Household food insecurity in black-slaves descendant communities in Brazil: has the legacy of slavery truly ended?

Muriel B Gubert[1,]*, Anna Maria Segall-Corrêa[2], Ana Maria Spaniol[1], Jessica Pedroso[1], Stefanie Eugênia dos Anjos Campos Coelho[1] and Rafael Pérez-Escamilla[3]

[1]Faculdade de Ciências da Saúde, Departamento de Nutrição, Universidade de Brasília, Campus Universitário Darcy Ribeiro, Asa Norte, CEP 70910-900, Brasília, DF, Brazil: [2]Department of Collective Health, University of Campinas, Campinas, SP, Brazil: [3]Department of Chronic Disease Epidemiology, Office of Public Health Practice, Yale School of Public Health, New Haven, CT, USA

Abstract

Objective: To identify the factors associated with food insecurity among *Quilombolas* communities in Brazil.
Design: An analysis of secondary data assessed in the 2011 *Quilombolas* Census was performed. The Brazilian Food Insecurity Measurement Scale (*Escala Brasileira de Insegurança Alimentar*, EBIA) was used to assess household food security status. Sociodemographic conditions and access to social programmes and benefits were also evaluated.
Setting: National survey census from recognized *Quilombolas* Brazilian territories.
Subjects: *Quilombolas* households (*n* 8846).
Results: About half (47·8%) of the *Quilombolas* lived in severely food-insecure households, with the North and Northeast regions facing the most critical situation. Households located in North Brazil, whose head of the family had less than 4 years of education, with a monthly per capita income below $US 44, without adequate sanitation and without adequate water supply had the greatest chance of experiencing moderate or severe food insecurity. Households that had access to a water supply programme for dry regions (*Programa Cisternas*) and an agricultural harvest subsidy programme (*Programa Garantia Safra*) had less chance of experiencing moderate and severe food insecurity. Households that did not have access to health care (*Programa Saúde da Família*) had greater chance of suffering from moderate or severe food insecurity.
Conclusions: Interventions are urgently needed to strengthen and promote public policies aimed to improve living conditions and food security in *Quilombolas* communities.

Food and nutrition security is the guaranteed right for all to have access to safe, healthy and nutritious foods in adequate amounts, respecting cultural and social preferences[1,2]. The violation of this leads to household food insecurity (HFI), which can range from mild (concerns with food shortage and poor quality of foods due lack of money) to severe (occurrence of hunger)[3]. In Brazil, HFI is measured by national surveys using the Brazilian Food Insecurity Measurement Scale (*Escala Brasileira de Insegurança Alimentar*, EBIA)[3].

Since 2004 Brazil has generated data on household food security from three National Household Representative Surveys[4]. Analyses of these data have identified black or brown skin colour, low income and education, and poor health as risk factors for HFI[3,4].

In 2004 the prevalence of food insecurity among black and brown individuals was 43·4% compared with 24·6% among whites. Between 2004 and 2013 this prevalence decreased but still remained higher among black and brown individuals than whites (33·4 *v.* 17·2%, respectively). In 2013 over half (50·7%) of the Brazilian population self-identified as having black or brown skin[5], a characteristic associated with illiteracy and low income. Specifically, illiteracy was 11·8% among black and brown individuals and 5·3% among whites; furthermore, 14·1% of the black and brown individuals and 5·3% of the white population were in the lowest income decile. Conversely, among the richest 1% of the population, only 16·2% were blacks and 81·6% were whites[5].

Even though black slavery in Brazil ended in 1888, communities for black individuals still experience major

socio-economic inequities, especially among those living in slave-descendant communities. These communities are named *Quilombos* and the people living in them are known as *Quilombolas*. *Quilombos* are communities predominantly located in the rural areas of Brazil that were originally founded by runaway black slaves during the slavery period. *Quilombos* were legally recognized in the Brazilian Constitution in 1988[6], although only a few of them were given the right to ownership of their lands. These communities are distributed all over the country and have a relative degree of geographical isolation, a situation associated with difficulties in accessing basic goods and services[7–9]. In addition to poverty, *Quilombolas* experience other social exclusion risk factors including lack of Brazilian State official recognition of their lands, lack of political power and loss of their historically constructed cultural identity[9,10]. *Quilombolas* are legally eligible for social programmes (e.g. the *Bolsa Família* conditional cash transfer programme), to preferential policies to improve their access to land, to infrastructure development, to actions to promote quality of life, to support for local production and economic autonomy, and to strategies aiming to promote and protect their rights and citizenship (*Programa Brasil Quilombola*)[11]. Unfortunately, to date, these policies have not improved the quality-of-life situation of *Quilombolas* substantially.

Qualitative and quantitative studies using indirect indicators have shown that *Quilombolas* communities are at a very high risk of food insecurity[7–9]. *Quilombolas* communities in general have high illiteracy rates, low income, poor access to programmes of several social and agricultural public policies, and difficulties in getting their land ownership legally recognized[9]. The situation of extreme poverty faced by most of the *Quilombolas* families exposes them to food shortages and poor dietary quality, contributing to malnutrition, diseases and other negative health outcomes[2,7,9].

The present study aimed to identify the factors associated with food insecurity among *Quilombolas* communities in Brazil. In contrast to previous studies, our analysis is based on a direct measure of household food security using the experience-based Brazilian HFI scale (EBIA). Thus, the study's findings can help guide the Government to improve the design and focus of household food security policies for *Quilombolas* that are still affected by a legacy of major historical inequalities[11].

Methods

We analysed secondary data from a Census of 169 officially recognized *Quilombolas* Brazilian territories. This national census was conducted in 2011 under the coordination of the Ministry of Social Development and Fight Against Hunger (*Ministério de Desenvolvimento Social e Combate à Fome*, MDS) and the identified database is available in the public domain.

The *Quilombolas* Census assessed the living conditions of 9191 households distributed across fifty-five municipalities located in fourteen Brazilian States, including households with or without children[2]. The present study used the household as the unit of analysis and included only those that had complete information regarding the EBIA items (8856 households).

HFI was measured by EBIA. EBIA was originally a fifteen-item scale, but in 2010 one of the questions was excluded as a result of new psychometric analyses[3]. Thus, even though the fifteen-item EBIA scale was applied in the *Quilombolas* survey, we only used the recommended fourteen-item scale in our analyses. EBIA measures different HFI intensities, ranging from questions about worries about running out of food to questions about children not eating for a whole day. An additive household score was computed based on the number of affirmed questions. Based on this score, households were classified as: food secure (score = 0), mildly food insecure (score = 1–5), moderately food insecure (score = 6–9) or severely food insecure (score = 10–14)[3]. EBIA is an adapted and validated version of the US Household Food Security Survey Module[12]. The validation process of EBIA in Brazil included *Quilombolas* communities in the states of São Paulo and Mato Grosso, for both qualitative and quantitative phases, and concluded that EBIA is a valid scale to assess the HFI situation of *Quilombolas* populations[13].

We conduced descriptive socio-economic and demographic analyses for *Quilombolas* households located in each one of the five Brazilian regions. These regions have different environmental, climatic and socio-economic characteristics. The following variables were investigated: region; educational level of the head of household; monthly per capita household income, with extreme poverty defined as a monthly per capita income below $US 44[14]; enrolment in governmental social assistance programmes, namely the conditional cash transfer programme (*Programa Bolsa Família*), food assistance programme (*Programa Cesta de Alimentos*), water cistern supply programme (*Programa Cisternas*), family agriculture strengthening programme (*Programa Nacional de Fortalecimento da Agricultura Familiar*, PRONAF) and agriculture subsidy programme (*Programa Garantia Safra*); household adequate sanitation, defined as having public sewage system or a septic tank; adequate water supply, defined as water available from the public service or appropriately collected spring water; number of individuals in the household; number of children in the household; household visit from a community health worker in the past 2 months; health coverage by the family health programme (*Programa Saúde da Família*); enrolment in the federal government's single registry (*Cadastro Único*), an institutional mechanism for accessing the conditional cash transfer and other social protection programmes; household presence of person with physical disability; employment status of the head of

the household (employed or receiving government retirement; and characteristics of the employment: formal or informal); and earnings from the sale or growth of foods.

The *Programa Bolsa Família* is a conditional cash transfer programme for the population living in extreme poverty and provides monthly basic allowances with an additional amount of cash transfer according to the number of eligible individuals in the household. The *Programa Cesta de Alimentos* distributes food supplies to families in emergency or disaster situations and to specific population groups at high risk of food shortage such as indigenous and *Quilombolas* communities. The *Programa Cisternas* aims to promote access to water for human consumption and food production in dry areas by implementing low-cost technologies to store rainwater[15]. *PRONAF* subsidizes credits for small-scale farmers aiming to reduce rural poverty and to promote sustainable rural development. The *Programa Garantia Safra* has the objective to guarantee minimum earnings to small family farmers susceptible to crop losses due to drought or flood[16]. The *Programa Saúde da Família* is a health strategy focused on primary health care that includes multidisciplinary teams working in health promotion and disease prevention/control, as well as in the provision of routine care to communities (including visits from community health workers). In Brazil, all individuals, no matter their social status, are entitled to receive free health assistance from the Brazilian Unified Health System or *SUS*.

The four-level household food (in)security dependent variable was used in the bivariate analyses. For the adjusted analyses, a dichotomous dependent variable was created by combining secure and mildly food insecure into one category (reference group) and moderately and severely food insecure into the other category. We combined HFI categories as done in previous studies[17,18], allowing us to contrast two distinct HFI groups. The food secure/mild food insecure group is expected to not experience or to experience small reductions in dietary quality, without reductions in amount of food or following unusual food access coping patterns. By contrast, the moderately/severely food insecure is expected to experience major deterioration in dietary quality and quantity to the point of having household members experiencing hunger once the coping strategies used to sustain energy intake become ineffective[12].

Bivariate analyses were performed using the χ^2 test to investigate the association between demographic and socio-economic variables and the dependent variable (HFI). Subsequently, a multivariate analysis with a binary logistic regression model was conducted to generate unadjusted odds ratios for HFI.

Adjusted analyses were performed using a logistic regression model to calculate adjusted odds ratios for HFI (OR_{adj}). We included the independent variables that in the bivariate analyses were associated with HFI with $P < 0.10$.

Initially we included the block of distal independent variables (i.e. sanitation, water supply, earnings from the sale or growth of foods, enrolment in social programmes (*Cadastro Único, Programa Bolsa Família, Programa Cesta de Alimentos, Programa Cisternas, Programa Garantia Safra, PRONAF* and *Programa Saúde da Família*) and visit of the community health worker). Then we tested the block of proximal independent variables, such as household presence of person with physical disability, employment status of the head of the household, number of individuals in the household, number of children in the household, income and educational level. The final model included the variables that remained associated with HFI with $P < 0.05$. These were: per capita household income, educational level of the head of the household, region, *Programa Bolsa Família, Programa Cisternas, Programa Garantia Safra*, adequate water supply, adequate sanitation, number of individuals in the household, provision of care by the *Programa Saúde da Família* and employment status of the head of the household. The final P value for model fit was < 0.001.

All analyses were performed using the statistical software package IBM SPSS Statistics Version 20.0. The data came from a Census including all *Quilombolas* households, thus sample weights were not needed for the statistical analysis.

Results

The present study found a low prevalence of food security (14·4%) and a high prevalence of severe HFI (47·8%) among the *Quilombolas* population. The majority of *Quilombolas* lived in the North and Northeast regions (84·3%; data not shown). In the North of Brazil, severe HFI affects 62·3% of the *Quilombolas* (Table 1).

The educational level of the *Quilombolas* was low, with 31·2% of heads of household having less than 4 years of education and only 1·8% having more than 9 years. The majority of the *Quilombolas* lived with a monthly per capita household income below $US 44 (45·0%). The prevalence of extreme poverty among the *Quilombolas* living in the North region was 48·4% *v*. 15·7% among *Quilombolas* from the South/Southeast.

With regard to social programmes, 61·2% of *Quilombolas* households received a cash transfer from *Programa Bolsa Família*. Only 14·8% of *Quilombolas* households had adequate sanitation and 44·1% had adequate water supply. Our data showed that 38·6% of the heads of household were unemployed, the majority of whom lived in the Midwest region (58·7%), and only 10·0% of them had a formal employment contract. Only 21·8% of *Quilombolas* households complemented their income with the sale or growth of foods, a percentage that was highest in the North region (26·5%).

Table 1 Descriptive analysis of the population: demographic aspects of the *Quilombolas* population in Brazil and its regions. Brazil, Census of Titled *Quilombola* Communities (*Censo de Comunidades Quilombolas Tituladas*), 2011

Study variable	Brazil n	Brazil %	South/Southeast n	South/Southeast %	Midwest n	Midwest %	Northeast n	Northeast %	North n	North %
Household food security status										
Food security	1277	14·4	173	49·0	190	18·7	453	16·7	461	9·7
Mildly food insecure	1557	17·6	116	32·9	353	34·7	644	23·7	44	9·3
Moderately food insecure	1785	20·2	35	9·9	276	27·2	587	21·6	887	18·6
Severely food insecure	4227	47·8	29	8·2	2197	19·4	1036	38·1	2965	62·3
Educational level of the head of the household										
Up to 4 years	2819	31·2	59	16·3	513	48·4	1121	40·7	1126	23·2
From 5 to 8 years	6047	66·9	294	81·4	532	50·2	1576	57·2	3645	75·0
9 years or more	170	1·8	8	2·2	15	1·4	58	2·1	89	1·8
Monthly per capita household income										
Below $US 44·00	4135	45·0	58	15·7	433	40·2	1251	44·6	2393	48·4
From $US 44·00 to $US 160·00	3121	33·9	156	42·3	321	29·8	965	34·4	1679	34·0
Above $US 160·00	1937	21·1	155	42·0	322	29·9	589	21·0	871	17·6
Social programmes and benefits										
Programa Bolsa Família										
Yes	5608	61·2	160	43·8	598	55·7	1930	69·3	2920	59·3
No	3554	38·8	205	56·2	476	44·3	866	31·0	2007	40·7
Programa Cesta de Alimentos										
Yes	2889	31·6	206	56·3	784	73·4	1290	46·3	609	12·4
No	6254	68·4	160	43·7	284	26·6	1499	53·7	4311	87·6
Programa Cisternas										
Yes	432	4·7	7	1·9	6	0·6	405	14·5	14	0·3
No	8734	95·3	362	98·1	1065	99·4	2392	85·5	4915	99·7
PRONAF										
Yes	511	5·9	35	11·3	55	5·3	194	7·6	227	4·8
No	8094	94·1	274	88·7	977	94·7	2375	92·4	4468	95·2
Programa Garantia Safra										
Yes	353	4·1	4	1·3	3	0·3	332	12·9	14	0·3
No	8270	95·9	307	98·7	1027	99·7	2243	87·1	4693	99·7
Adequate sanitation										
Yes	1350	14·8	212	58·6	237	22·1	578	20·9	323	6·6
No	7775	85·2	150	41·4	835	77·9	2193	79·1	4597	93·4
Adequate water supply										
Yes	4037	44·1	321	87·7	426	39·7	1223	43·8	2067	42·1
No	5108	55·9	45	12·3	647	60·3	1572	56·2	2844	57·9
Number of individuals in the household										
Up to 4 individuals	5247	57·1	256	69·4	751	69·8	1740	62·0	2500	50·6
From 5 to 7 individuals	3063	33·3	95	25·7	264	24·5	859	30·6	1845	37·3
More than 8 individuals	883	9·6	18	4·9	61	5·7	206	7·3	598	12·1
Number of children in the household										
1 child	7917	86·1	341	92·4	961	89·3	2466	87·9	4149	83·9
More than 2 children	1276	13·9	28	7·6	115	10·7	339	12·1	794	16·1
Visit of the community health worker										
Yes	6823	74·6	263	71·9	922	86·2	2146	76·9	3492	71·0
No	2317	25·4	103	28·1	147	13·8	644	23·1	1423	29·0
Provision of care by *Programa Saúde da Família*										
Yes	3244	35·6	300	83·3	319	29·8	1522	54·8	1103	22·5
No	5865	64·4	60	16·7	752	70·2	1253	45·2	3800	77·5

The analysis of the association between the variables investigated and HFI status (Table 2) showed that higher socio-economic conditions were inversely associated with HFI. Crude regression analysis revealed that households located in the North region of Brazil had 19·22 (95 % CI 14·52, 25·44) times higher odds of experiencing moderate or severe food insecurity than those located in the South or Southeast region of Brazil. Similarly, households whose head had less than 4 years of education (OR = 2·54; 95 % CI 1·84, 3·50) and those with monthly per capita household income below $US 44 (OR = 4·19; 95 % CI 3·72, 4·72) were more likely to present a higher prevalence of severe HFI. Households that were not receiving cash transfer from *Programa Bolsa Família* (OR = 0·51; 95 % CI 0·46, 0·56), were not registered in *Cadastro Único* (OR = 0·55; 95 % CI 0·50, 0·61) and were not receiving earnings from selling or growing foods (OR = 0·59; 95 % CI 0·52, 0·66) had a lower prevalence of moderate or severe HFI.

Adjusted logistic regressions analyses showed that households located in the North *v.* the South/Southeast region (OR$_{adj}$ = 11·26; 95 % CI 7·83, 16·19), who had heads of household with low levels of education (OR$_{adj}$ = 1·92; 95 % CI 1·29, 2·85) and in extreme poverty (OR$_{adj}$ = 2·78; 95 % CI 2·36, 3·29) had higher odds of moderate to severe food insecurity (Table 3).

Households that did not have access to *Programa Cisterna* and *Garantia Safra* had 1·35 (95 % CI 1·06, 1·72) and 1·43 (95 % CI 1·41, 1·85) times higher chance of experiencing moderate/severe HFI, respectively. Households not receiving benefits from *Programa Bolsa Família* were less likely to experience the most severe forms of food insecurity (OR$_{adj}$ = 0·66; 95 % CI 0·58, 0·75). Moreover, households that did not have access to the *Programa Saúde da Família* had 1·40 (95 % CI 1·25, 1·58) times higher adjusted odds for moderate/severe HFI (Table 3).

Households without adequate sanitation (OR$_{adj}$ = 1·88; 95 % CI 1·61, 2·19) and without adequate water supply (OR$_{adj}$ = 1·23; 95 % CI 1·10, 1·39) were more likely to present moderate/severe HFI. Finally, households whose head was unemployed had 1·11 (95 % CI 0·98, 1·26) times higher adjusted odds of experiencing moderate/severe HFI.

Discussion

The prevalence of HFI observed in the *Quilombolas* Census (85·6 %) was higher than that found in smaller studies that also used the EBIA to evaluate HFI. Investigating *Quilombolas* communities in the state of Tocantins (North Brazil), Monego *et al.*[8] found that 85·1 % experienced HFI, with 32·9 % experiencing moderate HFI and 14·9 % severe HFI. In that study HFI was associated with community-level variables such as water supply, sewage and garbage collection infrastructure. Cordeiro *et al.*[19] found in *Quilombolas* communities in the state of Goiás

Table 1 *Continued*

Study variable	Brazil n	Brazil %	South/Southeast n	South/Southeast %	Midwest n	Midwest %	Northeast n	Northeast %	North n	North %
Enrolment in *Cadastro Único*										
Yes	6275	68·6	226	61·7	684	63·8	2096	75·2	3269	66·4
No	2875	31·4	140	38·3	388	36·2	692	24·8	1655	33·6
Physical disability										
Yes	420	4·6	18	4·9	48	4·5	138	5·0	216	4·4
No	8713	95·4	347	95·1	1023	95·5	2649	95·0	4694	95·6
Employment status of the head of the household										
Employed	4290	47·0	245	66·4	295	27·7	1435	51·5	2315	47·2
Unemployed	3518	38·6	57	15·4	626	58·7	980	35·2	1855	37·8
Retired	1316	14·4	67	18·2	145	13·6	369	13·3	735	15·0
Type of employment of the head of the household										
Formal	422	10·0	73	30·2	42	14·4	99	7·0	208	9·2
Informal	3803	90·0	169	69·8	249	85·6	1323	93·0	2062	90·8
Receiving earnings from the sale or growth of foods										
Yes	1909	21·8	41	11·4	152	14·5	435	17·3	1281	26·5
No	6850	78·2	320	88·6	895	85·5	2080	82·7	3555	73·5

PRONAF, *Programa Nacional de Fortalecimento da Agricultura Familiar*.

Table 2 Determinants of food and nutrition insecurity and demographic aspects in the Brazilian *Quilombolas* population. Brazil, Census of Titled *Quilombola* Communities (*Censo de Comunidades Quilombolas Tituladas*), 2011

Study variable*	Food security n	Food security %	Mild food insecurity n	Mild food insecurity %	Moderate food insecurity n	Moderate food insecurity %	Severe food insecurity n	Severe food insecurity %	Unadjusted OR†	95 % CI
Region										
South/Southeast	173	49·0	116	32·9	35	9·9	29	8·2	1·00	–
Midwest	190	18·7	353	34·7	276	27·2	197	19·4	3·93	2·92, 5·30
Northeast	453	16·7	644	23·7	587	21·6	1036	38·1	6·68	5·04, 8·85
North	461	9·7	444	9·3	887	18·6	2965	62·3	19·22	14·52, 25·44
Educational level of the head of the household										
Up to 4 years	393	14·5	443	16·3	520	19·2	1355	50·0	2·54	1·84, 3·50
From 5 to 8 years	808	13·9	1044	17·9	1202	20·6	2771	47·6	2·43	1·77, 3·33
9 years or more	40	25·0	45	28·1	40	25·0	35	21·9	1·00	–
Monthly per capita household income										
Below $US 44·00	280	7·0	559	14·0	759	19·1	2385	59·9	4·19	3·72, 4·72
From $US 44·00 to $US 160·00	403	13·5	605	20·2	680	22·7	1305	43·6	2·20	1·96, 2·48
Above $US 160·00	594	31·8	393	21·0	346	18·5	537	28·7	1·00	–
Social programmes and benefits										
Programa Bolsa Família										
Yes	480	8·9	939	17·4	1180	21·8	2811	52·0	1·00	–
No	790	23·2	613	18·0	598	17·5	1408	41·3	0·51	0·46, 0·56
Programa Cesta de Alimentos										
Yes	521	18·7	710	25·5	530	19·0	1027	36·8	1·00	–
No	746	12·4	839	14·0	1245	20·7	3183	52·9	2·21	2·01, 2·43
Programa Cisternas										
Yes	69	16·5	128	30·5	99	23·6	123	29·4	1·00	–
No	1204	14·3	1424	16·9	1680	20·0	4095	48·7	1·95	1·60, 2·37
PRONAF										
Yes	71	14·5	112	22·9	112	22·9	195	39·8	1·00	–
No	1082	13·8	1340	17·2	1555	19·9	3836	49·1	1·33	1·10, 1·60
Programa Garantia Safra										
Yes	45	13·1	107	31·2	73	21·3	118	34·4	1·00	–
No	1109	13·9	1346	16·9	1598	20·0	3924	49·2	1·79	1·44, 2·23
Adequate sanitation										
Yes	353	27·1	384	29·5	268	20·6	198	22·9	1·00	–
No	913	12·2	1164	15·6	1505	20·1	3898	52·1	3·39	3·00, 3·82
Adequate water supply										
Yes	731	18·9	758	19·6	788	20·4	1586	41·1	1·00	–
No	534	10·8	794	16·1	993	20·1	2617	53·0	1·70	1·56, 1·87
Number of individuals in the household										
Up to 4 individuals	976	19·4	994	19·7	1019	20·2	1044	40·6	1·00	–
From 5 to 7 individuals	261	8·8	470	15·9	633	21·4	1589	53·8	1·95	1·77, 2·16
More than 8 individuals	40	4·7	93	10·8	133	15·5	594	69·1	3·52	2·90, 4·26
Number of children in the household										
1 child	1176	15·5	1385	18·2	1534	20·2	3514	46·2	1·00	–
More than 2 children	101	8·2	172	13·9	251	20·3	713	57·6	1·79	1·55, 2·07
Visit of the community health worker										
Yes	985	14·9	1225	18·6	1384	21·0	3006	45·5	1·00	–
No	282	12·8	327	14·9	392	17·8	1197	54·5	1·31	1·18, 1·46
Provision of care by *Programa Saúde da Família*										
Yes	671	21·5	680	21·8	641	20·5	1132	36·2	1·00	–
No	593	10·5	862	15·3	1127	20·0	3062	54·3	2·19	2·00, 2·41
Enrolment in *Cadastro Único*										
Yes	621	10·3	1066	17·6	1272	21·0	3093	51·1	1·00	–
No	652	23·6	485	17·6	506	18·3	1115	40·4	0·55	0·50, 0·61

Table 2 *Continued*

Study variable*	Food security		Mild food insecurity		Moderate food insecurity		Severe food insecurity		Unadjusted OR†	95 % CI
	n	%	n	%	n	%	n	%		
Physical disability										
Yes	73	17·8	63	15·4	68	16·6	206	50·2	0·95	0·77, 1·17
No	1194	14·2	1487	17·7	1709	20·4	3989	47·6	1·00	–
Employment status of the head of the household										
Employed	627	15·2	715	17·4	796	19·3	1978	48·1	1·00	–
Unemployed	346	10·2	623	18·4	715	21·1	1709	50·4	1·21	1·10, 1·34
Retired	293	23·1	210	16·5	262	20·6	504	39·7	0·74	0·65, 0·84
Type of employment of the head of the household										
Formal	129	32·6	88	22·2	71	17·9	108	27·3	1·00	–
Informal	488	13·4	614	16·8	709	19·4	1844	50·5	2814	2·28, 3·46
Receiving earnings from the sale or growth of foods										
Yes	171	9·2	268	14·5	356	19·2	1058	57·1	1·00	–
No	1056	16·0	1219	18·5	1358	20·6	2950	44·8	0·59	0·52, 0·66

PRONAF, *Programa Nacional de Fortalecimento da Agricultura Familiar.*
*All analysed variables showed statistical significance in the bivariate analysis using the χ^2 test and considering a significance level of $P < 0.05$.
†OR considering food-secure and mildly food-insecure households as the reference category *v.* moderately and severely food-insecure households.

Table 3 Determinants of food and nutrition security and demographic aspects in the Brazilian *Quilombola* population. Brazil, Census of Titled *Quilombola* Communities (*Censo de Comunidades Quilombolas Tituladas*), 2011

Study variable*	Adjusted OR†	95 % CI
Region		
South/Southeast	1·00	–
Midwest	2·33	1·59, 3·42
Northeast	4·48	3·12, 6·44
North	11·26	7·83, 16·19
Educational level of the head of the household		
Up to 4 years	1·92	1·29, 2·85
From 5 to 8 years	1·34	0·91, 1·97
9 years or more	1·00	–
Monthly per capita household income		
Below $US 44·00	2·78	2·36, 3·29
From $US 44·00 to $US 160·00	1·61	1·37, 1·89
Above U 160·00	1·00	–
Social programmes and benefits		
Programa Bolsa Família		
Yes	1·00	–
No	0·66	0·58, 0·75
Programa Cisternas		
Yes	1·00	–
No	1·35	1·06, 1·72
Programa Garantia Safra		
Yes	1·00	–
No	1·43	1·41, 1·85
Adequate sanitation		
Yes	1·00	–
No	1·88	1·61, 2·19
Adequate water supply		
Yes	1·00	–
No	1·23	1·10, 1·39
Number of individuals in the household		
Up to 4 individuals	1·00	–
From 5 to 7 individuals	1·95	1·77, 2·16
More than 8 individuals	3·52	2·90, 4·26
Provision of care by *Programa Saúde da Família*		
Yes	1·00	–
No	1·40	1·25, 1·58
Employment status of the head of the household		
Employed	1·00	–
Unemployed	1·11	0·98, 1·26
Retired	1·09	0·92, 1·30

*All analysed variables showed statistical significance in the bivariate analysis using the χ^2 test and considering a significance level of $P < 0.05$. Adjusted OR by monthly per capita household income, educational level of the head of the household, region, *Programa Bolsa Família*, *Programa Cisternas*, *Programa Garantia Safra*, adequate water supply, adequate sanitation, number of individuals in the household, provision of care by *Programa Saúde da Família* and employment status of the head of the household.
†OR considering food-secure and mildly food-insecure households as the reference category *v.* moderately and severely food-insecure households.

(Midwest Brazil) a prevalence of 74·2 % of HFI, with 45·1 % having mild HFI, 21·6 % having moderate HFI and 8·5 % severe FI. The risk factors identified for HFI in these two smaller studies are highly consistent with those found in the present census analysis of officially recognized *Quilombolas* territories[8,19]. The studies conducted in the North and Midwest used the old EBIA version with fifteen items *v.* the fourteen-item EBIA, that excluded the weight loss item, used in our study. However, this difference in metric used does not explain the differences in HFI

prevalence across studies as the HFI categories' classification is comparable between the fourteen-item and the fifteen-item scale[20]. The difference between these lower HFI estimates and ours is likely to be due to the differences in samples studied, namely a representative national sample *v.* a local sample, as well as sampling exclusion criteria. For example, the study in the Midwest enrolled only families with children attending public schools located near cities, and excluded remote communities which are the poorest ones and less likely to be able to benefit from public policies[19].

There was a clear contrast between the North and Northeast regions and the remaining three Brazilian regions. These two regions have worse economic, social and health indicators compared with the others, including food shortages and food deprivation as documented in prior studies[3,21]. These findings confirm the persistence of geographical inequalities in the social determinants of health across regions in Brazil. Bezerra *et al.*[22] found a high prevalence of hypertension associated with socio-economic and demographic factors such as economic class and education among *Quilombolas* in a Northeast Brazilian municipality (Vitoria da Conquista). Kochergin *et al.*[23] found in the same community that self-rated health was associated with socio-economic and demographic indicators, lifestyle, social support and health status. Gomes *et al.*[24] documented an underutilization of health services by members of this same community.

Socio-economic and demographic determinants of poverty strongly influence ethnic/racial differentials in health and well-being in Brazil. In addition to the *Quilombolas*, the entire black and brown population experiences more socio-economic deprivation compared with its white counterpart[3]. Even though people of colour represent more than 50 % of the Brazilian population[25], in 2009 blacks accounted for only 24 % of those in the richest income decile[26]. Homicide victims in Brazil are most likely to be young, male, black and with few years of education, showing the marginalization of people of colour within Brazilian society[27]. Black men had an average of 6·7 years of studying, compared with 8·4 years for white men[26]. Thus the ethnic/racial inequities in Brazil go beyond the *Quilombolas* land borders.

Regarding educational level, our results are similar to those of a previous study showing that the majority of *Quilombolas* had low levels of literacy or had just a few years of education[9]. Our findings revealed that low educational level and poverty are risk factors for HFI among *Quilombolas* and this is supported by the fact that educational level is a major social determinant of health and well-being; indeed, it is the main determining factor of personal income in Brazil[3].

Consistent with our results, a previous study documented that low income and extreme poverty were frequent among *Quilombolas*. Oliveira e Silva *et al.*[9] observed that 29·7 % of *Quilombolas* families living in a state localized in North Brazil did not generate any income. Our results about unemployment are consistent with those reported in the *Quilombolas* Nutritional Survey in 2006[7] and in Oliveira e Silva *et al.*'s study[9]. In those two studies low income was explained at least in part by the high levels of unemployment in *Quilombolas* families.

Consistent with previous studies, our findings strongly support the conclusion that HFI is the result of income inequities and the social exclusion resulting from it. Low income is an important risk factor for HFI in *Quilombolas* because it is associated with less access to food[28]. Low income can be the result of a lack of access to agriculture as a source of income, the legal problems with land ownership that this population experiences, and the illiteracy prevalence that reduces the employment and better income opportunities[2,7,9]. The lack of land ownership is an important challenge because of its major economic and social repercussions. Even if *Quilombolas* communities legally own their land, they often suffer expropriation by ranchers and land grabbers. These territorial issues make them revive the struggle for land and social injustices experienced by their ancestors with implications for income generation[29].

In the past, *Quilombolas* had a traditional relationship with the land providing food and with subsistence agriculture being very important for their food security[29]. Nowadays, however, this has changed as the agricultural activities in *Quilombolas* communities have become increasingly difficult to maintain due to lack of credit, lack of tools, high production costs and low selling prices of crops. Furthermore, ecosystem degradation and climate change have diminished the availability of foods from fishing and hunting and have hindered the fertility of the soil[9,10]. These major agriculture-related shifts have been accompanied by increased proximity to roads leading to urban areas and structural economic changes, including access to social programmes and wage labour, both of which have been associated with increased consumption of processed foods[19]. As a result, younger generations have lost their connection to the land and agriculture and their access to food has been monetized.

Widespread poverty has been associated with HFI among *Quilombolas* and the Brazilian population in general[3]. On one hand, our study showed that families that did not receive benefits from *Progama Bolsa Família* were less likely to experience moderate and severe food insecurity, and the result remained statistically significant after adjusting for socio-economic and demographic confounders. This can be explained by the programme's focus, showing that it is well targeted[30]. People enrolled in this programme are in extreme poverty and experience worse conditions of HFI than those not enrolled; thus this cross-sectional finding is simply likely to be explained by reverse causality. On the other hand, families not participating in *Programa Cisternas* and *Programa Garantia Safra* had a higher chance of living in moderately or severely food-insecure households. This important finding shows the importance of these very specific programmes

assisting vulnerable populations living in regions where weather conditions may generate water scarcity for consumption and for food production (Brazilian semi-arid region)[15,16]. The *Cisternas* programme is responsible for maintaining water accessibility during dry seasons, for individual consumption or agricultural use[15]. The food security concept includes access to clean water[1]. *Quilombolas* communities' access to safe drinking-water and sewage systems is indeed limited, as shown before in previous studies[8,9]. This situation is closely related to a high prevalence of parasite infections and diarrhoeal diseases in the *Quilombolas* population[31]. The *Programa Garantia Safra* ensures that *Quilombolas* will be paid fairly for the food they are producing, guaranteeing minimum earnings to small family farms susceptible to crop losses due to drought or flood[16].

Access to the *Programa Saúde da Família* and to community health worker visits was mostly limited within households experiencing food insecurity, especially in those with the most severe forms of food insecurity. These findings corroborate those of other studies showing that *Quilombolas* have limited access to health-care services due to income-related factors and their geographical isolation, thus reinforcing social vulnerability[24,32–34]. A new programme named *Mais Medicos* was launched in 2013 in Brazil and initial analyses showed that the programme was providing access to doctors in primary health-care teams in remote rural municipalities with presence of *Quilombolas* communities[35]. It remains to be seen if the improvement of *Quilombolas* health care will also have impact on their household food security status.

The current study has some limitations. Although HFI was measured directly by EBIA, food consumption data were not available. Food consumption data may have helped characterize dietary quality at the household and intra-household levels. The high prevalence of HFI and the homogeneity of living conditions experienced by *Quilombolas* also may have made it more difficult to uncover more associations between socio-economic variables and HFI. Moreover, the present data were collected in communities officially recognized as *Quilombolas*, leaving out those families without land titles who may have had worst HFI status. Another limitation is the small number of previous studies investigating *Quilombolas* in Brazil, limiting us to compare our findings with only a handful of previous studies conducted in small samples or single communities[8,9,19]. In spite of these limitations, our study is innovative because is based on a Census survey providing the most comprehensive analysis of HFI among *Quilombolas* to date. It is our hope that our findings will bring to the attention of the international community the prevalent social exclusion condition and food security needs of black-slave descendant communities in Brazil. In addition to the international perspective, the scientific evidence certainly supports revision of Brazilian public policies aimed to eliminate inequities experienced by *Quilombolas*[36].

Conclusion

Food insecurity was highly prevalent in *Quilombolas* households and, as expected, was directly associated with socio-economic factors. There were clear HFI inequities across different Brazilian regions. *Quilombolas* in Brazil experience high levels of HFI, but also poor quality of life, poor health, poor diet and non-dignified living conditions. Thus, the historical legacy of social exclusion and social vulnerability continues to be strongly present among those of black slave descent.

Through this innovative census application of EBIA in a highly vulnerable context, the findings can help Brazil improve food security governance among *Quilombolas* communities[36]. Although there are several public policies, social programmes and benefits currently established in Brazil, there still is a low coverage in *Quilombolas* communities. In order to improve living conditions and, consequently, the food and nutrition security status in *Quilombolas* communities, the Government should take into account the needs and wants of this population regarding access to basic rights as well as the governmental social programmes. These programmes should include actions that promote credit and access to tools for family agriculture, respect culturally accepted dietary practices, foster food and nutrition education activities that promote healthy diets, and improve sanitation conditions and hygiene practices that increase the biological utilization of foods, thereby ensuring food security in all its dimensions.

Acknowledgements

References

1. Presidência da República, Casa Civil, Subchefia para Assuntos Jurídicos, Brasil (2006) Lei nº 11.346, de 15 de setembro de 2006. Cria o Sistema Nacional de Segurança Alimentar e Nutricional com vistas em assegurar o direito humano à alimentação adequada e dá outras providências. *Diário Oficial da União*, 18 setembro.

2. Ministério do Desenvolvimento Social e Combate à Fome & Secretaria de Avaliação e Gestão da Informação (2014) *Quilombos do Brasil: Segurança Alimentar em Territórios Titulados. Cadernos de Estudos – Desenvolvimento Social em Debate número 20*. Brasília, DF: MDS.

3. Instituto Brasileiro de Geografia e Estatísticas (2014) *Pesquisa Nacional por Amostra de Domicílios (PNAD). Segurança Alimentar: 2013*. Rio de Janeiro, RJ: IBGE.

4. Instituto Brasileiro de Geografia e Estatísticas (2010) *Pesquisa Nacional por Amostra de Domicílios (PNAD). Segurança Alimentar 2004/2009*. Rio de Janeiro, RJ: IBGE.

5. Instituto Brasileiro de Geografia e Estatísticas (2013) *Síntese de Indicadores Sociais – Uma Análise das Condições de Vida da População Brasileira: 2013. Estudos e Pesquisa – Informação Demográfica e Socioeconômica número 32*. Rio de Janeiro, RJ: IBGE.

6. Presidência da República, Casa Civil, Subchefia para Assuntos Jurídicos, Brasil (1988) Constituição da República Federativa do Brasil de 1988. Promulgada em 5 de outubro de 1988. http://www.planalto.gov.br/ccivil_03/Constituicao/Constituicao.htm (accessed September 2016).

7. Ministério do Desenvolvimento Social e Combate à Fome & Secretaria de Avaliação e Gestão da Informação (2007) *Chamada Nutricional Quilombola 2006: Sumário Executivo*. Brasília, DF: MDS.

8. Monego ET, Peixoto MRG & Cordeiro MM (2010) Food insecurity of Tocantins's *quilombolas* communities. *Seg Aliment Nutr Campinas* **17**, 37–47.

9. Oliveira e Silva D, Guerrero AFH, Guerrero CH *et al.* (2008) The causality of nutrition and food insecurity of *quilombola* communities with the construction of the BR-163 highway, Pará, Brazil. *Rev Nutr* **21**, 83–97.

10. Carvalho AS & Oliveira e Silva D (2014) Prospects of food and nutritional security in the Tijuaçu *Quilombo*, Brazil: family agricultural production for school meals. *Interface (Botucatu)* **18**, issue 50, doi: 10.1590/1807-57622013.0804.

11. Presidência da República, Secretaria de Políticas de Promoção da Igualdade Racial & Secretaria de Políticas para Comunidades Tradicionais (2013) Guia de Políticas Públicas para Comunidades Quilombolas. Programa Brasil Quilombola. http://www.seppir.gov.br/portal-antigo/arquivos-pdf/guia-pbq (accessed September 2016).

12. Bickel G, Nord M, Price C *et al.* (2000) *Guide to Measuring Household Food Security (Revised 2000)*. Alexandria, VA: US Department of Agriculture, Food and Nutrition Service.

13. Segall-Corrêa AM, Pérez-Escamilla R, Marin-León LL *et al.* (2009) *Evaluation of Household Food Insecurity in Brazil: Validity Assessment in Diverse Sociocultural Settings*. Santiago: Oficina Regional FAO Chile; available at http://www.bvsde.paho.org/texcom/nutricion/memredsan_3.pdf

14. Ministério do Desenvolvimento Social e Combate à Fome & Secretaria de Avaliação e Gestão da Informação (2014) *Questões Metodológicas Acerca do Dimensionamento da Extrema Pobreza no Brasil nos Anos 2000. Estudo Técnico número 08/2014*. Brasília, DF: MDS.

15. Ministério do Desenvolvimento Social e Combate à Fome (2016) Programa Cisternas – Água para Beber e para Agricultura. http://mdspravoce.mds.gov.br/seguranca-alimentar-e-nutricional/programa-cisternas-agua-para-beber-e-para-agricultura/ (accessed April 2016).

16. Ministério do Desenvolvimento Agrário (2016) Garantia-Safra. http://www.mda.gov.br/sitemda/secretaria/saf-garantia/sobre-o-programa (accessed April 2016).

17. Cabral CS, Lopes AG, Lopes JM *et al.* (2014) Food security, income, and the Bolsa Família program: a cohort study of municipalities in Paraíba State, Brazil, 2005–2011. *Cad Saude Publica* **30**, 393–402.

18. Ferreira HS, Souza MECA, Moura FA *et al.* (2014) Prevalence and factors associated with food and nutrition insecurity in families in municipalities of the north of the State of Alagoas, Brazil, 2010. *Cienc Saude Colet* **19**, 1533–1542.

19. Cordeiro MM, Monego ET & Martins KA (2014) Overweight in Goiás' *quilombola* students and food insecurity in their families. *Rev Nutr* **27**, 405–412.

20. Segall-Corrêa AM, Marin-León L, Melgar-Quiñones H *et al.* (2014) Refinement of the Brazilian Household Food Insecurity Measurement Scale: recommendation for a 14-item EBIA. *Rev Nutr* **27**, 241–251.

21. Gubert MB, Benício MHD & Santos LMP (2010) Estimates of severe food insecurity in Brazilian municipalities. *Cad Saude Publica* **26**, 1595–1606.

22. Bezerra VM, Andrade ACS, César CC *et al.* (2013) *Quilombo* communities in Vitória da Conquista, Bahia State, Brazil: hypertension and associated factors. *Cad Saude Publica* **29**, 1889–1902.

23. Koshergin CN, Proietti FA & César CC (2014) Slave-descendent communities in Vitória da Conquista, Bahia State, Brazil: self-rated health and associated factors. *Cad Saude Publica* **30**, 1487–1501.

24. Gomes KO, Reis EA, Guimarães MDC *et al.* (2013) Use of health services by *quilombo* communities in southwest Bahia State, Brazil. *Cad Saude Publica* **29**, 1829–1842.

25. Instituto Brasileiro de Geografia e Estatística (2011) *Censo Demográfico de 2010*. Brasília, DF: IBGE.

26. Instituto de Pesquisa Econômica e Aplicada (2011) *Retrato das Desigualdades de Gênero e Raça*, 4ª ed. Brasília, DF: IPEA.

27. Murray J, Cerqueira DRC & Khan T (2013) Crime and violence in Brazil: systematic review of time trends, prevalence rates and risk factors. *Aggress Violent Behav* **18**, 471–483.

28. Anschau FR, Matsuo T & Segall-Corrêa AM (2012) Food insecurity among recipients of government assistance. *Rev Nutr* **25**, 177–189.

29. Furtado MB, Pedroza RL & Alves CB (2014) *Quilombola* culture, identity and subjectivity: a cultural psychology perspective. *Psicol Soc* **26**, 106–115.

30. Segall-Corrêa AM, Marin-León L, Pérez-Escamilla R *et al.* (2008) Cash transference and food insecurity in Brazil: analysis of national data. *Rev Nutr PUCCAMP* **21**, Suppl. 39–51.

31. Andrade EC, Leite ICG, Vieira MT *et al.* (2011) Prevalence of parasitic intestinal diseases in a *quilombola* community, in the Municipality of Bias Fortes, State of Minas Gerais, Brazil, 2008. *Epidemiol Serv Saude* **20**, 337–344.

32. Guerrero AFH, Oliveira e Silva D, Toledo LM *et al.* (2007) Infant mortality rates in quilombo areas of the Municipality of Santarém – Pará, Brazil. *Saude Soc* **16**, 103–110.

33. Silva JAN (2007) Sanitary and health conditions at Caiana dos Crioulos, a *quilombo* community in the State of Paraíba. *Saude Soc* **16**, 111–124.

34. Volochko A (2009) Health in quilombos. In *Saúde nos Quilombos*, pp. 147–168 [A Volochko and E Batista E, editors]. São Paulo, SP: Instituto de Saúde.

35. Pereira LL, Santos LMP, Santos W *et al.* (2016) Mais Médicos program: provision of medical doctors in rural, remote and socially vulnerable areas of Brazil, 2013–2014. *Rural Remote Health* **16**, 3616.

36. Pérez-Escamilla R (2012) Can experience-based household food security scales help improve food security governance? *Glob Food Sec* **1**, 120–125.