK, Sampaio MF. Insegurança alimentar intrafamiliar e perfil de consumo de alimentos. *Rev Nutr*. 2008;21(Suppl):135s-144s.

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