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Original Article

The relation of cash transfer programs and food insecurity among families with preschool children living in semiarid climates in Brazil

A relação dos programas de transferência de renda e a insegurança alimentar entre famílias com pré-escolares da região semiárida do Brasil

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Abstract

Background: Food insecurity has important effects on human health, particularly in children's. It continues to increase, with an estimated prevalence of 14.9% in the USA and 35% in Brazil. There have been few studies on the effect of cash transfer programs (CTPs) on the prevalence of food security in Brazil. **Objective:** Evaluate the association between cash transfer programs and reductions in inequity and food insecurity. **Method:** Population-based cross-sectional study in the state of Ceará, Northeast Brazil, with a sample of 8.000 households. Ceará is one of the poorest states. The state population of 8.5 million inhabitants, social security benefits and government grants, "*Bolsa Família*", have become the most stable source of income. The main outcomes measures were food insecurity and CTP participation. Multivariate logistic models were constructed to assess the association between participation in CTPs and food security. **Results:** Participation in CTPs was found to be independently related to the prevalence of food security (APR 2.29 95% CI 1.57-3.33), as are education level, residential setting, and children's nutritional status. **Conclusions:** CTPs and investment in education are initiatives that might be used to reduce food insecurity.

Keywords: food insecurity; cash transfer; health equity; nutrition.

Resumo

Introdução: A insegurança alimentar tem efeitos importantes na saúde humana, em particular na das crianças. Continua aumentando, com uma prevalência estimada de 14,9% nos EUA e de 35% no Brasil. Existem poucos estudos sobre o efeito de programas de transferência de renda (PTR) sobre a prevalência de segurança alimentar no Brasil. **Objetivo:** Avaliar a

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associação de programas de transferência de renda e da redução da inequidade com a insegurança alimentar. **Método:** Estudo transversal de base populacional no Estado do Ceará, no Nordeste do Brasil, em uma amostra de 8 mil domicílios. O Ceará é um dos estados mais pobres do país. A população estadual é de 8,5 milhões de habitantes e os benefícios da segurança social e subsídios governamentais, como o Bolsa Família, tornaram-se a fonte de renda mais estável. As principais variáveis foram insegurança alimentar e a participação em PTR. Foram construídos modelos logísticos multivariados para avaliar a associação entre participação em PTR e segurança alimentar. **Resultados:** A participação em PTR foi relacionada de forma independente com a prevalência de segurança alimentar (APR 2,29 IC 95% 1,57-3,33), assim como nível educacional, ambiente residencial e estado nutricional das crianças. **Conclusões:** PTR e investimentos em educação são iniciativas que podem ser utilizadas para reduzir a insegurança alimentar.

Palavras-chave: insegurança alimentar; transferência de renda; equidade em saúde; nutrição.

INTRODUCTION

According to the World Health Organization (WHO), food security exists when people have, at all times, access to enough nutritious and safe food to maintain healthy and active lives[1]. Food insecurity has important effects on human health, particularly children's health. A study involving children that was conducted for three years in the United States showed that the risk of hospitalization for children affected by food insecurity is three times greater than for unaffected children. Greater the insecurity, greater the risk to children's health[2]. There is an association between food insecurity and worse cognitive, behavioural, and psychosocial development[2-6]. Additionally, food insecurity is associated with inadequate childcare practices, such as early weaning and inadequate diet[7,8].

Worldwide, even in developed countries, food insecurity continues to increase. Population growth is projected to increase the demand for food for at least 40 years, and the world is searching for strategies to ensure that nine billion people are adequately fed[9]. In the United States, approximately one out of five children is poor, and more than 14 million children under 18 years were living in households, experiencing food insecurity in the early[3] 2000s. In 2011, 14.9% of American households had food insecurity[1,10]. Developing countries are affected even more profoundly, and countries such as Honduras, more than 93% of the families suffer from some degree of food insecurity[11]. In Brazil, using secondary data, it was estimated that 35% of children live in households with food insecurity and that the family income level has an impact on the extent of this insecurity[12]. Another study conducted in the Northeast of Brazil, the country's poorest region, has identified that 50% of households have food insecurity and that this number may reach 70% in households that receive less than 25% of minimum wage[13].

Some factors, such as maternal age[14], educational level[14], and house size[15], have already been demonstrated as determinants of food insecurity. In addition, government programs can also have an impact on food insecurity[1,16,17]. A pre- and post-intervention study with children ranging from 6 to 36 months-old in emergency situation in Niger identified the beneficial effects of cash transfer programs in reducing food insecurity, confirming the findings of other studies[18,19]. Another factor related to food insecurity is equivocal access to food and to health care services[17,20], which may introduce confounding between cash transfer and inequity reduction with respect to reducing food insecurity.

There have been few population studies evaluating the effect of cash transfer programs and reductions in inequity regarding reducing food insecurity. Brazil has the largest conditional income transfer program in the world, and it has been associated to reduction in food insecurity[21,22], but the confounding between the program and other socioeconomic factors remains in the need of better clarification[23-25]. This study aims to fill these gaps.

METHOD

Study type and population

This population-based cross-sectional study surveyed a representative sample of households in the state of Ceará, Northeast Brazil, collecting socioeconomic, health, and nutritional data on families, women of reproductive age, and preschool children aged 0-35 months.

Study site

Ceará is one of the poorest states in the country, with 145.000 km^2, 95% of its territory is situated within the vast semiarid region of Northeastern Brazil. The state population of 8.5 million inhabitants is primarily supported by commerce and tourism in the capital, Fortaleza (2.3 million inhabitants), and subsistence agriculture on the countryside, an area where years of harvest alternate with recurrent periods of drought. Thus, the social security benefits and government grants, especially the cash transfer program, "*Bolsa Família*", have become the most stable source of income for the rural population, substantially ensuring the functioning of the economy on this region.

Study sample

This study used cluster sampling, using the Brazilian Institute for Official Statistics census tracts and stratification between the capital Fortaleza and the Interior Area. Census tracts result from the division of each municipality in geographic areas with variable extensions but with uniform populations (approximately 300 families). The sample size was calculated in 8.000 households

representing approximately 35.000 people, with 11.000 women aged 12-49 years and 2.000 children < 3 years. The sample size was multiplied by a correction factor equal to 2, covering the design effect of cluster sampling. Furthermore, the sample was increased by 10% to compensate losses.

To ensure a representative study population, the selection of municipalities, census tracts, and households was performed randomly using multistage sampling. First, were drawn from 40 municipalities, including 13 from the Metropolitan Area of Fortaleza (1/3 of the population) and 27 from the Interior Area. The selection of municipalities was performed systematically, according to their population weight from a list sorted by region, sequenced to ensure an appropriate geographic distribution. Using this process, a large city may be drawn more than once, and its weight, observed in the sample population. Thus, Fortaleza was selected more than once and the others, only once each. Second, in each municipality, 10 census tracts of urban and rural areas were randomly selected, allowing all areas, even the most remote, to be represented. In Fortaleza, 100 census tracts were randomly selected. Finally, once a census tract was defined and its corresponding map was obtained from the Brazilian Institute of Geography and Statistics (IBGE), the location of the cluster of 20 houses to be searched was defined. The starting point of the cluster and the first home to be visited, were selected randomly. Households were visited consecutively in accordance with specific rules: the direction of movement/travel was counter clockwise; shops and uninhabited buildings were excluded and replaced with occupied buildings; in the case of missing families, three return visits were conducted in an attempt to obtain data. In each household, all resident children within the relevant group age had their anthropometric measurements taken; other information were obtained from their caregivers.

Study variables

The main study's variables, which were collected from children and their families, included socioeconomic and demographic characteristics (participation in cash transfer program, food security, family income, availability of water, availability of toilets), child care (breastfeeding, father living with the family, mother's education), health care (child possesses a health card, medical consultation, immunization), biological characteristics (age, gender, birth weight, nutritional status) and history of morbidities (hospitalization for diarrhoea, hospitalization for pneumonia).

To assess children's nutritional status, two anthropometric indicators were used: weight-for-age (W/A) and height/length-for-age (H/A), in z scores compared to the normal population. Deficits were found, and children classified as follows: undernutrition, W/A<-2 Standard Deviation (SD); and stunting, H/A<-2 SD.

The outcome variables were treated as follows:

Food insecurity: This outcome was measured from a question that assessed the availability of food in the family, both in quantitative and qualitative terms: "In the last 12 months, has the food in your home been of the quantity and type you would like?", with four categories of response: (a) enough and of the desired type; (b) enough but not of the desired type; (c) sometimes not enough; and (d) often not enough. The variable presented a significantly high correlation with the current availability of basic food, e.g., staple food (rice, beans, and starch), meat (beef, poultry, and fish) and milk (cow's and formula), as shown in the *Results*. This method of assessing food insecurity was based on the U.S. Department of Agriculture Food Insecurity Module, which was validated for the Brazilian population[26]. This simplification of measurement, justified by the size and setting of the study, was tested and validated in this study (see results).

Cash transfer: This factor was measured from a composed variable with three categories of families, based in the main criteria for participating in cash transfers program, the family income, and related information by the interviewed: participant in the cash transfer program (CTP), eligible for participating in a CTP but not participating, and ineligible for a CTP. Eligibility was determined by the criteria used by the CTP of a *per capita* monthly income below 30 USD. Subsequently, the differences between the CTP participants and the eligible non-participants were analysed, as shown in the *Results*.

Data collection

Information was collected from September 2007 to February 2008 using three questionnaires. The first questionnaire recorded general information from each selected household. The second focused on mothers, and the third, on the children. The questionnaires were reviewed daily by field supervisors to identify and fix errors whenever possible. During fieldwork, a sub-sample of 10% of children was weighed, and their heights were measured again by supervisors blinded to measurements recorded earlier for quality control. Weight was measured using portable electronic scales (Tanita®) with a capacity of 150 kg and 0.1 kg calibration. Height was measured with a portable scale with a range of 30 to 110 cm, with a precision of 1 mm. Children < 24 months were measured horizontally, and children from 24-35 months were measured in the standing position. The equipment was calibrated regularly using standardized measures, both early in the day and after every 25 measurements. The technical team research comprised a coordinator and three fieldwork teams, each with a supervisor and eight evaluators/interviewers who had graduate degrees in nutrition, nursing, or social services. The evaluators worked in pairs, each covering a sector (cluster of 20 homes) per day.

Data processing and analysis

Data were entered twice using EpiInfo 2000 and analysed using SPSS 14 for Windows; the Anthro program was used to analyse the anthropometric data. The initial analysis consisted of

tabulating the frequency distributions of all variables according to nutritional status. The prevalence ratio (PR) was estimated as a measure of the association between variables. Bivariate analyses were done using chi square and ANOVA or Mann-Whitney, as appropriate. Kendall Tau-B test for ordinal variables was used to confirm the validity of the measurement of food insecurity. Cox regression was used to investigate whether the strength of the association found in the bivariate analysis was significantly affected by the presence of possible confounding variables. Assuming a constant period of risk, the Cox model can be adapted to estimate PR in cross-sectional studies. Multivariate analysis was conducted using a hierarchical strategy, with three strata: household, mother and child related variables. The modelling process included in each stratum the variables presenting a level of significance up to 0.20 in bivariate initial analysis. The variables were entered in a backward strategy, and those with a *p* value less than 5% remained in the final model.

RESULTS

Based on the responses of the interviewees, food insecurity was correlated with the non-availability of basic foods at home, namely, staple foods (rice, beans, and starch), meat (beef, poultry, and fish) and milk (cow's and formula). A direct correlation was observed between the variables with a steady gradient, at a highly significant level ($p < 0.001$) (Table 1). Hence, of the 1,489 families with children under three years old who were studied, less than half (46.3%) reported eating food of adequate quantity or quality within the past 12 months; 22.8% reported eating enough food but noted that it was not of the desired type; 24.5% reported sometimes not having enough food for their needs, whereas 6.4% always had food shortages at home. (Table 1) Given that, the last two categories represent a quantitative insufficiency of food, it is estimated that a prevalence of 30.9% of families with children under three years suffered from food insecurity in the sample.

Family participation in the cash transfer program (CPT) was classified into three categories: participant in the CTP, eligible for the CTP but not participating and ineligible for the CTP, with eligibility determined by the criterion used by the Brazilian Government of a *per capita* monthly income below 30 USD. Subsequently, the differences between the CTP participants and the eligible non-participating families were analysed to compare their monthly incomes (excluding the CTP earnings of the participant families). Although the overall earnings of the two groups of families were similar, the participants showed a twofold lower first quartile of *per capita* income (R$17.00) than the non-participants (R$9.00), suggesting that families enrolled in the CTP would be poorer than the not enrolled if weren´t receiving the governmental aid.

Families eligible for the cash transfer program showed a higher prevalence of food insecurity, which reached almost 50% (Table 2). When the eligible families were separated into those who actually participated in the program and those who did not, similar prevalence of 48.3% and 46.9%, respectively, were observed, which were significantly higher than the observed from families who were not eligible for the program, among which the prevalence was only 15.5% ($p < 0.001$). Other household socioeconomic significant conditions that were positively associated with food insecurity was the low level of schooling for the head of the family, a family size superior to five members, more than one sibling under three years old, not using tap water as a source of drinking water, living in a rural setting, and not owning a health insurance plan. Families headed by a grandparent, in contrast, had lower prevalence of food insecurity (Table 2).

Among maternal factors, whereas illiteracy, presented the highest prevalence of food insecurity ($p < 0.001$), work outside the home presented a significant lower prevalence ($p < 0.001$). The nutritional status of the mother, in turn, did not present any association with food insecurity (Table 3).

Regarding children, the only factors that were significantly associated with food insecurity were being underweight (z score < -1 S.D.) and stunted growth (z score < -2 S.D.), with prevalence of 41% and 39.2%, respectively (Table 4).

Six variables remained in the final model of the multivariate analysis due to their significantly association with food insecurity, with four pertaining to the household, one pertaining to the mother, and another pertaining to the child (Table 5). Participation in the cash transfer program remained as a factor that was highly associated with food insecurity (PRR=2.29, 95% CI 1.57-3.33), with a prevalence that was even higher than that observed for households that were eligible for the program but did not receive its benefits (PRR=1.75, 95% CI 1.20-2.55). The lower the educational level of the head of the family, the higher the prevalence of food insecurity. Families residing in rural municipalities showed a 69% greater prevalence of food insecurity compared with families living in urban areas. Families who had rivers, dams, or wells as sources of drinking water had an approximately threefold higher prevalence of food insecurity than families with piped water. The use of mineral water for daily consumption proved to be strongly associated with lower food insecurity. Among the controlled maternal factors, only maternal illiteracy remained significantly associated with food insecurity (PRR=1.75, 95% CI 1.20-2.55), whereas among the factors pertaining to children, being at risk for undernutrition presented an 88% higher probability of food insecurity than being overweight.

Table 1. Standard of food insecurity, correlated to the unavailability of basic foods at home on the day of the visit, among families with children below 3 years old, State of Ceará, Northeastern Brazil, 2007

Food unavailable at home[1]	Enough in quantity and quality	Enough in quantity, but not quality	Sometimes not enough	Always not enough	P value[2]
Staple food (*rice, beans, flour*)	8 (1.2)	6 (1.8)	14 (3.8)	12 (12.6)	<0.001
Protein food (*meat, poultry, fish*)	47 (6.8)	60 (17.6)	128 (35.1)	47 (49.5)	<0.001
Milk (*cow's, formula*)	97 (14.1)	102 (30.0)	105 (28.8)	30 (31.6)	<0.001
Total	689 (46.3)	340 (22.8)	365 (24.5)	95 (6.4)	<0.001

[1]In the previous 12 months; [2]Kendall Tau b test

Table 2. Household factors associated to food security among families with children below 3 years of age. State of Ceará, Northeastern Brazil, 2007

Factors	Sample proportion (%)	Prevalence of Food Insecurity	PRR	Confidence Interval 95%	P value
Cash Transfer:					
Eligible and participant	34.3	48.3	4.27	3.18-5.75	<0.001
Eligible, non-participant	13.1	46.9	2.81	2.06-3.84	<0.001
Non-eligible	52.6	15.5	1	1	
Family size:					
≤3 members	24.7	27.7	0.74	0.58-0.95	0.017
4-5 members	46	28.2	0.75	0.61-0.93	0.008
> 5 members	29.3	37.5	1	1	
Children <3 years:					
1 child	92.9	30.4	1	1	
≥ 2 children	7.1	37.1	1.22	0.88-1.69	0.233
Household's chief:					
Father	75.5	30.3	0.56	0.33-0.94	
Mother	15.6	31.2	0.58	0.33-1.04	0.018
Grandparents	4.5	22.7	0.38	0.17-0.81	
Others	4.2	44	1	1	
Chief's schooling:					
≤4 years	40.7	42.8	4.3	2.67-6.93	<0.001
5-8 years	25.6	28.6	2.88	1.75-4.75	<0.001
9-12 years	21.4	22.8	2.29	1.37-3.84	0.002
≥ 12 years	12.3	9.9	1	1	
Health insurance:					
Yes	14.5	9	1		
No	85.5	34.5	3.84	2.38-5.88	<0.001
Setting of residence:					
Rural	17.5	60	2.42	1.99-2.93	<0.001
Urban	82.5	24.8	1		
Drinking water source:					
Mineral water	15.4	5.7	1		
River/pound	3.4	76	13.39	7.13-25.13	< 0.001
Well	9.8	28.7	5.06	2.74-9.37	< 0.001
Tap water	60.4	33.4	5.88	3.37-10.24	< 0.001

Total of families = 1.489

Table 3. Maternal factors associated to food security among families with children below 3 years of age. State of Ceará, Northeastern Brazil, 2007

Factors	Sample proportion (%)	Prevalence of Food Insecurity	PRR	Confidence Interval 95%	P value
Age:					
10-19 years	15.4	29.5	0.71	0.49-1.00	0.054
20-29 years	48.9	26.3	0.63	0.47-0.84	0.002
30-39 years	26.1	35	0.84	0.61-1.14	0.26
40-49 years	9.6	41.9	1		
Literacy:					
Literate	90	26.8	1		
Illiterate	10	61	2.27	1.80-2.88	<0.001
Job:					
Housewife	74.1	33.6	1	1	
Work outside home	18.9	18.7	0.45	0.32-0.63	<0.001
Work at home	7	28.3	0.79	0.49-1.22	
Body image satisfaction:					
Yes, satisfied	50.7	32.3	1.07	0.79-1.45	0.679
No, wish lose weight	37.8	27.7	0.91	0.66-1.25	0.552
No, wish gain weight	11.6	30.5	1	1	
Diabetes:					
Yes	4.4	38.7	1.28	0.85-1.94	0.235
No	95.6	30.2	1		
Hypertension					
Yes	16.5	33.5	1.12	0.92-1.37	0.269
No	83.5	29.8	1		
Contraceptive usage:					
Yes	62.8	30	0.94	0.77-1.14	0.518
No	37.2	32	1		
Nutritional status					
Low weight (BMI<18)	5.7	29.6	0.86	0.53-1.37	0.517
Normal (BMI18-24)	51.9	20.4	0.88	0.66-1.16	0.361
Overweight (BMI25-30)	12.9	29.3	0.85	0.63-1.15	0.285
Obesity (BMI>30)	29.4	34.6	1	1	

Total of families = 1.489

Table 4. Children factors associated to food security among families with children below 3 years of age. State of Ceará, Northeastern Brazil, 2007

Factors	Sample proportion (%)	Prevalence of Food Insecurity	PRR	Confidence Interval 95%	P value
Gender:					
Male	55.7	28.6	0.84	0.70-1.01	0.069
Female	44.3	33.8	1		
Age:					
<6 months	19	29.6	0.93	0.71-1.22	0.593
6-11 months	16.5	33.2	1.04	0.79-1.37	0.772
12-23 months	34.5	29.8	0.94	0.74-1.18	0.569
24-36 months	29.9	31.9	1	1	
Father at home:					
Absence	25.1	32.3	1.06	0.86-1.31	0.576
Presence	74.9	30.4	1		
Birth weight:					
< 2,500g	8.4	37.9	1.26	0.93-1.70	0.141
≥ 2,500g	91.6	30.2	1	1	
Breast feeding:					
Never breastfed	5.5	21.5	0.64	0.39-1.04	0.071
1-6 months	28.8	27.9	0.83	0.66-1.03	0.089

Total of families = 1.489; [(1)]z scores

Table 4. Continued...

Factors	Sample proportion (%)	Prevalence of Food Insecurity	PRR	Confidence Interval 95%	P value
7-12 months	8.4	30	0.89	0.63-1.26	0.5
> 12 months	6.9	28.6	0.84	0.57-1.25	0.396
Still breastfeeding	50.4	33.8	1	1	
Weight in child's card:					
Yes	55.9	32.7	0.99	0.77-1.27	0.921
No	27.6	22.5	1		
Diarrhoea prev. 24 hours:					
Yes	12.8	37.8	1.19	0.79-1.78	0.402
No	87.2	30.3	1		
Nutritional status[1]:					
Underweight (<-1 SD)	15.4	41	1.67	1.21-2.29	0.002
Normal (-1 – 1 SD)	52.9	31.5	1.28	0.97-1.69	0.078
Overweight (1 – 2 SD)	14.3	25.4	1.03	0.72-1.48	0.873
Obesity (> 2 SD)	17.5	24.6	1	1	
Stunting[1] (<-2 SD):					
Yes	30.3	39.2	1.44	1.19-1.74	<0.001
No	69.7	27.3	1		

Total of families = 1.489; [1]z scores

Table 5. Final model of hierarchical Cox Regression analysis of determinant factors for food insecurity among families with children below 3 years of age. State of Ceará, Northeastern Brazil, 2007

Factors	Adjusted PRR	95% Confidence Interval	P value
Cash transfer program participation:			
Participant	2.29	1.57-3.33	<0.001
Eligible, non-participant	1.75	1.20-2.55	0.004
Non-eligible	1		
Schooling of household's chief:			
≤4 years	2.11	1.14-3.89	0.017
5-8 years	1.89	1.02-3.53	0.045
9-12 years	2	1.06-3.78	0.032
≥ 12 years	1		
Setting of residence:			
Rural	1		
Urban	1.69	1.28-2.24	<0.001
Drinking water source:			
River/pound	4.33	2.06-9.12	<0.001
Well	2.18	1.08-4.40	0.029
Tap water	2.97	1.59-5.54	0.001
Mineral water	1		
Literacy of mother:			
Literate	1		
Illiterate	1.49	1.11-2.00	0.009
Child's nutritional status[1]:			
Underweight	1.88	1.21-2.93	0.005
Eutrophic	1.57	1.05-2.33	0.026
Overweighed	1.53	0.95-2.48	0.081
Obese	1		

[1]Controlled for the following variables: Household: family's size, head of household, place of residence, health insurance; Mother: age group, work out home; Child: gender, birth weight, breastfeeding status, stunting

DISCUSSION

This work performed a population analysis of the prevalence of food insecurity among participants in the Brazilian cash transfer program, '*Bolsa Família*', in Ceará. The study's main finding is the high prevalence of food insecurity among families that are eligible to participate in the program, irrespective of their participation. Situated in a semiarid area, Ceará is one of the poorest states of the Northeastern Brazil, a region that comprises the largest population of the world living under such a climate[27]. The climate is one of the most important factors affecting the rising prevalence of food insecurity[28], making this population particularly important.

The effectiveness of cash transfer programs to improve nutritional status has been demonstrated in several countries[29], including Brazil, where it was found that participation in "*Bolsa Família*" protected children from chronic malnutrition[21]. In Niger, it was also found that cash transfer was important for nutritional protection[18]. However, no consensus has been reached with respect to this evidence, including in northeastern Brazil, where the study found no improvement in children's nutritional indicators[30]. The present study identified that the prevalence of food insecurity is high in families eligible for the "*Bolsa Família*", indicating that the cash transfer program should be used to address this issue. However, it also demonstrates that participation in the program is not sufficient for the reduction of the prevalence of food insecurity, with nearly equal frequency being noted among the families participating in the program and those not in the program, with the prevalence being slightly worse among the participating families.

The prevalence of food insecurity has been associated with many factors in the literature. Some studies found no linear relationship between poverty and food insecurity[12,31] because this association has been considered controversial. Our work also did not identify household income as a factor that is independently associated with food insecurity. The source of the water used by the family, an indirect measure of economic level and a direct measure of food resources, presented a significant prevalence ratio gradient.

The educational level of the head of the family has been found to be associated with food insecurity in most studies[14,32], including those conducted in Brazil[33], and a systematic review of 2015 identified that this was the third strongest factor that was associated with food insecurity[28]. Our findings show that educational level, in particular, protects families from food insecurity after 12 years of schooling. On the other hand, the complete absence of education, namely, illiteracy, is independently associated with food insecurity. Thus, it is suggested that after a minimum investment in education, new strategies should be developed, especially those directed towards nutritional education.

The impact of living in urban or rural regions has been well documented in the literature, showing results aligned with those found in this study, regarding protection for residents in the rural zones[34-36]. This protection is attributed to the increased availability of food in the countryside. The association between child undernutrition and food insecurity is also well documented[35,37], and other independent associations found in this study show the deleterious impact of food shortages on children.

The cross-sectional design of this study may be considered a limitation. The considerations regarding the associations should be interpreted in terms of prevalence, with caveats for causality. In addition, direct interviewing was used for the determination of food security using validated instruments in a simplified way and dependent on respondents' memories.

This study suggests directions for further analysis and possible adjustments in the Brazilian cash transfer program for the reduction of the commonness of food insecurity. In addition, this study presents several modifiable factors that can be the target of public policies aimed at reducing food insecurity.

LIST OF ABBREVIATIONS USED

Cash transfer programs (CTPs)
Adjusted Prevalence Ratio (APR)
World Health Organization (WHO)
Brazilian Institute of Geography and Statistics (IBGE)
National Center for Health Statistics (NCHS-US)

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was submitted to and approved by the Committee of ethics in research, through Brazil Platform or by direct delivery, following all the norms of the 466/2012 Resolution of the National Council of Health of the Ministry of Health or the present rules at the time of each study. All mothers who have agreed to participate in the research have signed an informed consent.

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