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The Impact of the Bolsa Alimentação Program on Food Consumption

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1. Introduction

Malnutrition in developing countries is a major constraint on both human and economic development, being directly or indirectly responsible for a substantial proportion of the existing high levels of preventable morbidity and mortality, especially among women and children. For example, it has been estimated that over 20% of worldwide disability-adjusted life years (DALYs) due to mortality and morbidity can be attributed to malnutrition, with some more speculative estimates putting the proportion at around one half (Gillespie and Haddad, 2001). Also, 55% of deaths of children under five are directly or indirectly attributable to malnutrition. In young children, malnutrition can impair physical, mental and cognitive development due to decreasing motivation, curiosity, and reduced play and exploratory activities.[5] There is also clear evidence that malnutrition rates are disproportionately concentrated among the poor (Wagstaff and Watanabe, 2000).

In addition to the strong moral motivation for eradicating malnutrition and its consequences, there is also a strong economic motivation. For example, it has been estimated that in Asia, where the problem of malnutrition is most severe, the annual economic loss due to various components of undernutrition can be as high as 3% of GDP (Horton, 1999) and may be higher. In addition, microeconometric analysis of household data provides evidence of a strong link between nutritional status, productivity and household incomes[6], as well as between nutritional status and education achievements.[7] It is therefore unsurprising that malnutrition is both a cause and a consequence of poverty and its intergenerational transmission.

Although these human and economic costs of undernutrition are now well understood, there has still been very little progress in its mitigation (Gillespie and Haddad, 2001; UN, 2002). This is due in part to failures to achieve poverty reductions in many developing countries over the

[5] See, for example, Haas et al (1996), Grantham-McGregor (1998), Martorell (1995, 1999), Martorell, Khan and Schreoder (1994), and Martorell, Riveria and Kaplowitz (1989). Balasz et al. (1986) and Pollitt (1997, 2001) review studies that link nutrition and brain development in children. Bhargava (1997) found that the removal of intestinal parasites such as hookworm and schistosomiasis is important for child development.

[6] See, for example, Boissiere, Knight and Sabot (1985), Strauss (1986), Jamison (1986), Moock and Leslie (1986), Deolalikar (1988), Behrman and Deolalikar (1989), Leslie and Jamison (1990), Pollitt (1990), Haddad and Bouis (1991), Behrman (1993), Strauss and Thomas (1995), Alderman et al (1996), Glewwe (1996), Lavy, Spratt and Leboucher (1997), Thomas and Strauss (1997), and Behrman and Rosenzweig, (2001). Although there is ample evidence on the positive link between nutritional status, labor outcomes, productivity and wages, the mechanisms underlying these relationships are not entirely clear.

1990s, but also reflects the absence of direct action. The *Bolsa Alimentação* program is part of a recent reversal in the latter trend. Many Latin American governments, including those in Mexico, Colombia, Honduras and Nicaragua, are now undertaking large programs to encourage investments in the human capital of children in poor households through cash transfers linked to nutrition, health, and education programs. Programs like *Bolsa Alimentação* demonstrate recognition by the government of the costs of undernutrition and the willingness to undertake targeted interventions towards its eradication.

2. The Bolsa Alimentação program

Bolsa Alimentação is a federal program designed to reduce nutritional deficiencies and infant mortality among the poorer households in Brazil. The program is a demand-side incentive with money transfers to very low-income families with pregnant and lactating women, and/or infants and young children aged 6 months to 6 years. The cash transfer is conditional on women committing to a 'Charter of Responsibilities' which requires regular attendance at ante-natal care and growth monitoring, compliance with vaccination schedules, and health and nutrition education. This 'partnership of trust' is intended to reinforce the bond between the local health services and marginalized families of limited resources. The program benefits approximately 800,000 pregnant and lactating women, and 2,700,000 children, from approximately 2 million households from all the 5,561 municipalities in the country. US$150 million are invested in this program each year, from Brazilian Federal Funds for the Alleviation of Poverty.

In order to ensure the most effective use of government resources to reach the poor, beneficiary households were selected in a two-stage process. In the first stage, the Ministry of Health (MOH) allocated program funding to the municipalities in proportion to the fraction of infants (aged 0-2 years) suffering from malnutition, as measured by weight for age. This fraction was determined in a study by Benício and Monteiro that predicted municipality-level malnutrition rates for all municipalities using observed malnutrition prevalence for the municipalities in the National Survey of Demography and Health (PNDS). Provided that a municipality agreed to fulfill the conditions required by the BA administration for participation in the program, the MOH allocated the corresponding quota of grants to that municipality.

In the second stage of targeting, the municipalities identified beneficiary households that would receive the grants. The size of the grant a household receives is a function of the number

[7] See, for example, Glewwe and Jacoby (1995), Alderman, Behrman, Lavy and Menon (2000), and Glewwe, Jacoby

of household members who qualify as beneficiaries from the target population of children and pregnant or lactating women under the program guidelines. Specifically, there were three types of eligible individuals: (i) a pregnant woman, (ii) a mother breastfeeding a child up to six months of age for whom maternal milk is the principal source of food, and (iii) children of age six months up to seven years (i.e., less than seven). In practice, the breastfeeding requirement for infants could be treated as a responsibility of the mother under the program, so that all children age 0-6 years in eligible households would be covered.

The Ministry of Health also considered several other criteria for eligibility designed to identify poor households or those at greatest nutritional risk. Among these was some combination of means testing (using reported income) and observed child health status (using anthropometry). After some deliberation, it was decided that using existing health status as a criterion for program eligibility created perverse incentives for parents to withhold food from a child temporarily in order to gain access to the program. In addition, any household with young children or a pregnant woman with income below the threshold could reasonably be considered to be at risk of nutritional deficit even if none were observed presently. Therefore, an eligibility requirement based solely on means testing was adopted. The administration of BA used the per capita income threshold of one half of the national minimum wage (0.5 *Salário Mínimo*), or 90 reais per capita, which is the poverty line adopted for most government welfare programs.

Because the 90 reais threshold is used for eligibility in several other government programs including *Bolsa Escola*, municipal authorities were asked to develop a register, the *cadastro unico*, of all households living below 0.5 SM per capita. The method of identifying households for the cadastro unico varied by municipality. Some municipalities conducted a household survey to find poor households, often using the register for a previous nutrition program, the Incentive to Combat Malnutrition (ICCN), as a starting point. In other municipalities, families were invited to appear at central points (in most cases, the Unidades Básicas de Saúde), and were warned that only those earning less than 0.5 SM per capita would be considered eligible. At this point in time, households also provided the information contained in the "pre-cadastro familiar/ individual/gestante/nutriz," the family and individual pre-registration forms. In many cases, no checking of the veracity of the socio-economic information provided was possible initially, but families will be warned that they will be subject to home visits in the future, and that false information will result in immediate suspension from the program.

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and King (2000)

In practice, the process of registering eligible households, and therefore implementation of the program, has been hampered by logistical and administrative difficulties. In some cases, it has been difficult to identify poor households that were not already on a list of welfare recipients from an earlier program. In those municipalities where registration relied on the initiative of the household to report to a local health facility, identification of eligible households has often been low. This may be due to lack of information about the program, or to the same transactions costs in obtaining health services that the program is trying to overcome.

The size of the grants ranged from R$15 to a maximum of R$45 (US$6.25 to US$18.70) per beneficiary per month, depending on the number of beneficiaries in the household. Households received their transfers in the form of a magnetic card. The card could be redeemed at CEF agency offices. A requirement of participation in the program is that the household must commit to and sign a 'Charter of Responsibilities'. The family's duties under the charter include obtaining regular prenatal care for pregnant women, vaccinations and growth monitoring for children, and participation in educational programs on health and nutrition. Initial enrollment in the program is for a period of six months, which could be extended if the family has completed these commitments and remains income eligible.

3. Measuring the impact of Bolsa Alimentação: The empirical strategy

In order to evaluate the impact of the program, it was necessary to find an exogenous factor affecting program participation for eligible households. In several municipalities, some households were omitted from the program because of administrative errors in targeting. These errors lead to quasi-random assignment of households into and out of the beneficiary group within municipalities participating in the *BA*. This form of assignment can be used to provide identification of program impacts for recipient households. There were two kinds of administrative errors that led some households to be excluded: (i) two files containing household identifying information were separated for some areas within municipalities, leading some households in those areas to be excluded from the program, and (ii) if the individual listed as the primary beneficiary for the household had a letter in his/her name not from the Roman alphabet (e.g., é, ô, or ç) the household was excluded from the program. A retrospective household survey was conducted in several municipalities in which these administrative errors were identified. Random selection of households for interviews within these municipalities was stratified based on whether the household was a beneficiary or was administratively omitted from the program.

Excluded households were found in 67 Brazilian municipalities. After checking with the program's implementation team, three additional criteria were established for the selection of the municipalities to be included in the evaluation estudy:

1. Only municipalities from the Northeastern region were to be included in the study, given that 60% of the beneficiaries reside in this region

2. For cost saving reasons, to be included a municipality had to have at least 40 excluded families

3. Municipalities had to be participating in the program for at least six months, so that there would be enough time for the cash transfers to have an effect on malnutrition

In April of 2002, when the survey team went to the field for the first round of data gathering, there were four municipalities that fit the three criteria above: Teotônio Villela, in the state of Alagoas, Mossoró, in the state of Rio Grande do Norte, Itabuna e Teixeira de Freitas in the state of Bahia. In terms of the number of randomly excluded individuals, Teixeira de Freitas, with 240 excluded, was the municipality with the largest sample, followed by Mossoró with 116 excluded applicants, Itabuna with 87, and Teotônio Vilela with 63. The first phase of data collection for the impact evaluation of Bolsa Alimentação were carried in these four municipalities.

The universe of randomly excluded households provides an ideal counterfactual for similar beneficiaries that were selected into the program. To ensure the comparability of the two groups, a sample of matching pregnant women and children was selected from the roster of receiving beneficiaries. To increase the power of the statistical tests, 2 beneficiaries were matched to each excluded woman and child. The matching criteria used were the following:

1. Residence in the same municipality

2. Same gender

3. Same age

4. Similar socio-economic characteristics

After a pool of beneficiary individuals were matched by criteria 1 to 3 above, data collected during the registration process was used to determine which households best matched those who were excluded in terms of socio-economic characteristics (criterion 4). The variables used were: declared per-capita income, number of household members, rent paid, and the value of water, electricity and gas expenses. The matching pairs with the lowest Euclidean distances in terms of social economic variable to the excluded applicants were selected as comparison observations.[8]

Thus, the special feature of the data collected for the evaluation of Bolsa Alimentação is the existence of a control group formed by households who had actually applied for the program and were eligible to benefit from it, but were unintentionally excluded from the program. The exclusion of eligible households was due to bureaucratic mistakes that were beyond the control of households or program management staff. In some aspects, this form of accidental experiment provides better identification prospects because it is less likely to generate the usual experimentation biases.[9]

4. Data and descriptive results

The database resulting from field survey in the four municipalities contains detailed information on households' consumption of a great variety of food goods. The data set also contains information characteristics, as demographic, schooling levels and child anthropometrics. In this paper we focus on the data of food expenditure to measure the impact of the program on food consumption.

Table 1 below presents a series of summary statistics of pre-program characteristics for the two groups surveyed, beneficiaries and non-beneficiaries. As it can be seen the two groups are very similar in most characteristics (e.g. household size, schooling of the head of households an mothers). Also, as expected, most of the households that were randomly excluded because of the aforementioned bureaucratic mistakes were still not receiving the transfers from the program when the survey was conducted. Nevertheless, 6.7% of the originally excluded households were

[8] See IFPRI (2002) for details on the algorithm used to match excluded applicants to beneficiary individuals in terms of socio-economic variables.

[9] Experimental evaluations require the critical assumption that the experimental version of the program operates as would a natural version. As pointed out by Hausman and Wise (1985) and Manski and Garfinkel (1992), for a variety of reasons, this rarely happens and estimates of impact from experimental designs can rarely be extrapolated to the real world.

able to solve their exclusion problems and had begun to receive the transfers by the time when they were interviewed.

However, as it can be seen in the table above, both the age composition of the household and the participation rate in government programs seem to be correlated with the participation in Bolsa Alimentação (BA). Of particular concern is the correlation between the participation in BA and in the Bolsa Ecola program (BE). BE is also a conditional cash transfer program targeted to the same public (i.e., households earning less than R$90 per-capita per month) which started about six months before BA. It is given to families with children aging 7 to 14 and it is conditional on children maintaining a minimum of 85% attendance rate in school. As we found out after this correlation was detected, BE beneficiaries were more likely to be excluded from the BA program because *Caixa Economica*, the state bank in charge of paying both BE and BA via the magnetic cards, would block registration into BA to any heads of households already registered into BE, but for who the new registration data coming from BA showed any inconsistency with the previously recorded data.[10] This added a third source of random variation to the data. That is, in addition to the possibility of being excluded because of problems related to data transmission and special Portuguese typescripts, applicants who were already beneficiaries of BE could also be excluded because of random discrepancies between the BE and the BA registration forms. Nevertheless, as argued in the next section, this new source of random variation conditional on being a BE beneficiary implies that in the regressions used to measure the impact of BA that will be presented below, a dummy variable indicating participation in BE needs to be included in the right hand side. We will discuss this further in the econometrics section below.

Table 1: Pre-program characteristics of beneficiary and non-beneficiary households

ITEM	Beneficiários	Não Beneficiários
Observations	*696*	*309*
Household Members	5.38	5.78
% of literate household heads	35.20%	33.98%
Mothers (or expecting women) with:		

[10] For instance, if a family already receiving BE tried to register to BA and one of the members' names was misspelled, CE would freeze the BA registration until the inconsistency was resolved.

No schooling at all	9.46%	9.16%
Incomplete primary schooling	72.52%	71.54%
Complete primary schooling	5.86%	6.91%
Incomplete secondary schooling	4.05%	5.47%
Complete secondary schooling	5.86%	3.38%
Demographic structure:		
Average number of kids aging 0 to < 4	1.07	0.90
Average number of kids aging 4 to < 7	0.86	1.44
Average number of kids aging 7 to < 15	0.84	2.94
Participation on government programs:		
% households beneficiary of Bolsa Alimentação	93.9%	6.7%
% households beneficiary of Bolsa Escola	26.8%	55.7%
% households beneficiary of Vale Gás	91.1%	54.6%
% households beneficiary of ICCN	3.2%	13.5%

Notwithstanding the identification issues described above, in Table 2 below and in the appendix we present tables that compare the expenditure patterns between the two groups in our sample. As it can be seen in Table 2, total and per-capita expenditures are very similar in both groups. Per-capita expenditure figures indicate that the average beneficiary in the sample is well below the cut of point of R$90 per-capita (or half minimum wage). Food and non-food expenditure results suggest that the program might be having an effect household expenditure patterns in favor of greater consumption of food and lower consumption of non-food items.

Table 2. Expenditure patterns of beneficiary and non-beneficiary households.

ITEM	Beneficiários	Não Beneficiários
Observations	*696*	*309*
Total household expenditure	380.58	376.47
Per-capita household expenditure	77.73	72.60
Housing expenditures	46.32	51.36
Total expenditure on non-food items	88.79	94.79
Total exp. on food-items (excluding alcoholic beverages)	243.78	228.53
Total expenditure on fresh meats	61.10	56.09
Total expenditure on fruits and vegetables	21.04	17.64
Total expenditure on grains	87.64	84.23

The tables in appendix present statistical tests for the differences in the average consumption (incidence and value) of several food items between beneficiaries and non-beneficiary households. The results show that beneficiary households exhibit statistically

significant higher consumption in several food items, particularly fruits and vegetable, and fish and bovine meat. For instance, it seems that at the time of the survey, 25% more beneficiary households had consumed fish at least once in the past week, and 10% more beneficiary households had consumed red meat. A higher consumption of meats is consistent with a high income elasticity of meat consumption reported by many observers in Brazil. Higher incidence and value of consumption of fruits and vegetables by beneficiaries is also evident.

In sum, it appears from these initial results the diets of beneficiary families was richer than the diets of non-beneficiary families. However, while the results suggest that there are statistically significant differences consumption patterns between the two groups, because of the identifications issues discussed above, inferences on the impact of the impact of the program needs to wait until further more controlled regression analysis to be carried below.

5. The impact of Bolsa Alimentação on dietary diversity

In the previous section we discussed results that suggest that beneficiaries of the Bolsa Alimentação program appear to attain a richer diet than non-beneficiary. In this section we look into this relationship further by estimating the impact of the program on dietary diversity.

As Hoddinott and Yohannes (2002) indicates, households with low levels of dietary diversity are also likely to have low levels of consumption per person and low caloric availability. Changes in dietary diversity – as defined as the number of unique foods consumed – are a good indicator of changes in per capita consumption and per capita caloric acquisition, "access" measures of household food security. Changes in dietary diversity are also associated with changes in the consumption of staples and non-staples, with the magnitude of this association being higher in the case of the latter. As such, they conclude, dietary diversity can play a role in identifying the food insecure, in monitoring changes in circumstances as well as assessing the impact of interventions like Bolsa Alimentação.

If our sample had been obtained from a "pure" social experiment in which applicants for the program were selected in or out of BA randomly, as suggested by Hoddinott and Yohannes, to estimate the impact of the program on dietary diversity we would just estimate the parameters in the following model:

(1) $$N_i = \alpha + \beta BA_i + \varepsilon,$$

where N_i is the number of food items consumed by the household in the last seven days, BA_i is a dummy variable indicating participation in the BA program, and ε is a random disturbance which captures the effects of other factors influencing dietary diversity. The parameter α in (1) measures the average number of food items consumed by non-beneficiary households, and β measures the impact of the program on the number of food items consumed. Under an experimental design, ε is sure to be uncorrelated to BA_i and therefore, the OLS estimator of β is unbiased and consistent. However, our sample includes households who were excluded quasi-randomly from the program. Particularly, as shown above, households who were registered in the Bolsa Escola program were more likely to be excluded from BA by *Caixa Economica* because of conflicting registration information.

Nevertheless, conditional on being a BE beneficiary, whether or not an applicant was excluded from BA is still random and probably not related to other household characteristics that may influence dietary diversity.[11]

Therefore, β may still be unbiasedly and consistently estimated via OLS if a dummy variable indicating BE participation is also included in the right hand side of (1). In that case we would estimate the parameters in the following model:[12]

(2) $$N_i = \alpha + \beta BA_i + \delta BE_i + \varepsilon \,,$$

where BE_i is an dummy variable indicating participation on BE, and δ is the effect of BE participation on dietary diversity. Note however that the OLS estimator of δ in (2) may not be consistent if BE_i is endogenous.[13] Still, as shown in Appendix B, the OLS estimator of β will be consistent even if the estimator of δ is not.

Table 3 below shows estimates of the impact of Bolsa Alimentação on dietary diversity obtained via OLS regression on equation (2). While, columns (1) and (2) present results from

[11] Caixa Economica excluded beneficiaries of BE from BA when the new registration information was not exactly identical to what was entered previously by BE. This was largely due to misspelling of names and other data entry problems, and therefore is very unlikely to be related to unobserved factors affecting dietary diversity.
[12] See Appendix B for a proof that the OLS estimator of β in equation (2) is consist and unbiased.
[13] BE_i will be endogenous if participation in Bolsa Escola is correlated to unobserved characteristics that also affect diet diversity. That is, if BE_i is correlated to ε.

regressions in which the dependent variable is the number of different food items consumed in the seven days preceding the household interview, columns (3) and (4) present estimates from similar regressions in which the natural logarithm of the number of food items consumed is used instead. As it can be seen, the results suggest that the program has a positive and statistically significant impact on dietary diversity. Beneficiary households appear to consume approximately two food items more per week than non-beneficiary households. As the logarithmic regression results indicate, this represents an approximate 9% increase in dietary diversity.

As suggested by Hoddinott, J. and Y. Yohannes, a 1% increase in dietary diversity is likely to be associated to a .7% increase in per capita caloric availability. Therefore, our results allude to an approximate 6% increase in per capita caloric availability. Perhaps more importantly, as also put forward by Hoddinott, J. and Y. Yohannes, our results suggest that the program may have increased household per capita daily caloric availability from non-staples (items other than rice, beans and manioc) by approximately 12%. That is, it appears that beneficiary households are not only eating more calories, but are deriving such calories from a less monotonous diet that include healthier non staple items as fruits and vegetables.

Table 3. Estimates of the impact of Bolsa Alimentação on Dietary diversity[14]

Dependent variables:	***# of food items***		***ln(# food items)***	
	(1)	(2)	(3)	(4)
Dummy = 1 if beneficiary of BA	1.901	1.879	0.089	0.088
	[0.585]**	[0.587]**	[0.024]**	[0.024]**
Dummy = 1 if beneficiary of BE	-0.395	-0.901	0.001	-0.032
	[0.692]	[0.549]	[0.029]	[0.022]
Log of household population	-0.249		-0.013	
	[0.893]		[0.037]	
Share of members aging 0 to less than 7	-4.209		-0.198	
	[2.466]		[0.099]*	
Share of members aging 7 to less than 15	-3.681		-0.217	
	[2.733]		[0.112]	
Share of members aging 15 to less than 19	-6.19		-0.295	
	[3.206]		[0.138]*	
Share of members aging 61 and up	3.518		0.152	

[14] Results from OLS regression using Huber/White/sandwich estimator of the variance-covariance matrix which are robust to heteroskedasticity.

	[3.730]		[0.137]	
Constant	29.502	27.004	3.357	3.232
	[1.678]**	[0.556]**	[0.068]**	[0.024]**
Observations	1005	1005	1005	1005

Robust standard errors in brackets

* significant at 5%; ** significant at 1%

6. The marginal propensity of consuming food out of BA transfers

Policy makers entertaining cash transfer programs aimed at fighting hunger and malnutrition are often concerned with how the transferred resources are spent by beneficiary families. Indications that a large proportion of the cash received is not spent on food tend to erode popular and political support for such programs. Moreover, if families living under risk of malnutrition do not spend their transferred resources on food, it is because lack of income may not be the main cause of malnutrition, and therefore other policies should be enacted. In this section we estimate the marginal propensity to consume food (MPCf) out of cash transferred given by the Bolsa Alimentação program.

We consider the following models to estimate MPCf:

$$Y_i = \theta_0 + \theta_1 M_i + \theta_2 BE_i + \theta_3 X_i + \nu_i \,, \tag{3}$$

$$\ln(Y_i) = \phi_0 + \phi_1 M_i + \phi_2 BE_i + \phi_3 X_i + \omega_i \,, \tag{4}$$

where Y_i is total household food expenditure measured in Brazilian Reais, M_i is the amount transferred by Bolsa Alimentação to household i, BE_i like before is a dummy variable indicating participation in the Bolsa Escola Program, and X_i is a vector of household characteristics.

The linear model (3) is consistent with utility maximization. However, it imposes the unrealistic restriction that the share of food in overall expenditure remains constant at all levels of income. The logarithmic model (4) has generally been found to provide better fit to food

consumption data. While in model (3) the MPCf out of BA transfers is given by $\partial Y_i / \partial M_i = \theta_1$, in model (4) it will depend on the level of food consumption and therefore will be given by $\partial Y_i / \partial M_i = \phi_1 . Y_i$.

It is also important to note that while participation on BA is exogenous (conditional on participation on BE), the amount received by each household (M_i) will depend on the number of children aging 0 to 7 which may be correlated to unobserved household characteristics that affect expenditure on food. That is, M_i may well be correlated to the disturbance terms ν_i and ω_i, in which case the OLS estimators of the parameters in (3) and (4) will be biased and inconsistent. To address this problem we also estimate (3) and (4) via *Instrumental Variable* methods (IV) using the dummy variable indicating participation (BA_i) as an instrumental variable for the amount received M_i.[15]

Table 4 below presents the results of the OLS and IV estimation of the parameters in models (3) and (4). Columns (1)-(3) present the estimates for equation (4), while columns (4)-(6) present the estimates for equation (3). The OLS estimates for both models are presented in columns (1), (2), (4) and (5), while the IV estimates are in the remaining columns. From the Hausman specification tests performed, we cannot conclude that the OLS and the IV estimators are different for neither of the models. Therefore, it does not appear that the variable M_i is endogenous in both regressions. In this case the OLS estimator is more efficient and preferable to the IV estimator. Also, the F-test rejects the null hypothesis that the coefficients on all demographic variables (shares of each age group) are equal to zero. Therefore we concentrate our discussion below based on the estimates presented in columns (1) and (4).

As it can be seen in Table 4, the results suggest that the program does have a positive and statistically significant impact on household food consumption. The logarithmic regressions suggest that each real transferred by the program increases expenditure on food by approximately 0.3%. Therefore, since the average beneficiary household receives approximately R$30 per month, the data suggest that the program augments food expenditures by approximately 9%.[16]

The results in column (1) also indicate that the marginal propensity to spend on food out of one Real transferred is of approximately 0.70, which is statistically different from zero at the 1% significance level. That is, in average 70% of any additional Real transferred to beneficiary

[15] Conditional on BE, BA_i is orthogonal to the error terms in (3) and (4) and is obviously highly correlated to M_i.
[16] Note that this is a similar to the 9% increase in caloric intake estimated via the increase of dietary diversity.

households would be spent on food.[17] This is much higher then the estimates obtained from programs in Africa (del Ninno and Dorosh, 2002) and in the United States (Breunig and Dasgupta, 1999).[18]

The results in column (4) give us the MPCf out of BA transfers estimated via model (3). They indicate that the MPCf is 0.57 out of each incremental real given to beneficiaries. This estimate is statistically different from zero at the 1% significance level. While lower than the estimated MPCf obtained via model (4), is still much higher than the reported MPCfs reported in the literature. It still suggest that the majority of the resources being transferred via BA is being spent on food.

7. Conclusion

In this paper we study the impact on food consumption of conditional crash transfers given out by the Brazilian government via the Bolsa Alimentação program. The program relies on demand-side incentives to pregnant-women and mothers of children under seven in very low-income families. Due to bureaucratic mistakes, many eligible applicants were randomly excluded after applying for the program. These unintended exclusions formed a comparison group similar control groups formed in social experiments, which allow us to identify the impact of the program on food consumption with minimum identification assumptions.

Table 4. Estimates of the MPCf out of Bolsa Alimentação transfers

Dependent variables: ln(Household food expenditure)				***Household food expenditure***		
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS		IV	OLS		IV
Amount receive from BA	0.003	0.002	0.004	0.574	0.413	0.722
	[0.001]**	[0.001]**	[0.001]**	[0.209]**	[0.199]*	[0.286]*
Dummy = 1 if in BE	-0.001	-0.032	0.014	-2.888	-8.008	0.114
	[0.038]	[0.033]	[0.038]	[8.444]	[7.437]	[8.449]
Log of household population	0.393	0.351	0.4	90.983	85.924	93.142
	[0.053]**	[0.046]**	[0.053]**	[12.108]**	[10.501]**	[12.140]**
% hh members aging 0 to < 7	-0.464		-0.498	-95.081		-100.572
	[0.151]**		[0.158]**	[31.573]**		[32.699]**

[17] The estimated average food expenditure for non-beneficiary households is R$228.53. Therefore, the MPCf= R$228.53x0.003=0.69. The estimated standard error for the MPCf derived from model (1) is .219, and therefore the t-ratio=3.15, and the P-value=0.001.

[18] MPCfs reported in both papers vary between .28 and .41.

% hh members aging 7 to < 15		-0.394 [0.162]*		-0.436 [0.163]**	-71.796 [35.278]*		-80.485 [35.335]*
% hh members aging 15 to < 19		-0.424 [0.209]*		-0.45 [0.213]*	-56.776 [43.769]		-61.011 [44.482]
% hh members aging 61 and up		0.239 [0.203]		0.226 [0.204]	55.529 [50.761]		53.188 [50.857]
Constant		4.911 [0.096]**	4.762 [0.071]**	4.897 [0.095]**	125.82 [19.018]**	92.842 [15.447]**	121.657 [18.686]**
Hausman test - $\chi^2(7)$:	Test value:			10.11			1.06
	P-value:			0.183			0.994
F-test(4, 997):	Test value:	4.15			3.51		
	P-value:	0.002			0.008		
Observations		1005	1005	1005	1005	1005	1005

Robust standard errors in brackets
* significant at 5%; ** significant at 1%

Our results indicate that the program seems to have been having a significant impact on dietary diversity by increasing the number of food items beneficiary households consume per week by approximately 9%, which is likely to be associated to an increase of 6% in caloric availability from the average diet and a 12% increase in caloric availability from healthier non-staples, specially fruits and vegetables.

Finally, our results also indicate that the marginal propensity to consume food (MPCf) out of Bolsa Alimentação transfers is high compared to other programs cited in the literature. We estimate that the MPCf varies between 0.57 and 0.70 cents for each incremental Real given to beneficiaries of the program.

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Appendix A

Tabela A.1. Consumo durante os últimos 7 dias, Gastos Mensais e Intervalos de Confiança (95%) para a Diferença: Grãos, cereais e farinhas.

Item	Consumo de Alimentos nos últimos 7 dias				Gasto Médio *Per Capita* com Alimentos – Mensal (em Reais R$)			
	BA	Não BA	I.C. de 95% da Diferença		BA	Não BA	I.C. de 95% da Diferença	
Arroz	97.84	98.71	-0.97	2.69	2.58	2.59	-0.29	0.31
Feijão	97.84	96.76	-3.17	1.01	2.48	2.39	-0.30	0.12
Farinha de Mandioca	92.67	93.85	-2.24	4.60	1.03	1.05	-0.10	0.15
Fubá	*57.33*	*48.87*	*-15.12*	*-1.80*	*0.82*	*0.66*	*-0.32*	*0.00*
Farinha de trigo	31.61	28.48	-9.32	3.06	0.44	0.38	-0.17	0.06
Pães	76.15	77.35	-4.49	6.89	2.33	2.48	-0.25	0.57
Bolos	15.95	12.94	-7.80	1.79	*0.35*	*0.22*	*-0.28*	*0.02*
Macarrão	*88.94*	*80.26*	*-13.27*	*-4.09*	*1.38*	*1.18*	*-0.36*	*-0.05*
Biscoitos	*77.59*	*67.64*	*-15.77*	*-4.13*	*1.89*	*1.46*	*-0.68*	*-0.18*

Tabela A.2. Consumo durante os últimos 7 dias, Gastos Mensais e Intervalos de Confiança (95%) para a Diferença: Legumes, Verduras e Tubérculos.

Item	Consumo de Alimentos nos últimos 7 dias				Gasto Médio *Per Capita* com Alimentos – Mensal (em Reais R$)			
	BA	Não BA	I.C. de 95% da Diferença		BA	Não BA	I.C. de 95% da Diferença	
Alface	23.42	25.57	-3.59	7.89	0.19	0.18	-0.08	0.07
Cenoura	*50.72*	*37.22*	*-20.15*	*-6.86*	*0.37*	*0.24*	*-0.20*	*-0.06*
Tomate	*81.61*	*72.49*	*-14.58*	*-3.66*	*0.63*	*0.49*	*-0.22*	*-0.07*
Chuchu	40.95	39.16	-8.38	4.80	*0.26*	*0.19*	*-0.13*	*0.00*
Quiabo	22.70	22.01	-6.30	4.91	0.15	0.15	-0.07	0.06
Cebola	*89.22*	*85.11*	*-8.47*	*0.25*	*0.53*	*0.43*	*-0.18*	*-0.02*
Batata doce	*24.86*	*17.48*	*-12.98*	*-1.78*	*0.24*	*0.17*	*-0.14*	*0.00*
Batata	*62.50*	*52.10*	*-16.96*	*-3.83*	*0.55*	*0.41*	*-0.25*	*-0.04*
Aipim /Mandioca/ Macaxeira	*31.18*	*22.65*	*-14.57*	*-2.48*	*0.35*	*0.23*	*-0.21*	*-0.02*
Abóbora/ Jerimum/ Moranga	*42.96*	*34.95*	*-14.58*	*-1.44*	0.34	0.28	-0.13	0.01
Couve	12.50	12.30	-4.63	4.23	0.07	0.08	-0.03	0.04
Repolho	*27.59*	*22.01*	*-11.45*	*0.29*	*0.15*	*0.11*	*-0.08*	*0.00*

Tabela A.3. Consumo durante os últimos 7 dias, Gastos Mensais e Intervalos de Confiança (95%) para a Diferença: Frutas Frescas.

Item	Consumo de Alimentos nos últimos 7 dias				Gasto Médio *Per Capita* com Alimentos – Mensal (em Reais R$)			
	BA	Não BA	I.C. de 95% da Diferença		BA	Não BA	I.C. de 95% da Diferença	
Banana da terra	21.98	20.71	-6.80	4.25	0.30	0.24	-0.15	0.03
Banana prata/ ouro /etc.	61.06	55.34	-12.31	0.86	*0.91*	*0.69*	*-0.42*	*-0.01*
Maçã	*35.34*	*24.27*	*-17.30*	*-4.85*	*0.45*	*0.27*	*-0.27*	*-0.08*
Mamão	*22.70*	*17.15*	*-11.01*	*-0.09*	0.21	0.20	-0.09	0.07
Maracujá	*28.59*	*22.01*	*-12.50*	*-0.67*	0.26	0.20	-0.12	0.02
Melancia	19.40	15.53	-9.04	1.31	0.26	0.17	-0.19	0.01
Laranja	*55.03*	*46.93*	*-14.79*	*-1.42*	*0.62*	*0.42*	*-0.37*	*-0.03*
Caju	1.01	1.62	-0.85	2.07	0.01	0.03	-0.02	0.05
Limão	34.05	37.22	-3.24	9.57	0.23	0.22	-0.10	0.08
Manga	9.48	8.09	-5.24	2.46	0.11	0.09	-0.07	0.03

Tabela A.4. Consumo durante os últimos 7 dias, Gastos Mensais e Intervalos de Confiança (95%) para a Diferença: Laticínios.

Item	Consumo de Alimentos nos últimos 7 dias				Gasto Médio *Per Capita* com Alimentos – Mensal (em Reais R$)			
	BA	Não BA	I.C. de 95% da Diferença		BA	Não BA	I.C. de 95% da Diferença	
Leite líquido	66.52	62.14	-10.78	2.00	2.30	1.94	-0.75	0.02
Leite em Pó	45.40	41.75	-10.32	3.01	1.77	1.72	-0.53	0.42
Iogurte	*26.72*	*18.45*	*-14.00*	*-2.55*	*0.55*	*0.37*	*-0.32*	*-0.03*
Queijo	10.06	9.39	-4.67	3.33	0.31	0.25	-0.21	0.08
Manteiga	10.63	9.06	-5.62	2.48	0.12	0.10	-0.07	0.04
Margarina	*69.68*	*63.75*	-12.19	0.33	0.74	0.63	-0.24	0.03
Requeijão	2.73	2.27	-2.60	1.67	0.06	0.04	-0.07	0.04

Tabela A.5. Consumo durante os últimos 7 dias, Gastos Mensais e Intervalos de Confiança (95%) para a Diferença: Carnes, Peixes, Crustáceos e derivados.

Item	Consumo de Alimentos nos últimos 7 dias				Gasto Médio *Per Capita* com Alimentos – Mensal (em Reais R$)			
	BA	Não BA	I.C. de 95% da Diferença		BA	Não BA	I.C. de 95% da Diferença	
Peixes	*33.05*	*26.54*	*-12.71*	*-0.31*	*1.24*	*0.82*	*-0.72*	*-0.12*
Crustáceos	1.44	2.27	-0.90	2.56	0.03	0.06	-0.02	0.09
Frango	79.17	76.38	-8.32	2.74	3.57	3.34	-0.68	0.23
Carne bovina fresca / congelada	*66.24*	*59.87*	*-12.79*	*0.06*	*4.43*	*3.72*	*-1.36*	*-0.05*
Charque, carne de sol, carne de salpresa	38.22	36.25	-8.48	4.53	1.85	1.80	-0.48	0.37
Carne suína	12.07	9.39	-6.92	1.55	0.52	0.41	-0.35	0.13
Carnes de outros animais (cabrito, coelho etc.)	3.02	3.24	-2.10	2.54	0.16	0.18	-0.13	0.16
Vísceras (fígado, coração, rim, tripa, bucho, passarinha)	20.26	21.36	-4.33	6.53	0.54	0.56	-0.17	0.20
Embutidos (salsicha, calabresa, mortadela, presunto)	45.40	41.75	-10.32	3.01	0.98	0.85	-0.35	0.09
Ovos	74.71	72.82	-7.78	3.98	1.09	1.04	-0.21	0.11

Tabela A.6. Consumo durante os últimos 7 dias, Gastos Mensais e Intervalos de Confiança (95%) para a Diferença: Óleos e Gorduras, Temperos e Condimentos.

Item	Consumo de Alimentos nos últimos 7 dias				Gasto Médio *Per Capita* com Alimentos – Mensal (em Reais R$)			
	BA	Não BA	I.C. de 95% da Diferença		BA	Não BA	I.C. de 95% da Diferença	
Óleos vegetais	97.70	96.44	-3.43	0.91	1.18	1.07	-0.28	0.05
Azeite de Oliva	*2.01*	*4.21*	0.03	4.36	*0.02*	*0.05*	*0.00*	*0.07*
Azeite de Dendê	2.44	4.21	-0.52	4.05	0.02	0.02	-0.02	0.02
Banha, toucinho	10.06	7.12	-6.81	0.93	*0.16*	*0.09*	*-0.14*	*0.00*
Sal	98.99	98.06	-2.45	0.58	0.12	0.11	-0.03	0.01
Açúcar	99.28	99.03	-1.45	0.94	1.83	1.76	-0.21	0.07
Pimenta do Reino/ Malagueta/ Cominho	61.35	62.14	-5.75	7.32	0.29	0.25	-0.15	0.06
Outros temperos, molhos e condimentos	*62.79*	*56.96*	-12.37	0.71	*0.33*	*0.28*	*-0.11*	*0.00*

Tabela A.7. Consumo durante os últimos 7 dias, Gastos Mensais e Intervalos de Confiança (95%) para a Diferença: Bebidas e Outros alimentos.

Item	Consumo de Alimentos nos últimos 7 dias				Gasto Médio *Per Capita* com Alimentos – Mensal (em Reais R$)			
	BA	Não BA	I.C. de 95% da Diferença		BA	Não BA	I.C. de 95% da Diferença	
Café, mate e chá	95.83	96.76	-1.66	3.52	1.05	1.11	-0.05	0.18
Refrigerante, refrescos e sucos engarrafados	46.70	42.07	-11.30	2.05	0.79	0.73	-0.27	0.14
Cerveja	3.16	4.53	-1.12	3.86	0.17	0.34	-0.12	0.46
Aguardente e outros destilados	*3.45*	*6.47*	*0.28*	*5.77*	0.17	0.10	-0.25	0.09
Doces e balas	47.84	43.04	-11.49	1.89	0.60	0.53	-0.30	0.16
Produtos enlatados prontos para o consumo	9.63	11.33	-2.35	5.75	0.14	0.15	-0.06	0.08