

# Measuring the impact of Bolsa Familia Program based on data from Health and Nutrition Days (Brazil)

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## Summary

Bolsa Família Program (PBF) reached the target of 11.2 million households in 2006; it is the largest conditional cash transfer program in the world. Health and Nutrition Day (HND) is a strategy that employs the window of opportunity offered by vaccination campaigns to estimate prevalence of anthropometric deficits in zero to five year old children. This article aims to verify the effect of PBF on children anthropometric indicators height/age, weight/age and weight/height based on data from HND. Four HND were included: semi-arid region and agrarian reform settlements (2005); maroon Quilombola communities and Amazon state (2006). HND employed cross-sectional designs; after unification and thorough verification, the final integrated data bank comprised 22,375 zero to five year old children with complete data. The variables under study, namely child birth weight, birth certificate, family head education, family head gender, piped water, electricity, height for age, weight for age and weight for height, were converted into binary variables (categories: appropriate and inappropriate) for regression analysis. Significance level was set at  $p < 0.05$ . Notably, there was low or moderate variability between the studied groups as regards most variables except for family head education. Concerning access to PBF, one observed a double standard, grouping, on the one hand, the families from Semi-Arid and Amazon (around 39% coverage) and on the other, settled families and maroon Quilombolas (next to 50% coverage). The odds ratio indicated that a child receiving PBF had 26% more chance to have appropriate indicator Height/Age when compared to non beneficiaries. In relation to Weight/Age this chance is also 26% higher. Beside that, only birth weight increased the chance of anthropometric indicators fitness. There were no significant results related to Weight/Height deficit. The findings indicate the need to enlarge access of beneficiary families to the goods and services which interact with improved nutrition, to ensure a sustainable increase in health levels.

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## Introduction

The mode of action to confront hunger and food insecurity is closely related to the fight against poverty. Brazilian experience historically tended towards emergency distribution of foods for immediate consumption (eg basic food basket, school meals, milk and oil). At the end of twentieth century a consensus was reached that society should be organized in order to ensure an universal minimum income, as a citizens' right (Almeida, 2000, Suplicy 2002).

Considering the high income and wealth concentration in Brazil, the guarantee of a minimum income has become an important strategy to combat poverty. According to Senna et al. *"The Brazilian minimum income programs propose to promote the linkage with other social policies and programs, creating the possibility that, in theory, the typical fragmentation of the Brazilian social policies will be overcome, facilitating the adoption of intersectoral actions"* (Senna et al. 2007).

Some authors point out that direct cash transfer contributes to diminish administrative costs and to reduce the incidence of fraud and misappropriation of resources. In addition, this type of strategy allows beneficiaries to choose products to buy, as compared to the classic mode of food distribution (Lavinias, 2000).

In Brazil, the adoption of such strategy is recent and has created a series of expectations, as regards the possibility to make effective both beneficiaries citizen's rights and the opportunity to disarticulate a harmful status quo that stimulate an identity between social policies and political patronage.

From 2001 to 2003, several cash transfer programs were created in Brazil, such as National School Allowance Program (Brazil 2001a), Food Allowance Program (Brazil 2001b) and National Program for Access to Food - Food Card (Brazil 2003). In late 2003 early 2004, these programs were unified in Bolsa Familia Program (PBF) (Brazil 2004). In January 2004 Ministry of Social Development and the Fight against Hunger (MDS) was created, with the mission to implement the national policy of food and nutrition security and coordinate, supervise, monitor and evaluate the operation of cash transfer programs.

The objectives of Bolsa Família are supported in the discussions and experiences on more advanced methods of social intervention, intending to be a differential in relation to existing social policies in the country. The Program unified procedures for managing and implementing Federal Government cash transfer actions and set up as a government's strategy for strengthening and coordinating policies against poverty. The

program seeks to emancipate the beneficiary families, associating access to health and education policies with cash transfer, through conditionalities (Silva, 2007).

The Program reached the target of 11.2 million households monthly in 2006. Its objectives are: i) to combat hunger and promote food and nutrition security, granting a financial benefit that up until 2007 ranged from R\$15.00 (US\$ 6.67) to R\$ 95.00 (US\$ 42.22) per month<sup>a</sup> depending on the socio-demographic characteristics of households, particularly the number of preschool children, schoolchildren; ii) to promote access to the network of public services, especially health, education and social services, conditioning the receipt of financial benefit to usage of these services, iii) to promote interdisciplinary, complementary and synergy among the governmental social actions. In 2007, the PBF investment was of US\$ 303 million per month, summing up US\$ 3.7 billion annually. It is the largest cash transfer program of the world.

In the health sector, focus of this study, the conditionalities emphasize child growth monitoring, assessed by anthropometric indicators, in addition to vaccination, prenatal and other basic health care actions. The program promotes the link between access to basic social rights: health, nutrition, education and welfare by provision of family benefits.

Most recent studies focused on program's impact in reducing poverty and inequality, access to education and health services (Oliveira et al 2007, Soares et al 2006). Few studies have explored the impact of the PBF in reducing malnutrition and food insecurity (Conde et al 2007, IBASE 2008, Segall-Corrêa et al 2008).

A comprehensive initiative to describe the nutritional status of children in vulnerable populations is the Health and Nutrition Day (HND). The strategy uses the window of opportunity offered by the vaccination campaigns to estimate the prevalence of anthropometric deficits in children from zero to five years. The Campaign is a privileged opportunity to perform such an action, both because of its ability to mobilize the population, as well as to optimize the structure needed for its survey. Thus, the unification of two major actions like these provides greater efficiency, in a context of limited resources and greater accountability of public funds (Santos et al 2008a).

Five HND were conducted to date, for children from the semi-arid (which is the largest and most densely populated poverty area in Latin America) and northeastern agrarian reform settlements in 2005. The surveys of maroon Quilombola communities (isolated rural communities descended from slaves) and Amazon state were performed in 2006. A similar study for the North region occurred in 2007. Data are not yet available for the last HND.

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<sup>a</sup> US\$ 1 = R\$ 2.25

The nutritional status has long been recognized as an important indicator to assess the health, nutrition and life conditions of populations. This biological indicator is especially relevant when it comes to the nutritional status of under five children, a group recognizably more vulnerable to adverse living conditions and social inequality.

This article aims to describe the nutritional status of children from families enrolled in Bolsa Familia program and to verify the effect of the Program on anthropometric indicators height/age, weight/age and weight/height in children from zero to five years old in vulnerable populations in Brazil.

## **Methods**

The four studies employed a cross-sectional design, including children under five years old that were vaccinated during the 2005 and 2006 National Immunization Days. In the semi-arid region the universe enclosed all the 1,133 region municipalities, according to a recent Ministry of National Integration classification. The population is around 26 million people, including 2.3 million children aged from zero to five years. The sample was designed to obtain independent estimates for each of the nine States in the region.

The primary sampling unit was the municipality and 30 of them were drawn per state, except in Alagoas and Sergipe in which all municipalities located in the semiarid were included, 38 and 29 respectively. The process resulted in 277 municipalities selected in the nine States. In each municipality two vaccination sites were drawn (secondary sampling units) in a way to ensure that rural and urban areas were represented. In each site children were selected in the queue in a systematic way, employing intervals calculated based on vaccination coverage in the previous year. Therefore it was a three stage selection process with allotment proportional to the number of children in each primary unit. The sample studied was actually 17,586 children, but after data cleaning and plausibility analysis, the databank resulted in 16,239 children with valid information (7.6% loss) (Santos et al 2006).

In the case of agrarian reform settlements, the universe encompassed the 3,329 settlements located in the Northeast region and north of Minas Gerais, enrolled in the National Institute of Colonization and Agrarian Reform (INCRA) Project Registry in June 2005. According to this listing, there were 213,878 families, with about 102 thousand 0 to five year old children (target population). The selection of municipalities and settlements occurred with probability proportional to the number of residents per State. The sample was distributed in 75 settlements in 40 municipalities of 10 states (north of

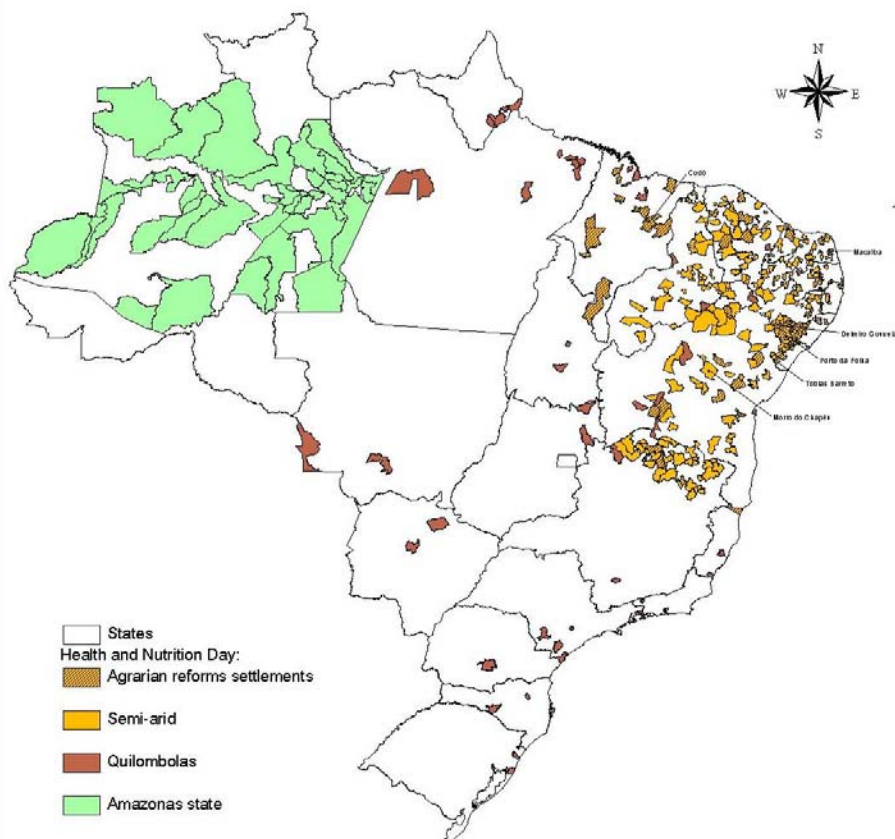
Minas Gerais and 9 states of the Northeast). During field work researchers randomly selected children in the vaccination sites for weighing, but in many settlements there was no need, because the number of children found was less than expected in the sample. The process resulted in a sample of 1,342 children from zero to five years of age.

The Quilombola Health and Nutrition Day sample was designed to obtain national estimates, not representative for each State. The primary sampling unit was the Quilombola community. The sample design was of conglomeration in two stages. In the first one, participant communities were selected for the sample and in the second stage, all families with children in this age group were investigated. As regards the sample size, due to the high costs involved, the decision was to investigate a number of 60 communities, with a distribution respecting the proportionality which existed in the cadastre. Thus, in those states where there were up to five communities two were selected. The exception was the state of Paraná, which only had one Quilombola community. In states with five to ten communities, four of them were drawn and if there were more than ten (Bahia, Maranhão and Pará) seven communities were selected. So to the extent that was possible, one tried to obtain a self-representative sample. The result was a probabilistic sample of 2,941 children from zero to five years (Santos et al 2008b).

In the state of Amazonas two samples were studied: one for the capital Manaus, which concentrates about 50% of the state's population and one for the interior, which included 42 municipalities. This analysis included only the sample of 2,405 zero to five year old children from the interior of Amazonas, in order to make studies more comparable, since in the other three surveys the state capitals were not covered. Figure 1 illustrates the municipalities sampled during the four HND included in this study. The six municipalities with names written on the map were sampled, by chance, in three of the HND: semi-arid, settlements and Quilombolas.

For data collection a brief, pre-tested questionnaire was used, which was applied to the party responsible for child's daily care. It included questions about education of the interviewed person and the head of the household, access to goods and basic social benefits, number of meals per day, growth monitoring, symptoms of diseases prevalent in childhood (acute respiratory infection and diarrhea), breastfeeding practices, prenatal care and so on.

Anthropometric measurements of weight and height were performed by a pair of professionals and one of them was responsible only for getting the weight and the other for reading the length or height. Measures were taken in duplicate for each child and



**Figure 1** - Municipalities selected for the Health and Nutrition Days. Brazil 2005 - 2006

annotated on the questionnaire. Wood instruments, marked from 10 to 99 cm and graduations in millimeters (Carci brand), were used to measure children length. Microtoise stadiometers with frontal reading were used for height measurement (SECA model 206), ranging from 0 to 2 meters with graduation in millimeters, or a metal stadiometer (AlturaExata brand), ranging from 0 to 2.13 meters and graduation in millimeters. To assess weight pediatric scales (capacity 16kg - graduation of 10g) and adult scales (150kg capacity - graduations of 100g) existing in the health centers were used. To improve accuracy, all scales were checked and faulty scales were replaced.

The fieldwork was supervised by the state and national coordinators and a set of multipliers in order to guarantee quality control. They also held municipal supervision during the HND. In addition, some states ensured the supervision of data collection in all, or some of the vaccination sites, assigning health professionals and/or students, previously trained in nutrition assessment.

The analysis of data consistency was performed by calculating the differences between the values of the two anthropometric measurements taken. Height measures were considered inaccurate if there was an absolute differences over 1 cm and for weight pairs with absolute difference greater than 0.2 kg were considered imprecise. The more acceptable number within the pair of imprecise measures was decided by polynomial regression to examine the best expression of the average for the pair.

Anthro 2006 software was employed to calculate nutritional indicators, according to the World Health Organization standard reference, WHO-2006. The anthropometric indices were expressed as standard deviations (Z scores) for the reference population, subject to the analysis of "biological plausibility", procedures recommended by the WHO (WHO, 1995). The classification of children nutritional status was made according to international criteria recommended by WHO. Children whose index had a standard deviation less than twice the median value for the reference population, were considered with nutritional deficit for the index under review. Children with standard deviation for the Weight/Height index 2 times greater than the median for the reference population were considered with excess weight-for-height.

The protocol for the HND was approved by the Ethics Committees of the National School of Public Health/FIOCRUZ and the National Amazonian Research Institute (INPA). Those responsible for the children were previously informed about the survey and signed the Statement of Free and Informed Consent. After the anthropometric examination the weight was recorded in the Child Card and parents or guardians were informed about the nutritional status. Children diagnosed with nutritional deficiency (Weight/Age < 3rd percentile) were referenced to the nearest Health Unit and were also identified by a more detailed form with indication for monitoring by municipal social workers.

Table 1 briefly shows the location of each HND, period of implementation, states and municipalities surveyed, number of children under 5 years sampled and the total population in that age group used as a reference for the sampling design.

After unification and thorough verification of the four surveys' databases the final integrated data bank comprised 22,375 zero to five year old children with complete data. Individual sample sizes were: 16,030 and 1,342 for semi-arid and settlements and 2,728 and 2,275 for Quilombolas and Amazonas, respectively. Frequencies were calculated to describe the social and demographic characteristics and Chi square test was used, with correction for continuity, where appropriate, adopting a significance level of  $p < 0.05$ .

**Table 1.** Description and scope of Health and Nutrition Days. Brazil 2005 - 2006

Population/ region	Date or period	Sampled states/ states in region	Sampled municipalities/ municipalities in the region	No. 0–5 year old children sampled	Estimated 0 to 5 year old reference population
Semi-arid/ North-east region	20 August 2005	9 / 9	277 / 1.133	16.239	2.300.000
Rural settlement/ Northeast region and MG	Aug - Sep 2005	10 / 10	40 / 1.877	1.342	230.000
Quilombolas/ National	Aug - Sep 2006	22 / 27	60 / 5.564	2.941	90.000
Amazon state/ North region	27 August 2006	1 / 7	43 / 62	Manaus 1.875 Interior 2.405	454.000

The analysis of Bolsa Família Program effects on the beneficiaries' anthropometric status was made by means of logistic regression to estimate the odds ratio for prevalence among the groups with and without Bolsa Família. The regression controlled for a set of six variables: birth weight, possession of child's birth certificate, family head education, family head's gender, access to piped water and access to electricity; the confidence intervals at 95% were calculated. These variables were included in the model as *proxy* of families' socioeconomic conditions and household environmental conditions. Due to the lack of sample weights for the universe of Quilombolas, data were treated as if it were a random sample drawn from an infinite population.

The variables under study, namely child birth weight, birth certificate, family head education, family head gender, piped water, electricity, height for age, weight for age and weight for height, were converted into binary variables into categories: appropriate and inappropriate.

Demographic and social characteristics analyses were performed with SPSS whereas SAS was the software of choice for regression analysis.

## Results and discussion

Table 2 shows the social and demographic characteristics of children studied in the four HND. Notably, there is low variability between the studied groups as regards: child sex, possession of child's vaccination card and normal birth weight. Regarding age

groups, the differences were a result of the singular sampling structures planned for each HND, not reflecting any potential demographic differences found in these populations. Children from settlements and Amazonas state had lower proportions in possession of birth certificate; this is a recurrent problem in rural and isolated areas.

**Table 2.** Social and demographic characteristics of children included in Health and Nutrition Days, according to specific population. Brazil 2005 - 2006

Characteristic	Semi-arid (n=16,030)	Settlements (n=1,342)	Quilombolas (n=2,728)	Amazonas (n=2,275)	Total (n=22,375)
<b>Child sex</b>					
Male	48.7	47.4	50.3	47.6	48.7
Female	51.3	52.6	49.7	52.4	51.3
<b>Age group</b>					
0 - 11 months	45.4	30.0	20.7	23.7	39.3
12 - 35 months	30.1	36.4	40.5	45.2	33.2
36 - 60 months	24.6	33.6	38.8	31.2	27.5
<b>Birth Certificate</b>					
Yes	93.1	87.5	94.0	90.1	92.6
No	6.9	12.5	6.0	9.9	7.4
<b>Birth Weight</b>					
Normal	93.2	91.8	92.1	91.4	92.8
Below 2.5 kg	6.8	8.2	7.9	8.6	7.2
<b>Child vaccination card</b>					
Yes, in hands	97.9	94.8	95.9	97.7	97.5
Yes, did not show	1.7	4.3	3.7	2.2	2.2
No	0.3	0.9	0.4	0.1	0.3
<b>Family head schooling</b>					
No schooling	16.1	24.2	16.3	8.9	15.9
1 – 4 years	36.2	50.8	47.2	26.6	37.5
5 – 8 years	26.2	18.9	24.7	31.1	26.1
9 or more years	21.4	5.8	11.8	33.4	20.6
<b>Family is enrolled in Bolsa Família</b>					
Yes	38.8	47.2	51.6	39.1	40.9
No	61.2	52.8	48.4	60.9	59.1
<b>Household with energy supply</b>					
Yes	92.6	73.8	79.6	89.3	89.6
No	7.4	26.2	20.4	10.7	10.4
<b>Household with water supply</b>					
Yes	68.9	13.3	28.3	59.7	59.7
No	31.1	86.7	71.7	40.3	40.3

According to the education of the family head, larger differences were observed: a) the median is 1 to 4 years of schooling for the population of the Semi-Arid, settlers and

maroon Quilombola communities; b) for those from the municipalities of Amazonas, the median schooling was higher.

Concerning access to Bolsa Família Program (PBF) among studied families, one observes two clusters, say, the families from Semi-Arid and the Amazon state (around 39% coverage) and settled families and maroon Quilombolas (next to 50% coverage). The findings are similar as regards homes with access to electricity and public water supply. The results reflect both a greater focus of Bolsa Família benefits in rural populations at the time of the HNDs and the historical deficits in housing infrastructure in rural areas.

Children with benefits from PBF, when compared with children without it do not present important differences on gender, birth weight and possession of vaccination card (Table 3). However, moderate differences are present in child age group, possession of birth certificate, household access to electricity and water supply. The two groups show important differences as regards the education of the family head, which indicates good program targeting.

Table 4 shows the results of regression analyses controlling for a set of six social and economic variables. There are consistent indications of lower occurrence of inadequate Height/Age and Weight/Age in the comparison between PBF beneficiaries and non beneficiaries. The odds ratio indicate that a zero to five year old child receiving Bolsa Familia program had 26% more chance to have appropriate Height/Age when compared to non beneficiaries. With regard to the Weight/Age this chance is also 26% higher.

Besides PBF, birth weight was the only variable which increased the chance of anthropometric indicators fitness. The odds ratio showed that children with normal birth weight were 3.5 and 4.5 times more likely to show an appropriate Height/Age and Weight/Age, respectively, than children with low birth weight. The other variables tested showed adverse effects - small, though significant, on the chance of nutritional adequacy. The family head sex showed no significant effect for any anthropometric indicator tested and public water supply did not affect, in a significant way, the Weight/Age deficits.

There was no effect of PBF on the Weight/Height deficit. The only variable with significant odds ratio for this indicator showed that a zero to five year old child with appropriate birth weight is 2.2 times more likely to show an appropriate Weight/Height than one with low birth weight.

**Table 3.** Social and demographic characteristics of children included in Health and Nutrition Days, according to Bolsa Família Program enrollment. Brazil 2005 - 2006

Characteristic	Enrolled in PBF (n=9,152)	Not enrolled in PBF (n=13,223)	<i>p</i> -valor
<b>Child sex</b>			
Male	48.4	49.0	0.385
Female	51.6	51.0	
<b>Age group</b>			
0 - 11 months	31.3	44.8	0.000
12 - 35 months	33.5	33.1	
36 - 60 months	35.3	22.1	
<b>Birth Certificate</b>			
Yes	93.8	91.7	0.000
No	6.2	8.3	
<b>Birth Weight</b>			
Normal	93.0	92.7	0.554
Below 2.5 kg	7.0	7.3	
<b>Child vaccination card</b>			
Yes, in hands	97.7	97.4	0.227
Yes, did not show	2.0	2.3	
No	0.3	0.4	
<b>Family head schooling</b>			
No schooling	20.4	12.8	0.000
1 – 4 years	45.0	32.3	
5 – 8 years	23.3	28.0	
9 or more years	11.3	26.9	
<b>Household with energy supply</b>			
Yes	87.9	90.7	0.000
No	12.1	9.3	
<b>Household with water supply</b>			
Yes	57.1	61.5	0.000
No	42.9	38.5	

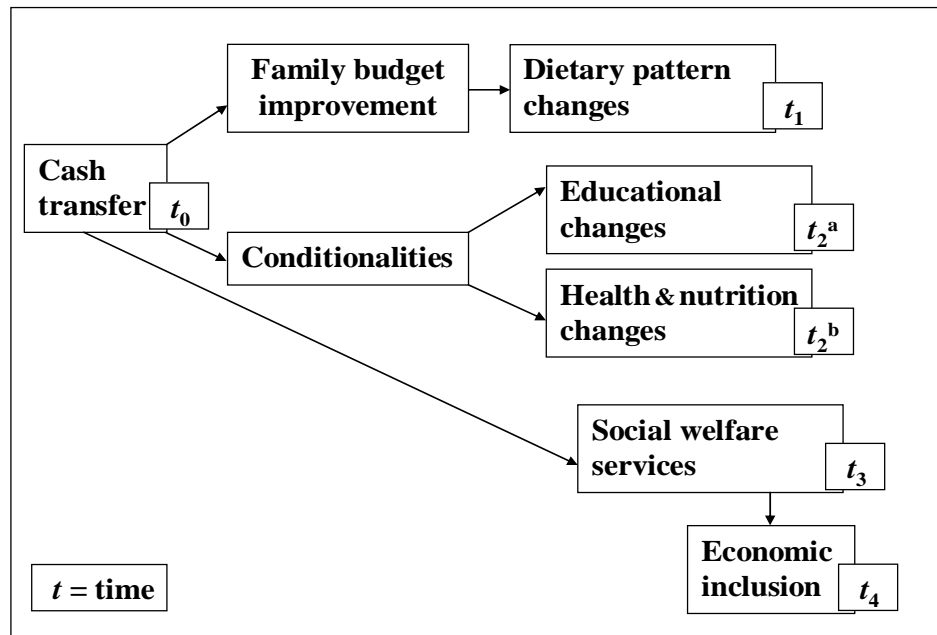
Cross-sectional studies present inherent limitations, such as not determining the length of exposure to the PBF benefit among the studied population, as well as possible biases related to enrollment in financial benefits other than those distributed by PBF. However data suggest that PBF interacts with basic conditions of family environment and home, leading to better nutritional status of children enrolled in the program, compare to non beneficiaries.

Table 4. Odds ratios on anthropometric indicators in zero to five year old children, according to a logistic model. Brazil 2005 - 2006

<b>Height for Age deficit</b>	Point Estimate	95% CI (Wald)	<i>p</i> -value	Significant
Beneficiaries X non beneficiaries	1.260	[1.156-1.377]	<0.001	Yes
Birth Weight	3.512	[3.114-3.960]	<0.001	Yes
Birth certificate	0.820	[0.706-0.953]	0.009	Yes
Family head schooling	0.719	[0.657-0.786]	<0.001	Yes
Family head sex	0.955	[0.868-1.053]	0.343	NS
Household electricity	0.771	[0.680-0.874]	<0.001	Yes
Household water supply	0.898	[0.823-0.980]	0.015	Yes
<b>Weight for Age deficit</b>	Point Estimate	95% CI (Wald)	<i>p</i> -value	Significant
Beneficiaries X non beneficiaries	1.257	[1.097-1.440]	0.001	Yes
Birth Weight	4.550	[3.870-5.349]	<0.001	Yes
Birth certificate	0.703	[0.563-0.876]	0.002	Yes
Family head schooling	0.705	[0.610-0.814]	<0.001	Yes
Family head sex	0.878	[0.757-1.019]	0.087	NS
Household electricity	0.647	[0.539-0.777]	<0.001	Yes
Household water supply	0.881	[0.767-1.011]	0.072	NS
<b>Weight for Height deficit<sup>1</sup></b>	Point Estimate	95% CI (Wald)	<i>p</i> -value	Significant
Beneficiaries X non beneficiaries	0.960	[0.807-1.141]	0.643	NS
Birth Weight	2.231	[1.757-2.833]	<0.001	Yes

<sup>1</sup>All other variables were not significant

Figure 2 shows the different timeframe in which PBF may impact on families. The first impact is precisely the change in dietary patterns ( $t_1$ ). The budget improvement produced by the cash transferred would allow benefited families to redirect resources to purchase more food. There is empiric evidence that this actually happens.



**Figure 2.** Time frame for potential impacts of Bolsa Família Program

The baseline study for Bolsa Família found that enrolled families, in contrast with the comparison group, have larger family expenditures, especially on food items: PBF families spend US\$172 a year more in foods (Oliveira et al 2007). More evidence is derived from the analysis of national data about Food Security from the National Household Sampling Survey, PNAD 2004. The results show that the average US\$30 transferred by Bolsa Família in 2004 increased by 52% the chance of having food secure families.

In another survey contracted by the Ministry of Social Development, Brandão et al. (2007) observed that the beneficiary families have aspirations to eat more healthy foods such as vegetables and fruits. This aspiration could indeed constitute an improvement in the beneficiary families' diet. However, food industries that manufacture low nutritional value foods, have already repositioned themselves in the market, seeking to increase the access of their enterprises to this "new consumer" class. This could hamper a healthy change in the food pattern of households receiving PBF.

The reference  $t_2^a$  refers to access to basic education, since this service has wide coverage in the country. The reference  $t_2^b$  would be reached later, because the coverage of basic health care services is somewhat limited. The network of Social Welfare Services (SUAS) is even more restricted. Therefore its access is still limited, leading to the usage of such services later than the previous ones ( $t_3$ ). In Figure 2, the impact on the economic inclusion related to PBF tends to be the latest of all, because of the complexity of the issue and weaknesses of the specific policies.

## Conclusions

The Bolsa Familia Program seeks to change behavior and attitudes of vulnerable families through the granting of financial benefits, conditional on greater utilization of health and education services. The benefit may immediately interfere with the attainment of minimum social rights related to food, clothing, transport and consumption of other goods and lower valued services. The conditionalities can operate as inducers for utilization of public services in health, education and social assistance.

The priority for purchase of foods for children may be related, both to conditionalities, as well as to changes in family attitudes towards the smaller number of children, arising from the fall in fertility, observed in the whole country and in all social groups. About the latter, the families seek to preserve the future of the group, providing more food to the fewer young people.

The increase in the utilization of public social services is associated with the provision of such services. Thus, the PBF inducing ability is limited by the capacity in the country to meet new social policies demands. The availability of public services shows the following order of decreasing supply: basic education, basic health care, welfare services and activities geared towards economic inclusion.

The findings indicate the need to enlarge access of beneficiary families to those goods and services which interact with improved nutrition, to ensure an increase in health levels. Also, to guarantee program effectiveness, the Brazilian government needs to increase supply and improve the quality of basic education, health services, welfare services and initiatives for inclusion in labor market.

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