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# Targeting and coverage of the Bolsa Família Programme: Why knowing what you measure is important in choosing the numbers

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# TARGETING AND COVERAGE OF THE BOLSA FAMÍLIA PROGRAMME:

## WHY KNOWING WHAT YOU MEASURE IS IMPORTANT IN CHOOSING THE NUMBERS

Working Paper number 71 October, 2010

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This paper is one of a series of papers that was presented at the session on *Social Development Strategies for Inclusive Growth* at the *India-Brazil-South Africa (IBSA) Academic Forum: A Policy Dialogue* which was held on 12-13 April 2010 in Brasilia. The forum was hosted by the International Policy Centre for Inclusive Growth (IPC-IG) in collaboration with the Strategic Affairs Secretariat of the Office of the President and the Ministry of External Relations, Government of Brazil. The objective of the session was to facilitate an exchange between researchers and policy makers in the three countries on their social development strategies.

The Institute for Applied Economic Research (IPEA) is a key partner in this regard. This paper which has been produced by IPEA is brought out jointly with the IPC-IG as part of an ongoing collaboration with a view to stimulating discussion on Brazil's experience and innovation in the area of social development strategies. The IBSA countries have not only demonstrated the potential for adopting and implementing large social assistance programmes effectively but they are also able to point to significant positive impacts of such policies on inequality and poverty as well as contributions to macroeconomic resilience—all of which may also be of interest to other developing countries.

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# TARGETING AND COVERAGE OF THE BOLSA FAMÍLIA PROGRAMME:

WHY KNOWING WHAT YOU MEASURE IS IMPORTANT

IN CHOOSING THE NUMBERS\*

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## 1 INTRODUCTION

The trade-off between targeting and coverage has always been something of a quandary for progressive cash transfers, particularly those that are not entitlements. Undue inclusion errors mean that families or individuals whose need is not so great are being paid at the expense of either taxpayers or other budgetary priorities. Undue exclusion errors mean that those who are in need, sometimes in desperate need, are not being helped by the state.

This trade-off is somewhat less extreme for entitlements. If the law says that families whose income is less than a quarter of a minimum wage are entitled to a given cash allowance, then all those whose income falls under that line should receive the allowance. There is still a trade-off because measurement error still occurs, but the discussion centres only on the inclusion criteria. Most conditional cash transfers (CCTs), however, are not entitlements.

When cash transfers of any kind are not entitlements, the targeting-coverage trade-off becomes more dramatic. In addition to inclusion criteria, coverage targets must be set and met. These coverage targets are usually set *ex-ante* and estimated before administrative records have given a clear idea of what is happening at the micro household level. Since these cash transfer programmes have suffered (or benefitted) from very high political visibility, it becomes difficult to change coverage targets once these are announced.

Our objective in this paper is to illustrate these quandaries using Latin America's largest CCT scheme, Brazil's *Bolsa Família* programme (PBF). To do this, we first describe briefly how the programme came to be and its targeting mechanisms. Section 3 discusses the size of the programme according to different criteria (this is important in deciding whether it is too small or just right). The following section evaluates how good *Bolsa Família* is at reaching the poor and only the poor. Section 5 considers the concept of income volatility and why the poor are especially hard-hit by uncertainty about tomorrow's income. Section 6 examines cross-sectional coverage. Section 7 discusses *Bolsa Família's* marginal targeting and explains why this is the right concept to use in estimating how big it should be to cover all the poor.

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## 2 THE *BOLSA FAMÍLIA* PROGRAMME AND ITS TARGETING MECHANISMS

The PBF was created by the federal government in October 2003. Far from being a radical novelty on Brazil's social policy scene, the PBF was more of an excellent managerial initiative whose goal was to unify initially four, and eventually five, pre-existing targeted cash transfer programmes. These were the *Programa Bolsa Escola*, *Programa Bolsa Alimentação*, *Auxílio Gás* and *Programa Nacional de Acesso à Alimentação* (also known as *Cartão Alimentação*). A fifth CCT programme, the *Programa de Erradicação do Trabalho Infantil* (Child Labour Eradication Programme, PETI), was not fully incorporated until December 2005.

Before the unification under the PBF, each of the above programmes had its own implementing agency, information system and financing source. There was little communication or cooperation, and sometimes considerable animosity, between the managers of the different programmes. This meant that it was possible for one family to receive all five benefits and another, with exactly the same socioeconomic profile, to be excluded from all five. The programmes had different transfer amounts, and thus the federal government could be paying different amounts to families in identical circumstances. The justification for these differences was that, though the programmes targeted the same population (the poor), they had differing objectives. This weak argument was used and abused by the opponents of unification, who feared that their own objectives (and, of course, their political clout) would be hampered by unification.

The PBF unified the inclusion and exclusion criteria, the transfer amounts, the implementing agency and, perhaps most importantly, the information system. Today, families whose per capita income is less than to R\$140 receive R\$22 for each child aged 14 or younger, up to a maximum of three children per family, and another R\$33 for each teenager aged 15 to 16 (16 is the minimum age for paid labour in Brazil), up to a maximum of two per family. Additionally, families whose per capita income is below R\$70 receive another R\$68, independently of household composition.

The implementing agency is the *Secretaria Nacional de Renda para a Cidadania* (National Citizenship Income Secretariat, Senarc) of the *Ministério de Desenvolvimento Social e Combate à Fome* (Ministry of Social Development and Fight against Hunger, MDS). The *Caixa Econômica Federal* (CEF), a federal bank, is in charge of making the payments. Perhaps the most important step in the unification process was a unified information system and registry, called the *Cadastro Unico* (CadÚnico). The CadÚnico was actually set up in 2001, two years before the PBF, but was largely theoretical before 2003 because of inter-agency strife. The creation of the PBF brought the CadÚnico into the limelight as the single information system on which basis decisions were made about who would and who would not receive PBF benefits. In conclusion, PBF today has a legal mandate and operational structure that allow better targeting and wider coverage than before. In 2003 the first coverage target was established: 11 million families.

Even following the 2003 unification, however, the minimum income system in Brazil is more than just the PBF. The *Benefício de Prestação Continuada* (Continuous Benefit, BPC), mandated by the *Lei Orgânica de Assistência Social* (Social Assistance Organic Law, Loas) is actually bigger in budgetary terms than the PBF. Although they have different eligibility criteria and information systems, are run by different agencies, and even use different

definitions of what a household is, they are both cash transfers targeted at the poor. The transfer amounts also differ widely. The BPC pays exactly one minimum wage, which is currently R\$510; this is more than twice the R\$200 maximum that any family can receive under the PBF. The argument for such a difference is that the PBF is an income complementation programme whereas the BPC is an income substitution programme for elderly or disabled individuals in poor families. Since the BPC is part of the minimum income system, it will also be analysed in this paper, but we will concentrate on how it compares and relates to the PBF.

The targeting and coverage of the PBF, of course, is the subject of this study. We will concentrate on the years for which we have information on the programme from household surveys; those years are 2004 and 2006. In September of these two years, the National Sample Household Survey (*Pesquisa Nacional por Amostra de Domicílios*, PNAD) included a supplement on cash transfer programmes that facilitates the analysis in which we are interested.

In 2004, the PBF was an expanding programme. Its coverage had not yet reached the initial 11 million family target, and every year more families were added to it. Administrative records show that this target was reached only in 2006. From 2006 to the beginning of 2009, the PBF remained at 11 million families, and new families were added only at the expense of others losing their benefits. Our hypothesis is that this expansion benefited both the programme's coverage and its targeting. It is to be expected that expansion would lead to better coverage among the eligible and worse targeting. This is why we investigate whether the PBF succeeded in including *only* the poor (according to the programme's definition) and whether it was successful in including *all* the poor.

### **Why Coverage Targets?**

The use of targeting mechanisms in social policy is justified on efficiency grounds: more resources are concentrated on the most needy (Coady et al., 2004). Hence targeting can be seen as a mechanism to heighten the impact on the poor, given that resources are limited. Targeting can also be justified independently of resource constraints if equality is seen as an end in itself (Soares et al., 2007). Finding and favouring those most in need, however, is not a minor process, and it has side effects on those in charge of the targeting and on the eligible and non-eligible populations. Programme managers face the administrative costs of investigating families to determine their income and behaviours, and also significant political costs because the inevitable errors will provide ready ammunition to the managers' political adversaries. For families, targeting may create some kind of stigma and the required behavioural changes may also entail costs (Coady et al., 2004).

As far as *Bolsa Família* is concerned, the most significant cost is most certainly administrative. Maintaining a registry with detailed household and family information on almost 20,000 families in a country as vast and diverse as Brazil is not an easy administrative task. The use of pre-existing municipal administrative structures, however, makes the undertaking much easier and much cheaper. In 2007, the PBF's administrative budget was R\$232 million, which is about 2.6 per cent of the programme's total budget. Since Brazil is a highly decentralised and federative country, beneficiary selection is a joint task of the federal and municipal governments. MDS provides municipal administrations with a standard registry form, loosely modelled on household survey questionnaires, to collect information on

households' demographic composition and income. If a family is eligible, in theory it should be given a *Bolsa Família* benefit; otherwise it simply remains registered in the CadÚnico, which is also used by other, smaller social programmes.

If a family receives a PBF benefit after municipal social workers have ascertained its need, it receives this benefit for two years. After two years, the family is once again visited by social workers, who check if its socioeconomic conditions have changed or remained the same. If these conditions have changed for the better, the benefit is cancelled; otherwise the family remains part of the programme for another two years.

Completing the information on the CadÚnico form is the responsibility of municipal employees, who then send the data either online or in hard copy to the Federal Bank (*Caixa Economica Federal*, CEF), which is in charge of payments. The CEF consolidates the data and turns it over to the ministry, which decides who is eligible. The list of beneficiaries is then turned over to the CEF, and the payments are made.

There is, however, one stumbling block to the smooth working of this machine. There are both national and municipal targets (limits), based on *ex-ante* poverty estimates. Since these estimates almost never coincide with the numbers received from the municipal authorities, many municipalities cannot find enough poor people to fill their quota, and in even more municipalities there are not enough benefits to go around. Lindert et al. (2007) argue that the municipal quotas are important to keep mayors from registering their populations indiscriminately. Quotas, by imposing limits, also impose costs, thus forcing mayors to select only the eligible. This argument, of course, presupposes that the poor or those acting for them are able to muster the necessary social control mechanisms at the local level. It is a very questionable assumption and there is no empirical evidence that this in fact happens.

The first municipal targets were based on the 2000 Demographic Census and the 2001 PNAD survey. The poverty line, of course, is the PBF eligibility line (R\$100, which was close to half the minimum wage in 2002) and family per capita income is calculated using the same methodology applied in the 2000 census. In 2006, the quotas were recalculated taking into account the improving income distribution as measured by the 2004 PNAD (Lindert et al., 2007). Note, however, that the PNAD survey allows for estimates of some precision only at the state level; individual municipalities cannot even be identified in the PNAD microdata. Needless to say, imputing poverty estimates for over 5,000 municipalities three or four or more years after their families' incomes were measured involves a lot of guesswork.

The municipal quotas are subject to negotiation. Benefits can be transferred from municipalities that cannot meet their quotas to those that exceed them. This transfer is neither automatic nor limitless, but there is some room for negotiation. What has been an iron number is the 11 million target or quota for the whole country. From 2006 to 2009, despite strong evidence of incomplete coverage, the number of benefits was not allowed to increase.

### **There Are Also No Quotas for Registration in the CadÚnico**

Who provides the information on which basis the benefit is granted varies by municipality. In some municipalities, the information is strictly self-declared. In others, social workers verify earnings directly. In still others, information on expenditures is used as verification. From the viewpoint of the federal government, however, all the information in the CadÚnico is considered self-declaratory. MDS performs some additional tests using pension and formal labour-market data. In other words, the PBF follows a verified, or at least partially verified, means test.

Some authors, such as Coady, Grosh and Hoddinott (2004) regard verified means testing as the gold standard in targeting methods. Still, the PBF is the only CCT in Latin America to provide benefits on the basis of self-declared information, spurring fears that its targeting might not be as good as those of other programmes that use indirect methods, such as composite indices, to choose beneficiaries. Despite their admiration for verified means testing, Coady, Grosh and Hoddinott state that in less developed countries, where informal income is more important, indirect methods may be better. Nevertheless, Soares et al. (2007) show that when PBF targeting is compared to that of other programmes, such as *Chile Solidario* or *Progresa*, it fares no worse. Soares et al. (2007), Hoffmann (2007), and Barros et al. (2007), among others, show that *Bolsa Família* is by far the most progressive income source in Brazil and 80 per cent of transfers go to the 23 per cent poorest individuals.

Soares, Ribas and Osório (2007) compare *Bolsa Família* results with those found by Coady, Grosh and Hoddinott (2004), and show that the PBF is among the 10 best targeted of the 122 programmes analysed. Barros et al. (2008) show that 40 per cent of PBF targeting performance is explained by registration in the CadÚnico alone, and only another 4 per cent is explained by the targeting process that occurs after that step. In other words, most of the PBF's performance is essentially self-selection by those who sign up for it. There are two possible explanations for this: municipal social workers are very effective at identifying and discouraging non-eligible families from signing up; or non-eligible families are simply not interested.

### **3 HOW BIG IS BOLSA FAMÍLIA?**

If the PBF is judged according to the volume of resources at its disposal, then it is a relatively modest programme. In 2006, PBF transfers accounted for a mere 0.69 per cent of household income as measured by household surveys, and an even less impressive 0.35 per cent of GDP. The other big targeted transfer programme, the BPC, was also modest at 0.53 per cent of household income and 0.41 per cent of GDP. The fact that the BPC is larger than the PBF (according to official financial data) and smaller than it (according to household surveys) is a result of under-reporting in household surveys. The BPC has some characteristics of a pension and many individuals report BPC income as pension income in household surveys.

In any case, when compared to the 7 per cent of GDP spent by social security or the 2.3 per cent accounted for by the pensions of federal employees, the 0.76 per cent transferred jointly by the PBF and BPC seems quite small. Table 1 shows that, as a proportion of household income, the BPC grew by 0.24 percentage points between 2004 and 2006; the PBF grew by 0.20 points in the same period. In terms of share of GDP, growth was 0.12 for BPC and 0.05 for PBF. In conclusion, although together they approach 1 per cent of GDP, the BPC and PBF are relatively lightweight budget items.

A second criterion to judge the size of a programme is its coverage, or how many families and individuals are receiving benefits. Household survey and administrative records do not agree either for the PBF or BPC. In the case of the BPC the reason is quite clear: many beneficiaries declare it as a pension and not as welfare. The reason for the discrepancies in the PBF count is different. In September 2006, the expansion process was in its final stage; there were 1.5 million benefit cards in the mail; their owners had not yet received them and thus had not yet been paid. The discrepancy between the household survey and administrative records may have arisen because many cards were in the mail or with social workers still looking for the families.



Other minor factors may also have contributed, such as benefits given to indigenous peoples, landless peasants, *quilombolas*, those freed from slave labour or other specific groups who, because of geographical concentration, are not adequately covered by sample surveys.

Whatever the data source, if the criterion for size is the number of people or families covered, then PBF and BPC are quite large. Almost a quarter of the Brazilian population (47.4 million people) were in the 10.2 million families receiving a PBF benefit. The only social policies with wider coverage are the universal health system (SUS), which theoretically covers all Brazilians; public education, with 52.8 million students enrolled in all levels; and social security with its 21.2 million benefits. Note that these are universal policies that comprise the backbone of Brazilian social policy.

TABLE 1

**Size of *Bolsa Família* and *Benefício de Prestação Continuada***

<b><i>Bolsa Família</i></b>			
Criterion	2004	2006	Change
Number of families (CadÚnico) (millions)	9.0	11.1	2.1
Number of families (PNAD) (millions)	6.3	9.0	2.7
Percentage of families in Brazil (PNAD)	12.5	16.8	4.3 p.p.
Number of people (PNAD) (millions)	31.7	42.7	10.9
Percentage of Brazilian population (PNAD)	17.9	23.4	5.4 p.p.
Percentage of total family income (PNAD)	0.49	0.69	0.20 p.p.
Percentage of GDP (SIAFI/SIDOR)	0.30	0.35	0.05 p.p.
<b><i>Benefício de Prestação Continuada</i></b>			
Criterion	2004	2006	Change
Number of families (CadÚnico) (millions)	2.0	2.4	0.5
Number of families (PNAD) (millions)	0.7	1.2	0.5
Percentage of families in Brazil (PNAD)	1.5	2.2	0.8 p.p.
Number of people (PNAD) (millions)	3.1	4.7	1.6
Percentage of Brazilian population (PNAD)	1.8	2.6	0.8 p.p.
Percentage of total family income (PNAD)	0.28	0.53	0.24 p.p.
Percentage of GDP (SIAFI/SIDOR)	0.30	0.41	0.12 p.p.

Sources: CadÚnico, Social Security Ministry (*Ministério da Previdência e Assistência Social*, MPAS), 2004 and 2006 PNADs; Castro et al. (2008); and Diretoria de Estudos Sociais (Disoc) of IPEA.

Despite these numbers, many eligible families are still not covered by the PBF. Before going into these numbers, we will judge *Bolsa Família* and the BPC by yet another yardstick: their impacts on the income distribution from 2004 to 2006.

Estimates of the contribution of the BPC and PBF to the reduction of inequality in Brazil are nothing new. Soares et al. (2006), Soares et al. (2007), Hoffmann (2007) and Barros et al. (2007) have all produced estimates of the surprisingly high inequality impacts of the BPC and PBF. In this section we update these estimates.

A good means of estimating how much an income source contributes to inequality and/or its reduction is to use concentration curves and the numbers that characterise them, concentration coefficients. How does one calculate a concentration curve?

- order the population by total income, including the transfers whose concentration coefficient we wish to know;
- on the vertical axis, accumulate the population (ordered by income) up to a given percentile;
- on the horizontal axis, accumulate the resources transferred to that same population;
- the resulting figure is the concentration curve;
- the concentration coefficient is twice area between the concentration curve and the line of perfect equality joining the points (0.0) and (1.1). The concentration coefficient of all income sources is also known as the Gini coefficient.

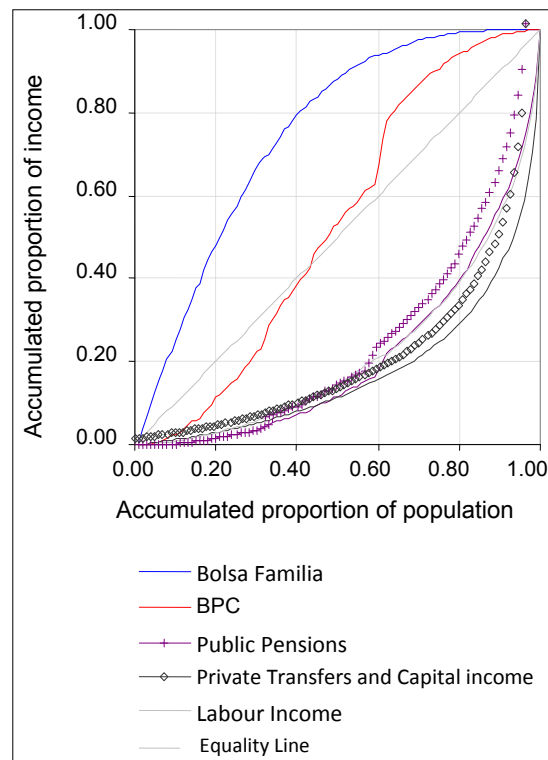
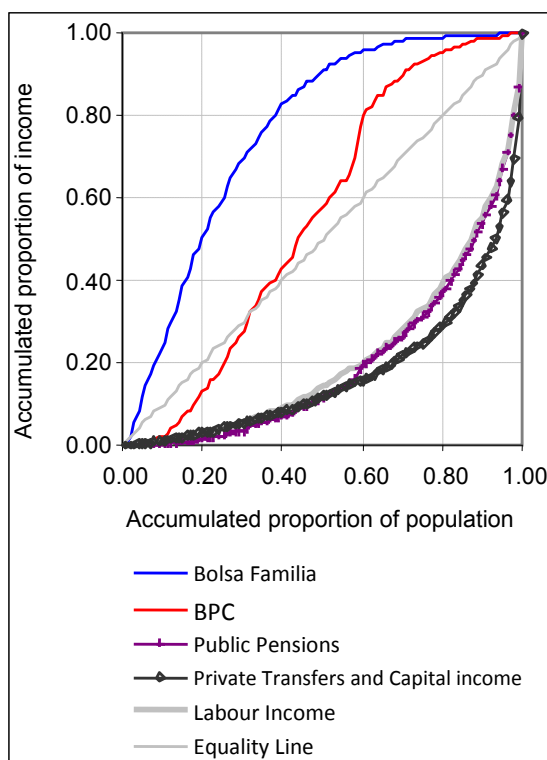
Figure 1 shows that in both 2004 and 2006, the concentration curve of the BPC is always below that of the PBF. This means that the PBF transfer is mathematically and unequivocally more progressive than that of BPC. The reason is that the BPC transfer is much larger than the PBF one. It is so much bigger that it takes most of its beneficiaries and places them relatively high on the income distribution. This is quite apparent in Figure 1. There is a sharp increase in the BPC concentration curves at centile 59 in 2004 and centile 61 in 2006. These centiles correspond to the household incomes of R\$260 and R\$350 for 2004 and 2006, respectively, which are exactly the values of the minimum wage for these two years. The increase corresponds to handicapped and elderly people living alone, and whose only income source is the BPC itself.

FIGURE 1

**Concentration Curves in 2004 and 2006**

Panel 1: 2004

Panel 2: 2006



Source: 2004 and 2006 PNADs.

Calculating the contribution of transfers to the reduction of inequality is relatively simple. In mathematical terms:

$$G = \sum_k c_k \mu_k$$

where  $G$  is the Gini coefficient,  $c_k$  represents the concentration coefficient of income source  $k$  and  $\mu_k$  is the participation of income source  $k$  in total income.

Table 2 shows that while labour earnings and pension income became less concentrated between 2004 and 2006, targeted cash transfers lost some of their progressivity. At the same time, these transfers increased their share of total income by 56 per cent, albeit from a very low baseline.

TABLE 2

**Relative Size and Concentration Coefficients of Income Sources**

	2004	2006	(p.p.)
Gini (per capita household income)	0.569	0.560	-0.010
<b>Income component</b>			
Concentration coefficients			
Labour income	0.567	0.563	-0.004
Public pensions	0.598	0.578	0.039
Capital income and private transfers	0.649	0.654	-0.013
Targeted social transfers	-0.373	-0.307	0.058
BPC	-0.111	-0.054	0.002
Bolsa Família	-0.524	-0.498	0.002
<b>Weight in total income</b>			
Labour income	76.5%	76.0%	-0.0047
Public pensions	18.0%	17.9%	-0.0012
Capital income and private transfers	4.8%	4.9%	0.0015
Targeted social transfers	0.78%	1.22%	0.0044
BPC	0.28%	0.53%	0.0024
Bolsa Família	0.49%	0.69%	0.0020

Source: 2004 and 2006 PNADs.

TABLE 3

**Decomposition of Inequality Change Between 2004 and 2006**

Income component	Concentration effect	Relative size effect	Total effect
Labour income	-0.0003	-0.3069	-0.3072
Public pensions	-0.0029	-0.3536	-0.3565
Capital income and private transfers	0.0133	0.0241	0.0374
Targeted social transfers	-0.4003	0.0659	-0.3343
BPC	-0.1560	0.0233	-0.1327
Bolsa Família	-0.2167	0.0150	-0.2017
Total	-0.3626	-0.5980	-0.9606

Source: 2004 and 2006 PNADs.

The most important and surprising finding in Table 3 is that targeted social transfers accounted for third of the fall in inequality over the two years. This is surprising, because they account for less than 1 per cent of total income. The PBF alone was responsible for a fifth of the reduction. Labour and pension income contributed about a third each, but they account for three-quarters and 18 per cent, respectively, of total household income. This high efficiency against inequality of the BPC and PBF is due to the high progressivity of their benefits, which in turn is a function of their excellent targeting mechanisms.

#### 4 HOW GOOD IS *BOLSA FAMÍLIA* TARGETING?

There are various standard tools for evaluating the targeting of income transfers. One, whose advantage is that it is sensitive to changes along the entire income distribution, is the incidence curve and the number that characterises it, the incidence coefficient. They are calculated in the same manner as their analogues, the concentration curve and coefficient, but with one important difference: individuals and their incomes are ordered according to their income net of the transfer whose incidence is being evaluated. The eligibility criterion for targeted social transfers is household income without the transfer itself. If it were not, there would be a contradiction between the criterion and the benefit.

To calculate incomes net of targeted social transfers using the PNAD surveys we used the identification technique pioneered in Soares et al. (2006). It consists of using the information from the supplemental questionnaire on income transfers to extricate transfer income from the "other income" category in which it is buried.

Incidence and concentration analysis are complementary. While the incidence curve shows the distributive impact of the first *real* transferred, the concentration curve shows the distributive impact of the last *real* transferred. When the question being answered is on the performance of an executing agency in reaching those in direst need, the correct approach is the incidence curve. When the question is on which programme should have its budget increased, the correct approach is the concentration curve.

Figure 2 shows that there was a small deterioration in the targeting of both the BPC and PBF from 2004 to 2006. If decreasing returns apply to social-transfer targeting, then this is no surprise, since both their budgets and coverage became much larger over the two-year period. This means that the modest fall in the incidence coefficient is not a negative result in itself. If the PBF incidence coefficient (-0.568) in 2006 is compared to its analogues in Mexico (Oportunidades: -0.56) or Chile (Chile Solidario: -0.57), it does not fare badly.

Another way of evaluating the targeting performance is the hit/miss ratio, which is the proportion of families or individuals receiving a transfer who are or are not eligible for it. Table 4 shows that in 2004 and 2006, respectively, 42.5 per cent and 49.2 per cent of families receiving *Bolsa Familia* benefits had incomes above the eligibility cutoff at the time. In 2004, the cutoff was either R\$50 for families without children or R\$100 for families with children, but in 2006 the cutoff lines were R\$60 and R\$120. This means that almost half of PBF families did not meet the programme criteria.

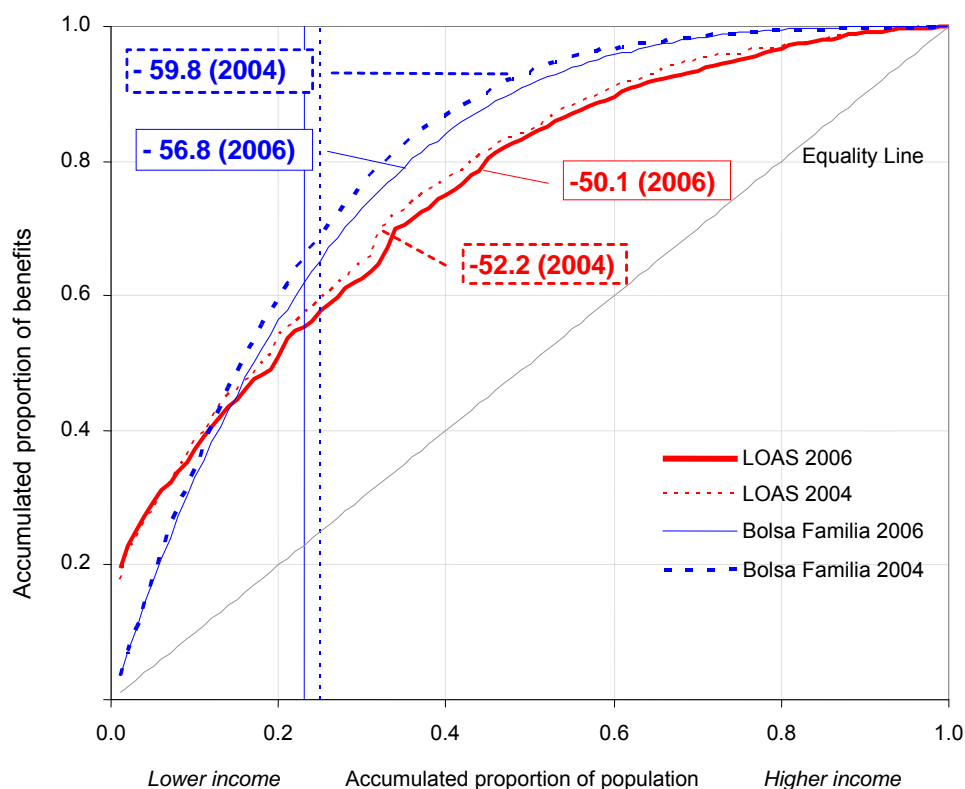
Half? This is quite a high number whose inconsistency with the excellent incidence coefficients needs explanation. Actually, the whole number needs explanation. A hit/miss ratio of half appears quite bad for *any* programme, not only one whose claims to excellent targeting have just been made.

The two most common explanations for this elevated targeting error are fraud or mistakes committed by municipal social workers. Fraud undoubtedly exists. Elected politicians, their families and friends have been found on *Bolsa Família* payrolls. Nevertheless, despite exhaustive investigation by both the National Audit Office and the media, the cases of fraud number in the few hundreds, which is completely insignificant when compared to 11 million benefits. Even if for every case of fraud discovered another ten go unnoticed, it is still not a relevant explanation for targeting errors in *Bolsa Família*.

Honest and semi-honest mistakes are probably more relevant. First of all, there are completely unbiased and honest mistakes: reading a 7 as a 1 or a 9 as a 0, transposing the wrong column from the paper to the computer. The result is to add a random error that may explain some of the targeting error.

There are also semi-honest mistakes. Potential beneficiaries have a very clear incentive to revise their incomes downwards on the CadÚnico form, but there is no such incentive for the anonymous information gathered by household surveys. Furthermore, social workers may identify a family as poor even if it formally does not meet the criteria, and they may fudge information one way or the other. For example, an agricultural family may be in the middle of harvest time when interviewed, and thus their income exceeds the PBF limit, but the social worker knows that in another three months they will be penniless. The social worker will then revise their income downwards so as to make sure they have some income in the coming tough months, thereby improving the real targeting of the PBF.

FIGURE 2

**BPS and PBF Incidence Curves in 2004 and 2006**

Source: 2004 and 2006 PNADs.

TABLE 4

**Bolsa Família Targeting**

2004	People			Families		
	Non-eligible	Eligible	Total	Non-eligible	Eligible	Total
Among all						
PBF non-beneficiary	70.1	12.0	82.1	77.9	9.6	87.5
PBF beneficiary	7.0	11.0	17.9	5.3	7.2	12.5
Total	77.0	23.0	100.0	83.2	16.8	100.0
Among only beneficiaries	38.8	61.2	100.0	42.5	57.5	100.0
2006	People			Families		
	Non-eligible	Eligible	Total	Non-eligible	Eligible	Total
Among all						
PBF non-beneficiary	68.6	8.0	76.6	76.6	6.6	83.2
PBF beneficiary	10.5	12.8	23.4	8.3	8.5	16.8
Total	79.2	20.8	100.0	84.9	15.1	100.0
Among only beneficiaries	45.1	54.9	100.0	49.2	50.8	100.0

Source: 2004 and 2006 PNADs.

As opposed to explicit fraud, it is very hard to quantify the prevalence of honest and semi-honest recording mistakes. Only a sample survey specially designed with re-interview procedures would allow for that.

Finally, there is a third reason, one that is hard to separate from recording error: income volatility. By income volatility we mean uncertainty with relation to income. The PNAD enquires about income for a given month (September) of a given year and is not necessarily a good reflection of the socioeconomic situation of that family over a longer period. It may well be that many families, while observed as non-poor by the PNAD, were in reality highly vulnerable to poverty and thus eligible for PBF benefits.

## 5 INCOME VOLATILITY AND TARGETING

The Brazilian literature does not include many estimates of income volatility, but there are a few. Barros, Mendonça and Neri (1995) estimate that between 1982 and 1992, 15 per cent of the population crossed the poverty line in one direction or another. Their work suffers from some limitations: it is only valid for six metropolitan regions and ignores non-labour income. They use the Monthly Employment Survey (*Pesquisa Mensal de Emprego*, PME), which contains a panel allowing direct measurement of income volatility, but only covers the six largest metropolitan regions and only contains information about labour incomes. They deserve credit, however, for pointing out that poor people not only have limited access to income but that the little access they do have is highly uncertain.

Ribas and Machado (2007) use pseudo-cohorts from the PNAD survey to estimate the percentage of the poor that often cross the poverty line as a result of idiosyncratic income changes. They conclude that between 1993 and 2003, about 27 per cent of the urban poor were temporarily poor. Ribas (2007) goes further, showing that the share of this transitory poverty in total poverty has been increasing over time. Finally, Ribas and Machado (2008) estimate poverty entry and exit rates in the same metropolitan regions as Barros, Mendonça

and Neri (1995). They also use the PME database but they innovate by imputing non-labour income as well. They find extremely high income volatility among the poor. In 2005, 31 per cent of the poor were no longer poor a month later, and 50 per cent had left poverty a year later. Some 12 per cent of the population crossed the poverty line in one direction or another from one month to the next. Over the period of one year, 15 per cent did so.

If the poverty rate is defined as people who were poor in one of two consecutive months, the rate is six percentage points or a third higher than the poverty rate defined as individuals who are poor in any given month. The same comparison, defining poverty as those who are poor in one of two months one year apart, yields a poverty rate that is 40 per cent greater than the single-month poverty rate.

Finally, the poverty return rate is also high. In 2005, 46 per cent of those who left poverty in a given month were back in poverty in the next one. Another 14 per cent returned to poverty two months after leaving it. Half of those who entered poverty were out of it the following month. The very clear conclusion is that poverty is neither static nor limited to a single episode. People at risk of becoming poor are constantly crossing the poverty line in both directions.

Ribas (2007), however, does not use *Bolsa Familia* poverty lines but rather his own, relative lines. But it is not hard to replicate his methodology using the PBF cutoff lines. The methodology is not difficult and involves imputing incomes into the PME survey using the PNAD survey to find the coefficients.

1. We look for all variables that are common to the PME and PNAD. It is important that they not only have the same name but be asked in the same way, since we know that how you ask a question will influence the answers you get. There are quite a few, since the household composition, education and labour market participation questionnaires are quite similar in the two surveys.
2. Using, in the national-coverage PNAD survey, only the six metropolitan areas also covered in the PME, four equations are estimated:
  - a. a probit to find the covariates of the probability of receiving pensions;
  - b. least squares to find the value of pensions, for those who receive them;
  - c. a probit to find the probability of receiving other income;
  - d. least squares to find the value of this other income, for those who receive it.
3. Using the coefficients estimated above, the four variables are imputed in the PME.
4. Every imputation requires a residual. For lack of a better option, a random residual was used for all individuals.

The resulting non-labour incomes are pooled to produce per capita household income, now complete with pensions and other income.

The random residual is kept constant for each individual throughout the four PME interviews. This means that imputed income will change only if an observed variable changes its value.

Figure 3 shows the coefficient of variation (average/standard deviation) of each individual's per capita income. Both the average and the standard deviation are defined over the four interviews in the PME panel. If all members of the household keep their income during these four months, then the coefficient of variation is zero.

Figure 3 shows clearly that the coefficient of variation for household income falls as income increases. In other words, the poor suffer much more income volatility than the rich. The explanatory power is not high, showing that various other factors are relevant predictors of volatility.

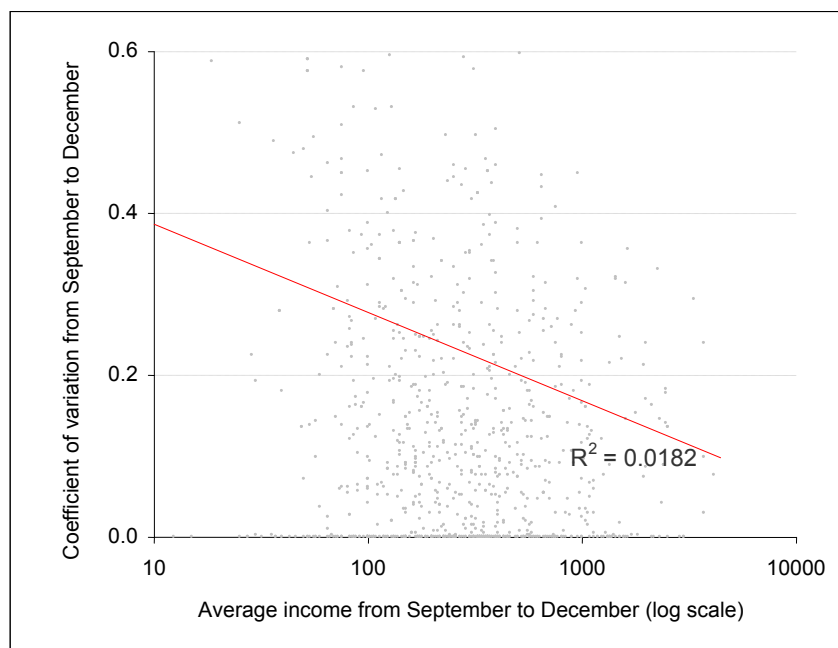
More importantly, the procedure above allows us to define households as eligible or not eligible for *Bolsa Familia*, albeit with one important limitation. The criteria for eligibility involve income net of PBF income, but our imputation method does not allow the identification of PBF income. This is, however, a small limitation since the object of the exercise is not to estimate the number of eligible individuals but rather the volatility of their incomes.

Once individual incomes are determined, we defined as poor the individuals who live in households whose per capita incomes fall below R\$100 up to 2005 and R\$120 from 2006 onwards. These are of course, the income criteria for PBF benefits for families with children.

Beginning in September of each year after the creation of the PBF (2004 to 2007), we followed three PME rotational groups, entering in August, September and October, for the four months that make up the panel.

FIGURE 3

**Coefficient of Variation of Income as a Function of Average Income**



Source: PME.



Figure 4 shows the rotation scheme for 2007. Group K7, for example, entered in August and was interviewed for the second time in September, but we consider this second interview as an October interview. This is because it is part of the three rotational groups whose entry is centred in September (the month of the PNAD interview). In Figure 4, October is shown by a black border and December by a double red border. In other words, for the four months beginning in September of each year, we followed a moving average of three rotational groups. We used three groups to increase the sample.

FIGURE 4

**Rotational Scheme**

Month	Rotational group		
August	K7		
September	K7	K8	
October	K7	K8	L1
November	K7	K8	L1
December		K8	L1
January			L1

Do not worry if the above discussion seems complicated. It is not necessary to understand the details of how each cohort was assembled in order to understand the results below.

For each month, we defined two poverty measures: transversal and longitudinal. Transversal poverty is the poverty measure we are used to: the percentage of people whose per capita household income fell beneath the PBF poverty (eligibility) line in a given month. Longitudinal poverty is the proportion of people whose per capita household incomes fell below the same line during any of the  $n$  months following September, when the panel we assembled begins. Thus, for September, the two measures coincide, but for December, the longitudinal measure is made up of individuals who were poor in any one of the four months between September and December.

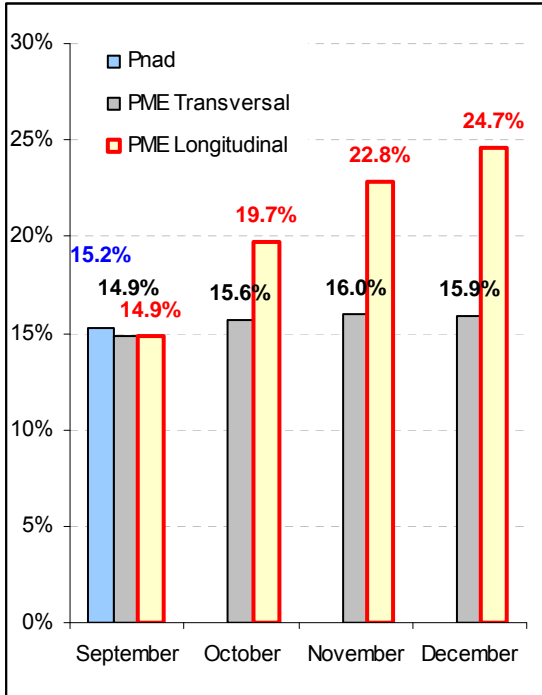
The results are shown in Figure 5. For all years shown, the longitudinal poverty rate in December is substantially higher than the transversal rate. For example, in December 2004 the transversal rate is 15.9 per cent but the longitudinal rate is 24.7 per cent, about two-thirds higher. By definition, longitudinal poverty is higher than transversal poverty. The surprise is that it is so much higher.

The second result is that the month-to-month increase in longitudinal poverty compared to transversal poverty is declining. In 2007, for example, there is an increase of 3.6 points from September to October, 1.8 points from October to November, and 1.2 points from November to December. These decreasing marginal increments are to be expected. As time passes, households at risk of falling into poverty will have already spent at least one month in poverty.

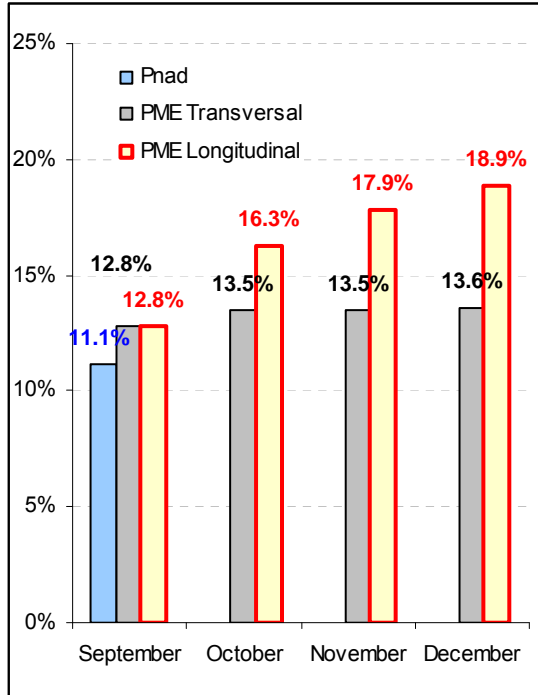
FIGURE 5

**Longitudinal and Transversal Poverty**

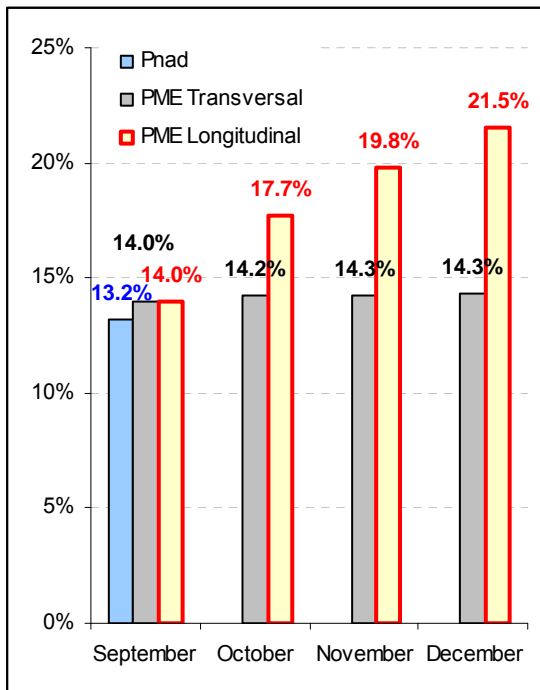
Panel 1: 2004



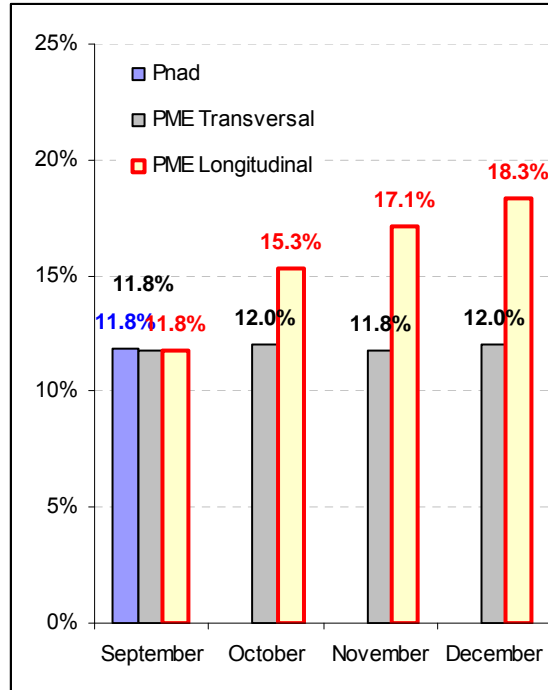
Panel 2: 2005



Panel 3: 2006



Panel 4: 2007



Source: PME.

Can these estimates be generalised to the country as a whole? Probably not. Alas, there is no longitudinal survey in Brazil for non-metropolitan areas, but we believe that volatility will probably be higher in rural areas and lower in medium-sized cities. What is undoubtedly true is that the poor face much uncertainty about tomorrow's income.

Are these estimates biased? Two effects lead to a negative bias. The first is that only families whose demographic composition remained intact throughout the four months are used. Since demographic changes in a household are an important source of income volatility, these almost certainly make up a less volatile sub-sample.

The second effect is that the same random residuals drawn for the first month are kept throughout the remaining three in imputing non-labour income. This is the same as supposing that nothing that is non-observable changes during the four-month period. While it is probably a better procedure than redrawing new residuals each month, it makes for another downward bias.

Notwithstanding these downward bias sources, there is an important source of upward bias: measurement error. If individuals do not know exactly what their income is (which is likely when dealing with the urban self-employed), there may be considerable measurement error of labour incomes. A street vendor not only takes home different incomes each month, but also probably knows with precision yesterday's take but not last month's. This increases the volatility of observed incomes but not that of real incomes.

Thus there are two sources of negative bias and one of positive bias. What is the net bias? It is impossible to know with certainty, but it is likely to be positive. We have no solid empirical evidence of this, but we believe that the income volatility of the poor is slightly less than our estimates suggest, but still quite significant.

What is the meaning of this for *Bolsa Família*? As we explained above, the PBF coverage targets were calculated using a survey in cross-section, the PNAD. But PBF benefit rules are not cross-sectional. Eligible families receive their benefits when eligible and keep them for two years, whereupon the socioeconomic condition of the family is once again evaluated. This means that the PBF poverty definition is a two-year longitudinal definition.

Longitudinal definition and cross-section targets: the two will never match. The number of people in need will always be greater than the targets. This is, in fact, what happens.

## 6 CROSS-SECTIONAL COVERAGE

We have shown thus far that: (i) PBF benefits are highly progressive; (ii) this progressivity leads to strong inequality-reducing effects; and (iii) incoherent definitions of poverty lead to the impression that there are targeting problems. But do these problems really exist? We can go beyond hit/miss ratios and look at where on the income distribution the PBF beneficiaries and non-beneficiaries are located.

Table 4 shows that 57 per cent of families that should be receiving a PBF benefit, according to the PNAD, were not on the payroll in 2004. More than half of the families whose per capita incomes were less than R\$50 for the childless or less than R\$100 for families with children were not covered by the programme. These numbers are not particularly serious,

because in 2004 the PBF was still a programme in expansion. However, with the expansion essentially over by September 2006, the programme was still not covering 44 per cent of eligible families.

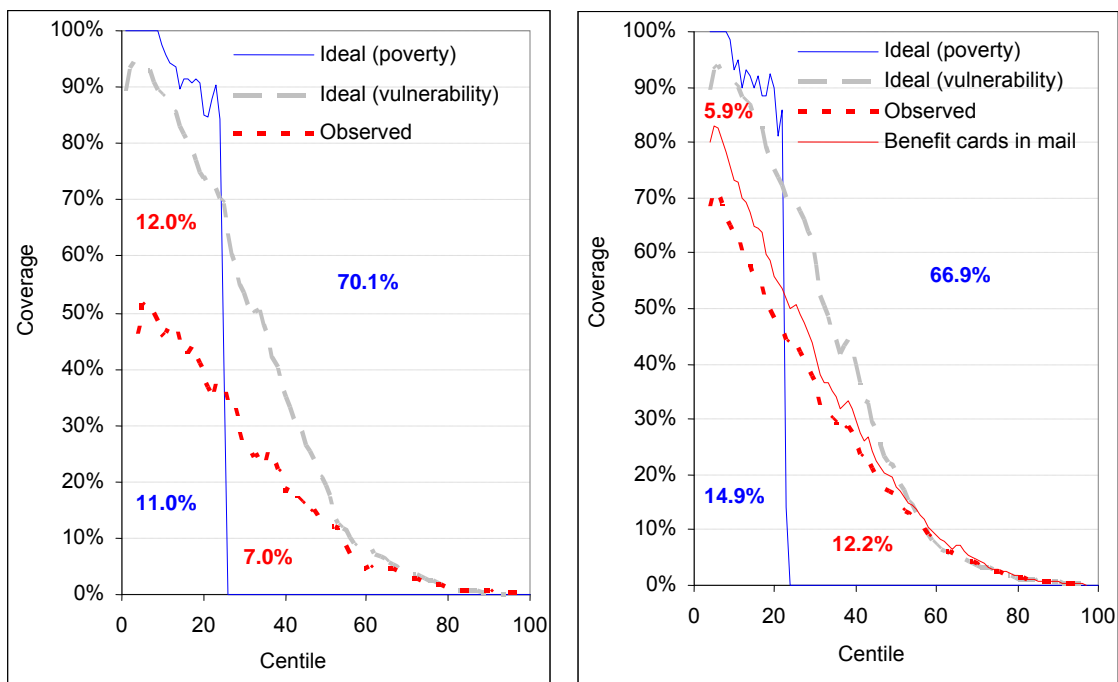
Figure 6 shows PBF coverage by income centile in 2004 and 2006. The solid blue line represents the percentage of individuals in each centile that are eligible for PBF transfers, according to PNAD data. They are all those with per capita incomes below R\$60 (R\$50 in 2004) and all those with per capita incomes below R\$120 (R\$100 in 2004) with children under 15. It is noteworthy that almost 90 per cent of the poorest households have children under 15. The dotted red line represents the actual PBF coverage by income centile. Due to sampling noise, the PBF coverage is calculated using a seven-centile moving average. The gap between the two lines is a centile-by-centile measure of under-coverage according to the legal PBF definition.

FIGURE 6

**PBF Cross-Sectional (Transversal) Coverage by Income Centile**

Panel 1: 2004

Panel 2: 2006



Source: 2004 and 2006 PNADs.

The blue numbers in Panel 1 show the percentage of the population that are targeting hits: either those that should not be receiving PBF benefits and are not in fact receiving them; or those that should be beneficiaries and in fact are. The red numbers show the misses: those that should receive but do not; and those that should not receive but do. These are cross-sectional definitions that do not take into account income volatility.

If we correct for the 1.5 million PBF cards in the mail in September 2006, it is possible to draw another beneficiary line. We cannot know in a sample survey whose cards were still in the mail, but we can suppose that the new cards conformed to the same income distribution as the previous benefits. If we distribute the 1.5 million cards according to the observed benefit distribution in 2006, the result is a new PBF benefit line. The blue and red numbers are

analogous to those for 2004, but are calculated using this new benefit line. Exclusion error, for example, falls from 12 per cent of the Brazilian population in 2004 to 6 per cent in 2006. Under-coverage in the poorest decile falls from 3.5 million to 2 million people, and in the second decile it falls from 9.6 to 4 million people.

Finally, we can count how many families are between the different lines of Panel 2 of Figure 6. Between the blue and red lines we have about 9.7 million people in 2 million households. This is an estimate of PBF under-coverage, but we know that, because of income volatility, it is not possible to achieve universal coverage of this population without (cross-sectional) leaks. Only a national longitudinal survey will allow us to measure the true leakage.

Before estimating how many people need to be included in the PBF to achieve universal coverage among the target population, we must look at the programme's marginal targeting. This can be done by looking at its expansion between 2004 and 2006.

## 7 BOLSA FAMÍLIA'S MARGINAL TARGETING

If we suppose that PBF's average and marginal targeting are the same, then we can conclude from the numbers in Figure 6 that 16 million beneficiaries would be enough to cover all poor families. The problem is that it is not at all clear that average and marginal targeting are the same. In general they will not be the same, since it is quite easy to find the first poor person in a country but quite difficult to find the last one. The bigger the dart, the harder it is to hit the target. This means that the important number is not the average distribution of benefits or the average hit/miss ratio of the 11 million beneficiary families, but rather the marginal distribution of benefits or the marginal hit/miss ratio. The price to be paid in terms of unwarranted inclusion for zero unwarranted exclusion must be calculated in marginal terms.

TABLE 5

### **PBF Marginal Targeting Estimate**

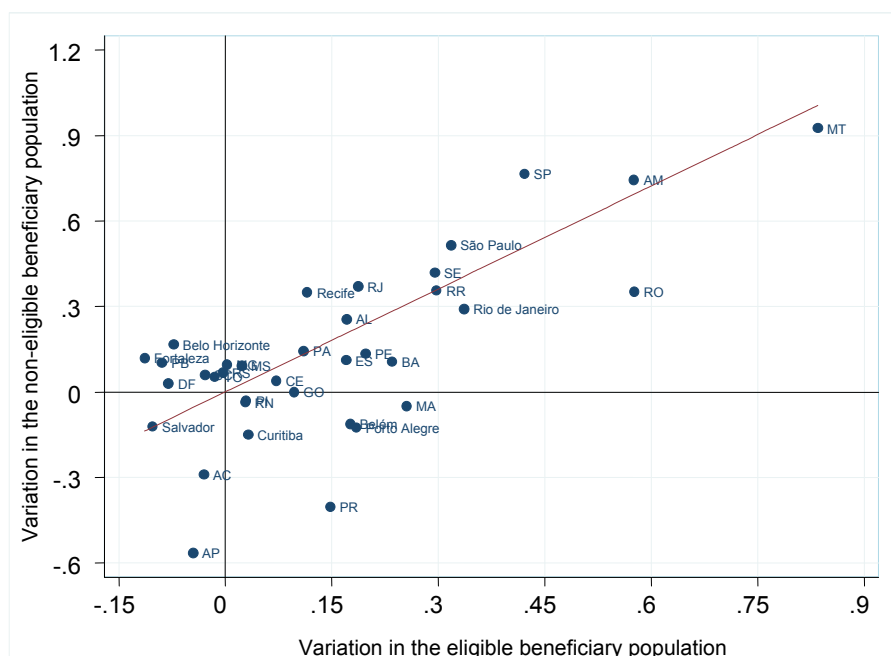
Elasticity	1.2003
Standard error	0.1937
Prob. = 0	0.000
Prob. = 1	0.309
$R^2$	0.5270
N	36

Source: 2004 and 2006 PNADs.

Estimates of this marginal targeting can be obtained using the programme's expansion from 2004 to 2006. These are years in which there are CCT supplements in the PNAD questionnaire, and there was a considerable expansion in coverage between them. One method of obtaining a rough estimate is to use aggregated data by state and metropolitan area. Brazil has 26 states, nine major metropolitan areas and the Federal District, amounting to 36 distinct geographical areas all of which allow significant estimates of coverage in the PNAD sample. We have, for each of these areas, two observations: 2004 and 2006. This means that we can use differences-in-differences with a log-linear regression adjustment on observed variables. The dependent variable is the variation in the number of (cross-sectional) non-eligible households receiving PBF benefits. We also used R\$60 and R\$120 poverty lines to eliminate variation due to changes in

eligibility criteria. The explanatory variable is the change in PBF coverage, using initial coverage as a control variable. The results are presented in Table 5.

FIGURE 7

**PBF Marginal Targeting Estimate**

Source: 2004 and 2006 PNADs.

The elasticity is basically 1 (1.2 with standard error of 0.2), which means that for every household included another, apparently non-eligible household, must also be included. This also means that average and marginal coverage are the same. Finally, it also means that the PBF must pay about 19 million benefits to achieve universal coverage among the poor.

The horizontal axis in Figure 7 shows the change in PBF coverage from 2004 to 2006, the vertical axis shows the price paid: the change in non-eligible beneficiaries. States and metropolitan areas that fall below the regression line are more efficient than average, since they managed to increase eligible coverage more than non-eligible coverage. Those above the line are the states and metropolitan areas where coverage among the non-eligible increased more than among the eligible. The slope of the regression line (close to 1) is the average elasticity for the country as a whole.

Using the above results to estimate the coverage necessary to leave no poor family behind, the number is 19 million. This obviously requires a radical review of both the national and municipal targets for the PBF. Perhaps a specific investigation of those states and metropolitan areas that were exceptionally efficient in increasing their coverage may yield some lessons for the others and somewhat improve the targeting, but it is unlikely that large gains will be made. This is because most of the coverage price to be paid is just a function of the income volatility of the poor.

## 8 CONCLUSION

The *Bolsa Família* programme is by far the most important piece of the Zero Hunger initiative, whose goal is that no Brazilian will pass the day not knowing from where his or her next meal will come. This means that a reliable income source must exist for the poorest Brazilians so they are able to buy food for themselves and their children. But estimating at 11 million the number of poor/eligible families/households ignores the fact that the population that is vulnerable to poverty because of uncertainty about future incomes is much larger than the poor, as defined by a cross-sectional definition of poverty.

The fact that PBF designers and managers (and just about everyone else, to be fair) ignored this elementary issue has led to a queue of 2 million families who were eligible for benefits but were not receiving them. This queue lasted from 2006 to 2009, when the financial crisis provided a political excuse to increase the PBF target above the initial 11 million. How many children went hungry because of this error in design is anyone's guess. We will never know how many children had their futures compromised or even died. The political and moral imperatives that led to Zero Hunger are at odds with the implementation of *Bolsa Família* coverage targets. These imperatives are clear: it is perfectly acceptable to allow a family whose income, temporarily, is slightly above R\$120 to receive its meagre benefits, but it is completely unacceptable to allow even one life to be extinguished or one future ruined because someone made a conceptual error in defining programme quotas. A family whose income is R\$150 may be highly vulnerable to poverty.

Today the 11 million limit has thankfully been exploded and no other self-imposed folly has taken its place. The ministry increased PBF quotas in 2009 and 2010, and no one appears even to have noticed. Today the quota is at 13 million and, because of improvements in the labour market, this is probably close to what is needed for full coverage.

An important result is that PBF marginal and average targeting efficiency are the same. This is consistent with an interpretation that the targeting problems stem from the wrong measurement of poverty and not from targeting problems *per se*. After all, if the PBF has the lowest coefficient of concentration on record, its targeting cannot be so bad.

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