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Effectiveness of the Brazilian Conditional Cash Transfer Program - Bolsa Alimentação - on the variation of linear and ponderal increment in children from northeast of Brazil

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Abstract

Background: **social programs can improve the conditions required for families provide sufficient care and attention for an adequate health and nutrition.**

Objective: **This study evaluates the effectiveness of the Brazilian's conditional cash transfer program - Bolsa Alimentação (PBA) on children anthropometric status.**

Methods: **a cohort of 1847 children, followed for 12 months: 1615 PBA children; 232 non-PBA. There were 316 (14.6%) missing children during the study. A quasi-experimental study adopting the before-after strategy was applied and the effectiveness approach was used to assess the impact of the program on children nutritional status. Multilevel analysis with three levels was used in the statistical analysis. The mean increment variations of height-for-age and weight-for-age were the outcome variables and the participation in the PBA was the exposition. Four participation groups were established: children not exposed to the program (internal control group); exposed to the program throughout the 12 months, exposed to the program only in the last 6 months; and exposed to the program only in the first 6 months. Repeated measures were obtained at baseline and at 12 months.**

Results: **it was found that the exposure to the program was associated to a mean variation in weight-for-age of 0.34 Z-score (IC = 0.04; 0.63) and height-for-age of 0.38 (IC = 0.05; 0.70) for children who were regular program beneficiaries during the follow-up. The exposure to the program in other periods was not statistically associated with a mean variation in the indicators.**

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EFECTIVIDAD DEL PROGRAMA DE TRANSFERENCIA DE INGRESO -BOLSA ALIMENTAÇÃO (PBA)- SOBRE LA VARIACIÓN DEL INCREMENTO DEL PESO Y DE LA TALLA DE NIÑOS EN EL NORDESTE DEL BRASIL

Resumen

Objetivo: **evaluar la eficacia del programa de transferencia de ingreso brasileño -Bolsa Alimentação (PBA)- sobre la variación media del incremento del peso y de la talla de niños.**

Métodos: **cohorte de 1.847 niños seguida durante 12 meses: 1.615 eran niños PBA; 232 eran niños no PBA. Se ha registrado la pérdida de 316 (14,6%) niños durante el estudio. Se adopta el diseño casi-experimental y la estrategia antes-después con el enfoque de eficacia para evaluar el impacto del programa sobre el estado antropométrico de los niños. La regresión lineal multinivel fue usada en el análisis estadístico. La variación media del incremento del crecimiento de la talla y del peso para la edad fueron los resultados, y la participación en el programa la variable de exposición principal. Se establecieron cuatro grupos de participación en el programa: niños no expuestos al programa (control interno; expuestos al programa durante 12 meses de acompañamiento, expuestos al programa solo en los últimos 6; niños expuestos al programa solo en los primeros 6 meses. Las medidas repetidas se obtuvieron al inicio y a los 12 meses del seguimiento.**

Resultados: **después de ajustar los efectos por los factores de confusión, la exposición al programa se asoció a una variación media de peso por edad de 0,34 Z-score (IC = 0,04; 0,63) y talla para la edad de 0,38 Z-score (IC = 0,05; 0,70) para los niños que fueron expuestos al programa durante los 12 meses. La exposición al programa en otros períodos de seguimiento no fue estadísticamente asociado con una variación media de peso o talla para la edad.**

Conclusions: **Cash transfers direct to the family were associated to anthropometric deficits reduction in childhood.**

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Key words: *Conditional cash transfer program. Brazilian's Program Bolsa Alimentação (PBA). Program evaluation. Child growth. Effectiveness. Quasi-experimental study.*

Conclusiones: **transferencias directas de ingresos a la familia se asociaron con la reducción de los déficits antropométricos en la infancia.**

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Palabras clave: *Programas de transferencia de ingresos. Programa Bolsa Alimentação de Brasil (PBA). Evaluación del programa. El crecimiento infantil. Eficacia. Estudio casi-experimental.*

Introduction

The nutritional and health state in childhood is determined by a complex relationship between biological, social, economic and cultural factors. Under adverse conditions, the availability and access to food is limited and basic services are inaccessible, forcing the family into a state of poverty and vulnerability. Poverty is multi-dimensional, restricting the family's capacity to provide the child the care and attention needed to ensure potential development[1] and contributing to mortality[2] and morbidity characterized by high rates of infectious, parasites, protein-energy malnutrition and micronutrient deficiencies[3].

Many countries, including some Latin American countries such as Mexico, Nicaragua, Colombia and Honduras, have adopted strategies that include conditional cash transfer (CCT), combined with education and health actions to reduce the burden of morbidity and nutritional deficits produced by poverty[3,4].

Based on these efforts, Brazil set up the national CCT program *Bolsa Alimentação* (PBA) in 2001 to benefit families with monthly *per capita* income less than half a minimum wage (US$27.97/month at the time)[5]. The PBA was the largest Brazilian CCT program at that time and it was a national intervention that included supportive strategies to improve the health and nutritional status of pregnant and lactating women and children from six to 72 months old[6].

Thus, each family received R$15.00 (US$4.20) per beneficiary, up to a maximum of R$45.00 (US$12.60). This monthly allowance was transferred directly to the mother's "magnetic card" (the mother was usually the beneficiary responsible) and could be withdrawn at a bank or lottery agency[5,6]. Some families also received other federal cash transfer programs (*Bolsa Escola* and gas for cooking) that were also developed concurrently with the PBA. And in 2004 the PBA was replaced by other federal cash transfer program (the *Bolsa Família* program) that involved all other cash transfer activities by the Brazilian government. Therefore, the PBA was the first cash transfer program in relation to the children's health with specifics objectives in the food and nutrition field[7].

The PBA is an inclusive program, with predominantly preventative focus, targeting not only individuals who are malnourished or with nutritional deficits, but also those who are at nutritional risk. It has as conditions for receiving benefits the compliance with such health-related actions as maintaining childhood immunizations up-to-date, participation in growth monitoring and nutrition education activities and pre-natal care[5]. It is consensus that programs with this focus improve the nutritional status of mothers and children in poor countries[8,9]. Unfortunately, records of PBA assessment on child health and nutrition are still insufficient to cover all dimensions of the possible effects of this program. On the other hand, the results found in the literature are sometimes contradictory. Moris et al[10] has registered negative impact on weight for children under 3 years old exposed to the PBA in some communities in Northeastern Brazil. However, publication of the Brazilian government reported positive effects of the PBA on the weight and height recovery in malnourished or at risk children when compared to those excluded of the program[6]. Studies produced have identified positive results of CCT program on the Colombian children linear gain and decline in the stunting rate among Columbians, Mexican and Nicaraguan children from 1 to 59 months old[4].

This intervention aimed to evaluate the program effectiveness under actual operational conditions and adopted an inference strategy about plausibility assessment by controlling biological, economics and social variables[11].

Materials and methods

Study Design

This investigation was structured as a follow-up study and employed the quasi-experimental approach, carried from October 2002 to November 2003. It was adopted the inference based plausibility assessment strategy in order to evaluate the program effectiveness under actual operational conditions on the basis of Habicht *et al* recommendation[11].

Selection of districts and population study

A sample of municipal districts of Brazil (Cipó, Piraí do Norte, and Irará) was selected for convenience and included those that had been part of the PBA in October 2002 to February 2003, for the collection of

baseline information. Additional selection criteria included: location within 350 km from Salvador city (the capital of the Bahia state); population between 10.000 and 30.000; and municipalities located in different geographical regions with similar socioeconomic characteristics, including rising poverty levels.

The district of Irará is located in northern Bahia and 64% of its 25000 inhabitants live in poverty conditions. Cipó is in the arid Northeast, has 13376 inhabitants and 52.4% of its families live in poverty. Piraí do Norte is located in the Southern part of the state, has 20183 inhabitants and 44% of its families live in poverty[12].

At the beginning of the study, 1414 families from the three districts were registered on the Program, although 186 (13.15%) could not be located. We counted 2163 children at 72 months old from the 1228 identified families in both urban and rural areas. At the beginning of the follow-up 1571 children had been receiving program benefits for less than 30 days and 592 had not received any benefits yet.

At 12 months of follow-up 1847 children were evaluated which 1615 had received program benefits continuously for 12 months while 232 had not. We recorded a loss of 316 (14.6%) children previously identified (Fig. 1). Children were evaluated at baseline (October 2002 to February 2003) and at 12 month follow-up (September to November 2003).

Creating study groups

The PBA's strategic policy is based on universal coverage for low income families; therefore, it was not possible to adopt a methodological strategy of randomized intervention or deliberately create a comparison group based on the exclusion of the program, which would have been unethical.

However, during the data analyses, we were able to set up four groups with different intensities of the PBA exposure, including an internal control group composed by children who did not receive program benefits, due to municipal administrative failures despite being enrolled and fulfilling PBA eligibility criteria.

Such administrative problems included failure to send the information necessary to authorize creation of the Social Identification Number needed to receive payment; and incorrect names and/or addresses (including missing and/or additional accent or cedillas incompatible with the computer system).

Some PBA families who had been receiving benefits from the program were inexplicably removed. In these cases, the condition 'exposed' was changed to 'not exposed'. The reverse situation also occurred, in which case the child's condition was changed front of "not exposed" to "exposed". Once the child had been in the same situation for 6 months or more in the program they were included in the group correspondent. This period of 6 months is considered sufficient for the physiological impact of a cash transfer program on the child's anthropometric status[13]. Furthermore, it is the point at which the family must be assessed to ascertain whether it still meets PBA requirements. The duration of child participation in the PBA can be extended if these requirements are met and the family continues to be meet economic eligibility criteria.

We created four program exposure groups but similar in the main characteristics evaluated and with different levels of intervention intensity: (1) a group of children who were continuously benefited from the program throughout the 12 months of follow-up; (2) children whose families had been receiving benefits but who were excluded from the PBA in the last 6 months of the follow-up; (3) children whose families were recipients during the last 6 months of the follow-up; and (4) children who were non-recipient during the 12 month period (internal control).

Data collection

The weight and height measurements were made in duplicate at baseline and at 12 months follow-up and

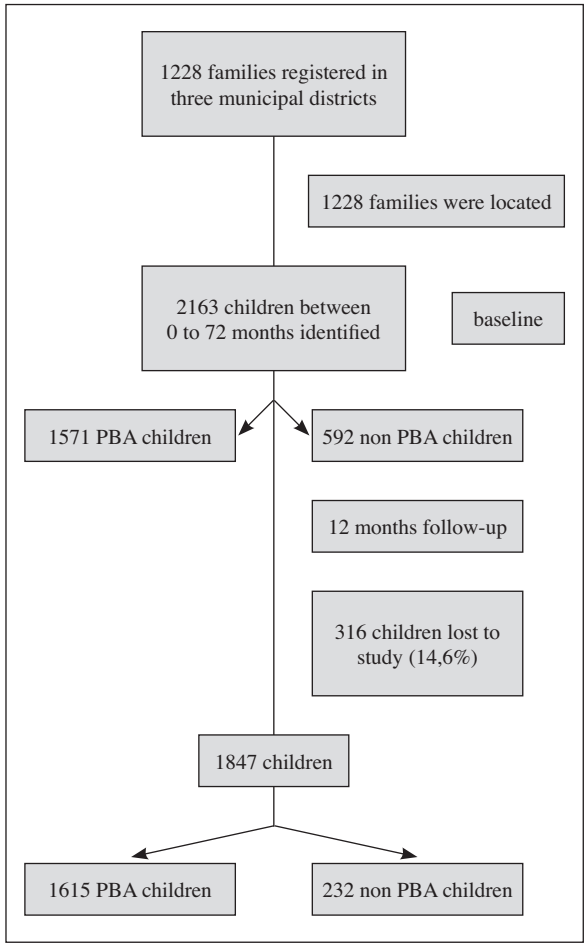

Fig. 1.—Selection of the population study. Bahia, Northeast Brazil, 2002-2003.

were standardized according WHO (World Health Organization) recommendations[14].

To measure weight we used electronic scales with 100g precision (Fillizola, model E-150/3P). To measure the height of children 2 or more years old we used the Leicester Height Measure (London, England); for those under 2 years we measured length with a wooden infantometer accurate to 0.1 cm. Child age was registered in accordance with birth certificate or vaccination records.

Covariates associated with child nutritional status and that could be changing over follow-up were collected at baseline, and at 12 months of the follow-up. Regularity and duration of receipted benefits, monthly amounts and length of PBA were verified through bank statements provided by the mothers at the time of interview.

Information concerning social, economic and morbidity conditions was obtained through parent or caregiver response to structured questionnaires. Evaluation of food intake was carried out through 24-hour recalls, in accordance with Willet[15]. A booklet containing pictures of food and standard liquid measurements, produced and used in other investigations of our group, was used to enable interviewees to recall the size of portions served[16]. Dietary intake at school or crèche was also noted and included in the form of dietary consumption of each child. Appropriately trained nutritionists gathered all data.

Data analysis

The anthropometric indicators (weight-for-age and height-for-age) were the outcome measured. These outcome variables were defined as variations in anthropometric indicators (changes in weight-for-age and height-for-age) throughout the follow-up period, expressed in Z-scores[17]. Both variables were considered the main dependent variable, time-variant and were included as continuous variables in the statistical analysis. The PBA exposure was the main independent variable. Differentiated duration of exposition to PBA was considered in the group's compositions.

Covariates were represented by a range of factors, including: child age and sex, residence area, the family's social and economic conditions, physical and sanitary home conditions, diarrhea and coughs history, as reported by the mother within 15 days prior to interview, food intake, income received from other programs (*Bolsa Escola* and gas for cooking), weekly food expenditure and seasonality. The season was defined according to the intervals in which the anthropometric measurements were taken[15].

The physical and sanitary home conditions, family structure, food intake and morbidity burden variables were introduced in the model as variant in the time. All other variables in this block were treated as invariant in the time.

Interaction terms (exposure of program versus age; exposure of program versus season and exposure of program versus participation in other social programs) were tested in the multivariate analysis. When appropriate, the variable was transformed into its respective dummy.

Hierarchical linear model derived from a multilevel analysis with level-3 model was used in the statistical analysis[18,19]. The level 1 was represented for the household level; level 2 for children; and level 3 for the municipalities. An appropriate correlation matrix for database with imbalanced data and results derived from robust statistics was adopted. Two different multivariate regression models were subsequently specified for variations in weight-for-age and height-for-age.

We adopted the forward technique in selecting which variables to include in each level of the model[20]. The covariates were included in the statistics analysis as defined in table I. The qui-square test was used to compare the main characteristics between the groups. Covariates that were significantly associated with the outcome, were retained in the end. A two-tailed test was used in the analysis.

Anthropometric status was evaluated using the program ANTHRO[17]. Information on food consumption was processed by Virtual Nutri software[21] and statistical analyses were performed by Stata for Windows.

Ethical aspects

The Ethics Committee of the Federal University of Bahia approved the study protocol. Consenting mothers or guardians were asked to authorize the child's participation by signing an informed consent form. If the child presented any nutritional disorders, they were offered appropriate assistance and, when necessary, referred to the local health service.

Results

A total of 2163 children up to 72 months old were originally included in the study, but 316 (14.6%) were lost during the follow-up. Subject losses were due to family migration to other districts or due the child absence from home at the time of the interview. Except for the participation in other social programs - whose losses were highest amongst children who were not program recipients - no other characteristic differed between the followed and lost groups (data not shown in tables).

The municipalities' variables included were child mortality rate, maternal education, the municipality clean water percentage, and the Gini coefficient, a measure to evaluate the degree of income concentration. However, these variables were homogeneously distributed among municipalities not allowing the convergence of the correlations. And so in the multilevel analysis it was not possible to include the level 3.

Table I

Household environment, biological, social, health and nutritional characteristics of children from the Bolsa Alimentação program according to program participation, Bahia, Northeast Brazil, 2002-2003

Variables	*Recipient (%)*	*Non-recipient (%)*	*p value*
Residential area (1849)			
Urban	465 (85.2)	81 (14.8)	0.05
Rural	1152 (88.4)	151 (11.6)	
Gender of child			
Male	827 (87.1)	122 (12.9)	0.68
Female	790 (87.8)	110 (12.2)	
Child's age (months)			
< 36	585 (86.7)	90 (13.3)	0.45
≥ 36	1023 (87.9)	141 (12.1)	
Gender of head of household			
Male	335 (89.1)	41 (10.9)	0.28
Female	1282 (87.0)	191 (13.0)	
Maternal schooling			
≤ 4 years of school	1158 (87.5)	165 (12.5)	0.88
> 4 years of school	459 (87.3)	67 (12.7)	
Water supply in home			
Adequate	530 (88.9)	66 (11.1)	0.19
Inadequate	1087 (86.8)	166 (13.2)	
Sanitary conditions in home			
Adequate	272 (88.3)	36 (11.7)	0.62
Inadequate	1345 (87.3)	196 (12.7)	
Garbage disposal			
Adequate	523 (88.8)	66 (11.2)	0.23
Inadequate	1094 (86.8)	166 (13.2)	
Flooring in home			
Adequate	146 (89.0)	18 (11.0)	0.52
Inadequate	1471 (87.3)	214 (12.7)	
N° of bedrooms			
< 2	255 (86.1)	41 (13.9)	0.45
≥ 2	1351 (87.7)	189 (12.3)	
Indoor toilet facility			
Yes	878 (88.7)	112 (11.3)	0.09
No	715 (86.0)	116 (14.0)	
Electricity in home			
Yes	1241 (86.8)	188 (13.2)	0.07
No	367 (90.2)	40 (9.8)	
Sibling <5 years old			
< 2	638 (88.5)	83 (11.5)	0.88
≥2	804 (88.3)	107 (11.7)	
No of inhabitants in home			
<5	524 (89.4)	62 (10.6)	0.08
≥5	1093 (86.5)	170 (13.5)	
Participation in other social programs			
Yes	1381 (87.7)	194 (12.3)	0.47
No	229 (86.1)	37 (13.9)	
Weekly food expenditure			
1st tertile (>63.6)	22 (91.7)	2 (8.3)	
2nd tertile (>42.4 a 63.6)	17 (65.4)	9 (34.6)	[b]
3rd tertile (≤42.4	1578 (87.7)	221 (12.3)	

Table I (cont)
Household environment, biological, social, health and nutritional characteristics of children from the Bolsa Alimentação program according to program participation, Bahia, Northeast Brazil, 2002-2003

Variables	*Recipient (%)*	*Non-recipient (%)*	*p value*
Cough[a]			
Yes	645 (40.2)	72 (31.9)	0.02
No	960 (59.8)	154 (68.1)	
Diarrhea[a]			
Yes	96 (84.2)	18 (15.8)	0.25
No	1508 (87.9)	208 (12.1)	
Anthropometric deficit (<-2 Z-scores)			
Height-for-age	187 (84.6)	34 (15.4)	0.18
Weight-for-age	140 (83.8)	27 (16.2)	0.14

[a]at 15 days prior to interview; [b]unable to apply the test of statistical significance

We evaluated the validity of the assumptions criteria for the hierarchical modeling by the absence of multicollinearity demonstrated by the Variance Inflation Factor (VIF) and the normality of dependent variables distribution indicated by the residue analysis. We also evaluated the existence of interaction and none of the tested terms of interaction was significant[20].

Household environment, biological, social, health and nutritional children characteristics at the ending of the follow-up, taking into account the composition of the groups, are presented in table I. Except for the variable cough (p=0.02), there were not statistically significant differences for these variables between the groups in the beginning of the study (Table I), which did not influence the results identified in this research.

The table II presents the results of multilevel multivariate analysis for variation in the weight-for-age anthropometric indicator. It was observed a positive increase of 0.34 Z score (CI95%; 0.04; 0.63) in the weight-for-age anthropometric indicator for children continuously exposed to the program for 12 months compared to those who never received the intervention. The analysis was adjusted for children age and sex, number of sibling <5 years old in the home, electricity at home, maternal schooling, family participation in social programs, and calorie intake (Table II).

For height-for-age, the increase observed was of 0.38 Z score (CI95% 0.05; 0.70), for children continuously exposed to the program for 12 months compared to those who had never received the intervention (Table III). For shorter PBA participation (in the first or in the last six months) the variation on both anthropometric indicators (weight-for-age and height-for-age) was not significantly.

The influence of the home level in the impact for weight-for-age and height-for-age was respectively 45% and 48%, while the child level contributed 55% and 52% for the increase in the weight-for-age and height-for-age indicators, respectively. These results indicate the variability among the households and children scores and the relevance of using the multilevel model in statistical analysis.

Discussion

The impact assessments of the Brazilian CCT program - *Bolsa Alimentação* – PBA on the child's health and nutrition are scarce. So far, this seems to be the only non-governmental publication from this program that includes data from baseline and robust design on the impact of anthropometric status of Brazilian children. We report a significant impact of PBA in anthropometric indicators improvements in target children between six months to 72 months old for height-for-age and weight-for-age at 12 months of exposure at PBA when compared to growth in non-recipient children in a quasi-experimental study with 12 months of follow-up. For shorter PBA participation the variation in these anthropometric indicators were not significantly different between participating groups.

We note that the positive influence on target children's growth occurred regardless of the age and sex and that no interaction statistically significant was observed between program levels participation and these variables.

The physiological mechanisms of catch-up growth in childhood are not completely known. Traditional studies were originated at 60's[22] 80's[23,24] and 90's[25] years and most of them were done with hospitalized children. But even for these children is not surprising a high catch-up growth rate when the weight-for-height ratio reaches approximately 80%, which occurs towards the end of the fifth or sixth treatment month, when started to be registered the weight gain deceleration and the linear growth speed increase[23]. The longitudinal catch-up growth tends to start after the weight recovery, but than begins to be two to three times greater than normal for an infant of the same age, reaching average speeds of up to 30g per kilogram of weight per day[22, 23,25].

Table II

Multivariate multilevel linear analysis for repeated data variation in the weight-for-age anthropometric indicator and covariates of children participating in the brazilian Bolsa Alimentação program. Bahia, Northeast Brazil, 2002-2003

Fixed Effects	*Coefficients*	*SE*	*CI(95%)*	*P-value*	*Explained Variance*	*Wald*
Level 1 - household					45%	11,7
Electricity	-0.18	0.07	-0.32; -0.05	0.007		
Programs participation	0.17	0.06	0.05; 0.29	0.005		
Maternal education	-0.18	0.06	-0.30; -0.06	0.004		
Rubbish	-0.17	0.06	-0.29; -0.04	0.010		
Level 2 – Child					55%	20,3
Bolsa Alimentação (PBA)						
Continuously benefited	0,34	0.15	0.04; 0.63	0.002		
Not recipient/recipient	0.24	0.15	-0.06; 0.55	0.12		
Recipient/not recipient	0.23	0.17	-0.10; 0.57	0.17		
Age	-0.001	0.001	-0.002; 0.00	0.07		

Perhaps for this reason the investigators Morris and colleagues[10] - studying brazilian mothers and children weigh at the sixth month of the follow-up who participated in the PBA - have sharply concluded that the sixth month weight were probably in the deceleration phase of physiological weight growth with consequent decline of the weight gain speed ratio. And the authors comment: This rule was once enforced in a Brazilian federal program called *Incentivo para o Combate de Carencias Nutricionais,* which made milk powder available to mothers of underweight children. Many (probably the majority) of the mothers in our sample had previously been beneficiaries of this program, and there have been anecdotal—and impossible to substantiate—reports of beneficiary mothers deliberately keeping their children malnourished to qualify for the benefits. Many (probably the majority) of the mothers in our sample had previously been beneficiaries of this program, and there have been anecdotal—and impossible to substantiate—reports of beneficiary mothers deliberately keeping their children malnourished to qualify for the benefits (p.2340)[10]. But there are not scientific reports that Brazilian mothers of these programs are wicked. These authors had not the information about children height, making impossible, at that time, the detection of interventions effects on children growth. Thus, a single analysis of weight gain could not explain or even detect some of the possible interventions impacts[6].

Furthermore, the Brazilian Ministry of Health noted that the PBA families tend to use a higher percentage of their program resources on food than non-beneficiaries. Thus, the beneficiary families have a higher Marginal Propensity to Food Consumption (PMCA), i.e., they spend proportionally more with food for each US$ 1.00 added to the family income[6]. This organ also registered an average over a period of one year variation of -0.21 deciles height-for-age for children six years old excluded from the study and -0.03 for recipients' children. For children between one and two years old excluded and not excluded this value was -3.08 and -2.25 respectively, and for children of three years old the mean deciles were -1.26 from excluded children to -0.91 for recipients children.[6] It is possible that the larger deficit is the possibility of recovery when conditions improve life, which makes it more credibility to our results.

Thus, whether contributing factors to impaired growth are eliminated,[22,23,25] especially when the anthropometric deficits in children under 5 years old were elevated for height-for-age (17.9%) and weight-for-age (8.3%), as in the Northeast of Brazil - one of the poorest areas in the country[26] and when the child dietary intake is improved, the preventive health actions is received, the health workers advice the mothers to improve the maternal behavior practice related to the children care of the program, as indicated by the Brazilian Ministry of Health report,[6] the compensatory growth, even in older children, can happen.

The PBA impact on compensatory growth in children up to six years old identified in this study is reinforced by the mortality rate decrease reported by Rosella et al in PBA children under 5 years old in the same geographic region (Northeast of Brazil) where this study was conducted,[27] using PBA secondary databases of 5565 brazilian municipalities from 2004 to 2009 period (it started one year after the ending of our follow-up).

The authors showed that where the PBA had consolidated coverage there was a decrease in the mortality rate by 17% (RR 0.83: 95% CI 0.79-0.88), which 53% were respectively attributed to incidence decrease of diarrhea (RR 0.47: 95% CI 0.37 to 0.61) and 65% to malnutrition (RR 0.35: 95% CI .24 to .50)[27].

Program effectiveness assessments have shown a positive impact on growth in children younger than six years old from poor countries[28,29,30,31,32,33]. For example in 'Progresa-Oportunidades' developed in Mexico, Leroy et al[28] identified a linear gain of 1.5 cm ($p<0.05$) (corresponding to 0.41 Z score for height-for-age) and an absolute weight gain of 0.76 kg in one-year period ($p<0.05$) in children. In Mexican children from 24 to 68 months old, Rivera

Table III

Multivariate multilevel linear analysis for repeated data variation in the height-for-age anthropometric indicator and covariates of children participating in the brazilian Bolsa Alimentação program. Bahia, Northeast Brazil, 2002-2003

Fixed Effects	*Coefficients*	*SE*	*CI(95%)*	*P-value*	*Explained Variance*	*Wald*
Intercept	-0.69	0.19	-1.07; - 0.32	0.000		
Level 1 - Household					48%	14,8
Electricity	-0.32	0.07	-0.46; -0.17	0.000		
Programs Participation	0.14	0.07	0.006; 0.27	0.04		
Maternal Education	-0.27	0.07	-0.40; -0.13	0.00		
Level 2 – Child						
Bolsa Alimentação (PBA)					52%	21,0
Continuously benefited	0.38	0.17	0.05; 0.70	0.02		
Not recipient/recipient	0.20	0.17	-0.14; 0.54	0.24		
Recipient/not recipient	0.28	0.19	-0.10; 0.65	0.15		
Age	0.001	0.001	0.00; 0.002	0.09		
Gender	0.11	0.05	0.01; 0.20	0.02		
Siblings <5y old	-0.38	0.06	-0.499; - 0.252	0.00		
Calorie diet availability						
Tercile 1	-0.25	0.07	-0.38; -0.11	0.000		
Tercile 2	-0.17	0.06	-0.29; -0.04	0.01		

et al[29] identified an overall association between the program participation and the growth improve. Fernald et al[30, 31] reported positive impact on the growth of Mexican children in the Opportunity program children from 24 a 68 months old and an improvement was observed in children younger;[32] but other investigators have found different results[33].

But we observed that the PBA had a positive impact on the growth of older children (6 months to 72 months old). This impact - age and sex independent - observed in this study can be expected, even in older children, in the first years of the program implementation, when children living conditions were more precarious and anthropometric deficits were more pronounced, such as the scenario where this study was developed. These results suggest that it may be more likely that the CCT program exerts more effect on the catch-up growth of younger children, but these effects can also be seen in older children. It is known for some time that eliminating the conditions that limit the adequate growth in school-aged children and even in adolescents is possible that the catch-up growth occurs in specifics contexts,[34] as the PBA context, whose effectiveness in the first year of the implantation, it revealed the possibility of breaking the association between poverty and health and nutritional status of children from the poorest urban and rural areas.

Positive effects on children catch-up growth of children was registered for a recent review of cash transfer programs in other Latin American countries, particularly in Nicaragua, Honduras and Colombia[4].

Despite the extremely positive results observed in the Brazil's CCT program (PBA) first implantation year, other factors continue to impede the adequate linear or weight growth in Brazilian children living in extreme poverty, such as more than 2 sibling <5 years old in the home, absence of electricity at home, low maternal schooling, the family necessity to participate in social programs, low food intake, specially micronutrient, as observed in this study. These observations reinforce the need to deal with the social and health inequalities combat to ensure the Brazilian children growth according to their genetic potential.

Finally, we should note the limitations imposed by the study design and follow-up losses. The follow-up losses were relatively low (14.6%) and did not influence significantly the group composition at the end of the study. These losses occurred in a random mannered and possibly not introduced selection bias in the study greater proportion in a district that suffered a long period of drought that led to temporary migration of families in search of less adverse conditions.

And we emphasize that all variables were homogenously distributed between recipient and no recipient children followed, with the exception of reported coughs (Table I).

However, it is worth noting the homogeneity observed in anthropometric variables distribution at the beginning and in the ending of the group set up, and between those lost in the program and those who remained until the end. This is important since this variable is directly related to the program impact.

We acknowledge the diversity of actions linked to the PBA; including immunizations, nutritional education and prenatal care among others; which makes it more difficult to identify the isolated effect of cash transfers on child's physical growth[35]. We also recognize that the operational

combination of these actions, including health actions, does not always have an additive effect, but may have a multiplicative one[1] that increases the potential of actions linked to the program. However, the study design allows us to control for the influence of various external factors that could influence the results, and we also included an internal control group.

An appropriated statistical technique was used; it is also expected to correct the regression to the mean, making the results more robust and reliable.

We recognize that the study design does not allow us to make inferences based on causality, however inferences can be made based on an assessment of the plausibility of the intervention[11] which point to the effectiveness of the PBA in reducing anthropometric deficits in Brazilian children living in poverty.

Thus, it is possible to conclude by the study plausibility that reinforces the findings that recipients PBA children had better growth than those whose not recipients, indicating that the cash transfers programs reach vulnerable families and promote positive response on the children growth.

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