Estimating a Poverty Line for Brazil Based on the 2017/18 Household Budget Survey

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Abstract

This study applies the cost-of-basic-needs approach to estimate food and total poverty lines for the Brazilian case. Using detailed data on expenditures from a 2017/18 household budget survey and caloric information from the Brazilian Table of Food Composition, calorie intake is assigned to more than 1,400 items to estimate the cost per calorie for a representative group of the population. The preferred results estimate the value of the food poverty line at R$258 (in 2018 urban Southeast prices), and the lower total poverty line (covering also nonfood necessities) at R$455. Robustness checks show that varying the assumptions leads to qualitatively similar results. The findings are also close in value to lines found in earlier studies and the societal poverty line. Finally, this work provides a data-driven validation of the income threshold used to determine eligibility for Brazil's social registry.

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1. Introduction

Poverty is usually defined as the insufficiency of resources to ensure the basic conditions of subsistence and well-being of individuals in a society. Given its broad importance for policy, monitoring poverty has become a well-established practice around the globe, with the headcount ratio (Foster et al., 1984) being the leading measure for the state of poverty in a country. The measure estimates the share of a population that lives below a monetary threshold deemed to be sufficient to cover the minimum needs of the population – also known as the poverty line.

Despite high levels of inequality and food insecurity (Hoffman, 2021), Brazil has not adopted an official poverty measurement methodology and thus does not have an official poverty line. To identify and track poverty, many researchers rely instead on several administrative lines used to determine eligibility for social assistance programs, such as the eligibility thresholds for the Bolsa Familia Program (Programa Bolsa Família; PBF) and the Cadastro Único eligibility threshold.[1] In addition, Brazil's national statistical institute, the Instituto Brasileiro de Geografia e Estatística (IBGE), uses the World Bank international poverty lines (US$1.90, US$5.50) in their synthesis report of social indicators (IBGE, 2020).

The use of administrative and international poverty lines, however, is not ideal for monitoring national poverty. While the former may not adequately capture the cost of meeting basic needs, the latter are "reference points" based on poverty line values of comparable countries. The international poverty lines, fixed at US$3.20 and US$5.50 per day (in 2011 purchasing power parity dollars), reflect only typical national poverty thresholds in middle-income countries (World Bank, 2018).

This study contributes to the body of literature aiming to define a poverty line for the Brazilian case. With the exceptions of World Bank (2007) and Rodrigues et al. (2018), in which national poverty line estimates were estimated, most studies have focused on using caloric insufficiency to construct regional poverty lines for Brazil (Rocha, 2000; Barros and Feres, 2003; Ferreira, Lanjouw and Neri, 2003; Silveira et al., 2007). All of them use data that is over a decade old. To the best of our knowledge, this study is the first attempt to estimate a poverty line for Brazil based on the most recent data (2017/18) and applying the well-established cost-of-basic-needs approach (Ravallion, 1998).

Our preferred specification results in a food poverty line of R$258 (in 2018 Southeast urban prices) per person per month.[2] This would be enough to cover basic nutritional requirements. The (lower) total poverty line – which accounts for other nonfood necessities as well –is estimated at R$455. The estimation of a poverty line as presented here is a time intensive and technical exercise that requires a range of decisions at different steps of the procedure. As such, our preferred results for the food and total poverty lines are reflective of the specific choices taken and assumptions made along the estimation process. We aim to be transparent about the assumptions made in the estimation of our poverty line, as well as about

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[1] The Cadastro Único refers to the national social registry administered by the Citizenship Ministry. Individuals and households who plan to apply for benefits of any public program must enroll in the Cadastro Único. As of June 2021, there were over 77.8 million individuals (30.2 million families) in the registry.

[2] This is equivalent to US$3.46 per person per day in 2011 purchasing power parity terms.

the sequencing of choices. Nonetheless, we conduct a series of checks that allow us to test how modifying assumptions at different stages of the implementation of the methodology would affect our estimates. Results remain qualitatively similar, showing that our preferred poverty lines are robust to alternative choices and assumptions regarding the preferred specification.

Interestingly, the value of the (lower) total poverty line found here is close to the income threshold used to define eligibility to register in the Cadastro Único (R$477, or half a minimum wage in 2018). Thus, results could be interpreted as providing empirically backed evidence of the relevance of such a value as a way to identify the destitute and vulnerable populations in Brazil.

The rest of the note is structured as follows: Section 2 describes the methodology to estimate the poverty line and the data. Section 3 presents results and section 4 covers the different robustness checks performed. Section 5 concludes.

2. Applying a cost-of-basic-needs approach to estimate a poverty line

The cost-of-basic-needs approach

The cost-of-basic-needs (CBN) approach, first taken by Rowntree (1901), has become a staple approach in studies that aim to estimate poverty lines. For instance, in the region, poverty lines of Argentina (INDEC, 2016), Mexico (CONEVAL, 2019), Paraguay (DEGEEC, 2020), and Ecuador (INDEC 2015) are based on the CBN approach, as well as in other upper middle-income economies like Lebanon.[3] Put simply, it consists of stipulating a certain bundle of basic needs that is then costed to come up with a monetary value that would allow individuals to satisfy these basic needs. The bundle of basic needs is chosen using consumption choices made by a relevant reference population.

The approach results in three poverty lines: a food poverty line and two (total) poverty lines that incorporate adjustments for nonfood basic needs to the food poverty line and are commonly called the lower and upper poverty line. The approach usually involves the following steps. First, the food poverty line (FPL) is estimated. The FPL conceptually stipulates the cost of achieving a minimum threshold of caloric consumption in the reference population. The first component – a minimum calorie requirement – is obtained from the country's nutritional tables, recommendations from the Ministry of Health, or another local authority on the subject. Depending on data availability, the minimum calorie requirement is obtained from international sources that may be applicable to the context at hand. The cost of achieving this minimum calorie requirement is then usually calculated on the basis of information from a household expenditure survey by estimating the average cost of a calorie. Such an average is estimated from the value of food consumption (and its associated expenditure) in the household survey and from the calories associated with the observed level of consumption. Calories consumed by food item are generally obtained from a reliable external source. The cost per calorie of different food items is thus estimated and aggregated to get a representative value. Notably, the cost per calorie is based on information from a reference population. This reference group is chosen because it is deemed that its consumption patterns (including the basket of goods and services it purchases) are most relevant to inform the estimation of

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[3] The poverty line used for targeting of social programs is based on the CBN (World Bank 2021).

the poverty line. Selection of the group can be based on its income or expenditure levels, or on its position in the income or expenditure distribution.[4] Finally, the food poverty line can then be estimated as the product of the minimum calorie requirement and the unit cost of a calorie of the reference population[5]:

$$FPL = minimum\ calorie\ requirement * unit\ cost\ of\ calorie \qquad (1)$$

While the food poverty line considers only basic food needs, people also have nonfood basic needs such as shelter and clothing. To account for these, based on the food poverty line and total (food and nonfood) consumption patterns observed in the household survey, an adjustment can be made for nonfood consumption. This is usually done by establishing a lower and an upper bound for the total poverty line, as proposed by Ravallion (1998). The lower poverty line obtains the adjustment for nonfood needs based on households whose *total expenditures* are equal to the food poverty line. It follows the assumption that households at this level of total expenditures choose to sacrifice some of their caloric needs to satisfy essential nonfood necessities. The average expenditures on nonfood items (goods and services) of households at this expenditure level are added to the food poverty line to obtain the lower poverty line. Figure 1 demonstrates this adjustment graphically. The line segment A represents the allowance for basic nonfood needs that is added to the food poverty line to derive the lower poverty line.

Figure 1. Accounting for nonfood basic needs in calculating poverty lines
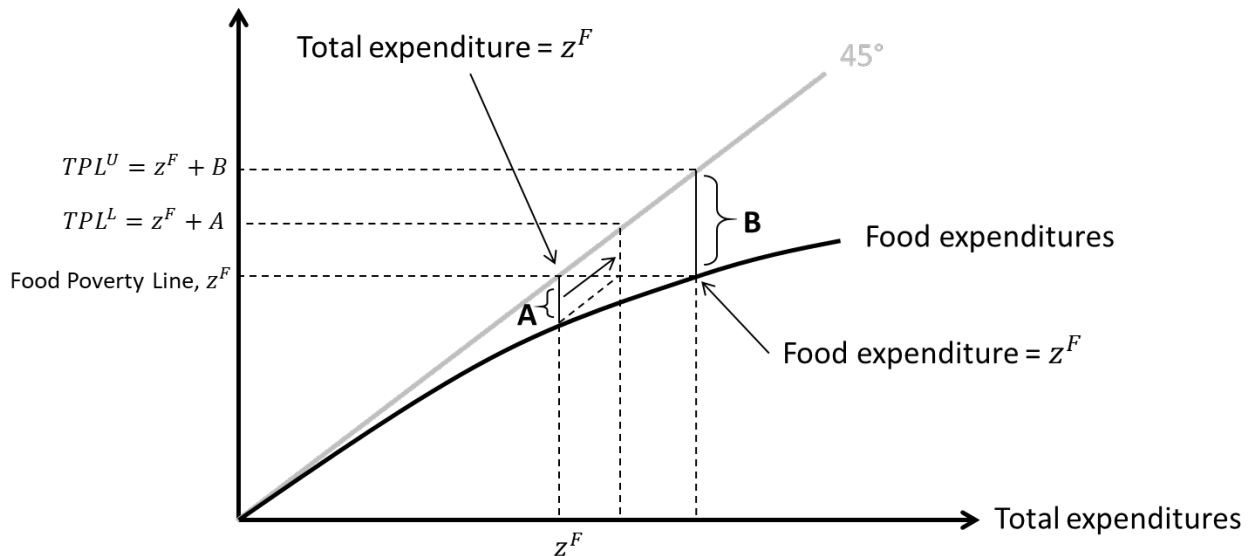
Source: Own adaptation based on World Bank (2007) and Ravallion (1998).

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[4] Given the differences in consumption patterns across households, it is important that the reference group represents closely the consumption basket (and likely actual cost of such a basket) of what is considered to be the poor population. Choosing income or consumption levels to select this reference group can be seen as a "first guess" of the position of the poverty line (Ravallion, 1998).

[5] It has been recognized that consuming a minimum level of calories does not equate the consumption of an individual's food needs. Nutritious diets require a broad range of nutrients (such as proteins, carbohydrates, fats, and so on). However, running a cost minimization problem covering all possible combinations to cover all nutrients is outside the scope of this work. For an interesting application of nutritional requirements into the poverty line calculation and its implementation issues, see Allen (2017).

The upper poverty line determines the nonfood adjustment on the basis of the consumption pattern of households whose *food expenditures* are equal to the food poverty line. Their spending on nonfood consumption is added to the food poverty line, as shown by segment B in Figure 1.

Data

We use two main data sources for our estimation of a poverty line for Brazil: the 2017/18 Household Budget Survey (Pesquisa de Orçamentos Familares; POF) and the Brazilian Table of Food Composition (Tabela Brasileira de Composição de Alimentos; TBCA). POF is a nationally representative semiregular survey on income and expenditures in Brazil, conducted every six to nine years. The sample of the 2017/18 round includes over 58,000 households in the whole country, comprising about 178,000 individuals. Data was collected between July 11, 2017, and July 9, 2018.

The survey collects very detailed data on the household budget composition and on the living conditions of the population, including the subjective perception of quality of life and information on the nutritional profile. It consists of seven questionnaires that collect information on demographics, work and income, quality-of-life perceptions, expenditures, and food consumption (at the household and individual level). For the estimation of the poverty line, we use data from the three expenditure questionnaires (POF 2-4), in addition to key demographic data collected in the general household questionnaire (POF 1). The expenditure questionnaires collect information on monetary consumption expenses as well as the value of nonmonetary consumption.[6]

In addition, we need information on the caloric value of the food consumption expenditures incurred by households. This information can be obtained from the TBCA. It has nutritional values per 100 grams, including calorie intake, for an extensive list of meals and food items typically consumed in Brazil.[7]

3. Estimating the poverty line for Brazil

We now describe the two main stages of our poverty line estimation: the food poverty line and the total poverty line. To keep the presentation simple, in this section we describe the procedure and assumptions made for our preferred estimation. Robustness checks and the associated results for varying our assumptions are presented in the following section.

Estimating the food poverty line

As described in equation [1] above, the food poverty line is obtained from multiplying the minimum daily caloric requirement deemed necessary by the cost per calorie of a reference group chosen from the population of interest. We describe each of these steps next.

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[6] Monetary expenditures are expenditures made in cash or by credit card, while the value of nonmonetary consumption is obtained for goods and services acquired through donation (in-kind transfers), withdrawal from business, exchange (trade with no money involved), or own production.

[7] The TBCA can be accessed at http://www.tbca.net.br/base-dados/composicao_alimentos.php.

Choosing the minimum daily caloric requirement for the food poverty line. There is no recent estimate of daily caloric requirement for the Brazilian population. The Food and Agriculture Organization of the United Nations (FAO) estimated minimum dietary energy requirements for the Brazilian population in 2000-2002 and 2006-2008 at 1,840 and 1,860 kcal per person per day, respectively (FAO, 2011). Average dietary energy requirements were estimated at 2,340 (2000-2002) and 2,360 kcal per person per day (2006-2008) (FAO, 2011). In the absence of estimates of the energy requirements of a population of interest, the World Health Organization (WHO) recommends using a mean daily per capita intake of 2,100 kcal for a developing country profile (Table 1). This is the threshold we will be using to estimate the food poverty line for Brazil.

Table 1. Potential minimum individual calorie requirements for Brazil

Minimum individual calorie requirement (kcal/day)	Source
1,840	FAO minimum dietary energy requirement (MDER) for Brazil 2000-2002
1,860	FAO MDER for Brazil 2006-2008
2,100	WHO (2000) recommends this mean daily per capita intake (for a developing country profile) if energy and protein requirements of the population are unknown.
2,300	World Bank (2007)
2,340	FAO average dietary energy requirement (ADER) for Brazil 2000-2002
2,360	FAO ADER for Brazil 2006-2008

Source: Own compilation.

Estimating the cost per calorie. To estimate the cost per calorie, we use information on food purchases (expenditures and quantity consumed) by food item from POF. POF collects information on food purchases for consumption at home as well as food consumed away from home (FAFH). Food purchases for consumption at home are collected in the household expenditure diary, which collects expenditures on frequent purchases over a reference period of one week (POF 3). It collects expenditures and quantities purchased by food item, containing 4,549 different food items. Although accounting for FAFH in the calculation of the cost per calorie is advisable, we cannot include it since it is not possible to assign calorie intake values to FAFH as observed in the data. FAFH is collected in a different questionnaire (POF 4) that collects expenditures by food item but does not have the associated quantities consumed.[8]

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[8] We assessed the possibility of addressing this shortcoming by using data from another questionnaire (POF 7) that registers quantities of items consumed, location, time, and its calorie intake. However, it was not possible to match the data from POF 7 (quantities) and POF 4 (expenditures) in a reliable way. First, item specifications differ across the two questionnaires. Food items in POF 4 are mostly vague. The item with highest expenditure is "takeaway meal (lunch/dinner)." In contrast, POF 7 has items as detailed as white rice, beans, eggs, potatoes, and so on consumed during lunch or dinnertime. Second, reference periods and data collection methods are different. POF 4 expenditures are collected via recall and have a reference period of one week. POF7 is a diary and collects information on all food items consumed within two nonconsecutive days in that reference week. Finally, POF 7 is captured only for a random subset of the sample and only for household members ages 10 years and above.

To calculate a cost per calorie for each food item, we assign caloric intake values to the quantities purchased, as reported in POF. The TBCA contains the caloric information for a myriad of items, but there are no common food item identifiers with the POF 2017/18 that would allow directly matching the information across the two data sources. Thus, we use the food item description in POF to look up corresponding items and calorie intake per kilogram (kg) in TBCA. Given the large amount of individual food items in POF (4,549) and the fact that their contribution to total average consumption differs, we opted for a simplified approach to assign calorie intake values from TBCA to food consumption in POF. This approach can be divided into two main steps. In the first step, we identify "key food items" in the Brazilian consumption basket. These items are identified as having the highest share in average total expenditures on food consumed at home. We rank all food items in POF 2017/18 and find 350 food items that together account for about three-quarters (73.3 percent) of average total expenditures on food consumed at home and about half (49.2 percent) of all expenditures on food. For each of these food items we obtain calorie intake values from TBCA that are based on the descriptions of the food item in POF and TBCA. TBCA has calorie intake values for different preparation forms of the food item. We use calorie intake for the raw state, given that it is not clear how households will prepare the purchased food and that they buy it in the raw form.[9]

A second step is applied in order to increase the list of food items that have calorie intake assigned to them—and thus contribute to the cost per calorie estimation. In this step, we create food groups by aggregating POF's original 7-digit item code to a 5-digit item code. Based on this, we impute calorie intake to items that were not mapped to calorie intake in step 1. For instance, different types of rice (*arroz hibrido*, *arroz bica corrida*, *arroz quirera*) were not found in the TBCA, but by creating a 5-digit aggregation, we can assign them to the same group as *arroz polido,* for which we do have a caloric intake estimate. For all of these types we assign the average value of calorie intake for rice at this 5-digit item code that had calories assigned from TBCA in step 1 (in this case, *arroz polido*). After this step, we have raw calorie intake values for 1,413 items, which account for 86.6 percent of average total expenditures on food consumed at home and 58.1 percent of all food expenditures.

Steps 1 and 2 are part of our preferred specification. In an alternative specification, we consider a third step to increase the number of items, and hence the proportion of expenditures, that have calorie intake assigned. In this step, we group food items into 117 different food groups, defined in IBGE (2020). We then assign items that did not have calorie intake assigned in steps 1 and 2 the average calorie intake of items of their food group that did have calorie intake assigned in either step 1 or 2. This yields 4,020 items

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[9] Beans, for instance, which are one of the most important food purchases and items in Brazil, have a raw calorie intake of 306 kcal per 100 g in TBCA (Feijão, carioca), while in the prepared form, TBCA assigns 71 kcal per 100 g, assuming a composition of 50 percent beans and 50 percent water to the meal. The weight of a food item when prepared, is however not equivalent to the weight when it is in its raw form. Beans for instance, or rice – another important staple in Brazil - absorb water and change in volume when cooked. We do not have conversion factors that would allow us to convert the prepared weight into the quantity in its raw form. Using kcal estimates in prepared form would also require strong assumptions about the way food was prepared before consumption. Working with the raw calorie intake we aim at assigning the potential calorie intake that could be obtained when prepared to a purchased food item. On the other hand, while non-edible parts of raw food items, such as fruits, vegetables, eggs and meat with bones, could be leading to an underestimation of the cost per calorie, we believe this to be of minor concern. Among the top-10 items as a proportion of total average food expenditures, none have non-edible parts.

that have calorie intake assigned and account for 98.6 percent of total expenditures on food consumed at home.

Table 2 shows the top 10 food groups in POF in terms of average calorie intake per 100g. It shows that 'Meat' is the most expensive food group, followed by 'Breads, Cakes and Pies'. On the other hand, 'Kitchen Oil' is displayed as the most caloric food group, as expected. It is followed by 'Flour Derivatives' (which includes pasta). The cheapest food group is 'Beans and Legumes', while the least caloric is 'Fruits'. Therefore, the data – including our calorie mapping – show some expected patterns of caloric and price distribution across food groups.

Table 2. Top 10 Calorie intake food groups average kcal and price per 100 g, in 2018 urban Southeast prices

Food Group	Kcal per 100g	Average price per 100g
Cereals	485.6	2.7
Kitchen Oil	1173.8	7.6
Meat	254.5	13.1
Sweets	548.7	5.0
Breads, cakes and pies	497.2	10.8
Flour Derivatives	508.0	4.5
Dairies	151.0	5.5
Potatoes and tubers	450.6	3.3
Beans and Legumes	430.7	3.7
Fruits	89.7	3.8

Source: Own calculations using POF 2017/18 data and TBCA, based on food items categorizations by IBGE.

Next, we calculate the household-specific cost per calorie of each food item consumed by dividing the expenditures reported on each food item by the product of the associated quantity purchased in kilogram and the calorie intake per kilogram. We then calculate household-specific average costs per calorie by computing a weighted average of the costs per calorie of the items consumed by each household h, as follows:

$$Cost\ per\ calorie_h = \sum_{i=1}^{I} w_{i,h} \frac{Expenditure_{i,h}}{kcal\ per\ kg_i * Quantity\ purchased\ in\ kg_{i,h}} \quad (2)$$

where $w_{i,h}$ is the share of calories consumed of each item i.

Reference group and consumption aggregate. We choose a reference population for the estimation of the poverty line on the basis of their position in the welfare distribution. As noted above, the average cost per calorie of this reference population is used to estimate the food poverty line. Although in Brazil welfare and distributional analysis is usually based on income, for the purpose of estimating the CBN poverty lines, we use a consumption aggregate, as this would be consistent with the poverty line we are estimating. For this, we construct a consumption aggregate using the data from POF. The consumption aggregate is based on household expenditures on goods and services. It considers monetary expenditures (made in cash or

by credit card) as well as goods and services obtained via nonmonetary means. The latter includes donations (presenting in-kind transfers), production for household self-consumption, and other sources such as withdrawal from business or trade where no money was involved.

The consumption aggregate is composed of the following components:

1) *Food consumption.* We include the value of food consumed from all possible sources, as measured in POF. This includes food acquired for consumption at home, which is collected in the household questionnaire of frequent acquisitions (POF 3). Food consumed at home can be acquired via monetary means, obtained through own production, or received in kind or via other means that do not involve monetary payment. The value of consumption of FAFH is collected in the individual-level expenditure questionnaire on nonhousehold goods and services (POF 4). Again, this component of food consumption might have been acquired via monetary as well as nonmonetary means. We aggregate the values of individual consumption of FAFH at the household level and include it in the consumption aggregate. Finally, POF also collects information on food consumption outside the home – in particular, meals consumed in settings like at school or on vacation. This information is collected outside of these two questionnaires, since it is collected in expenditure modules on education and vacation expenses, for instance. Following Deaton and Zaidi (2002), with the exception of school meals obtained via nonmonetary means, we include the value of this type of food consumption in the consumption aggregate.[10]

2) *Consumption of nonfood items.* For the value of nonfood consumption to be included in the consumption aggregate, we need to make a few choices in order to make the aggregate adequate for our purpose of analysis. POF collects information on a wide range of nonfood items, but several are typically not included in the construction of a consumption aggregate used for welfare analysis. Examples include taxes or "lumpy" acquisitions that are usually made at a low frequency (see Deaton and Zaidi, 2002). We exclude the following nonfood categories from the calculation of our consumption aggregate:
   - *Health expenditures (monetary and nonmonetary), other than expenditures on insurances.* The general recommendation on health expenditures is to exclude these from the calculation of the welfare aggregate (see Deaton and Zaidi, 2002). This is because it is not clear whether and to which extent health care expenditures are welfare-enhancing. Empirically, this decision can be guided by the elasticities of health care expenditures to total expenditures, with high elasticities providing a case for inclusion (Deaton and Zaidi, 2002). We estimated elasticities of expenditures on pharmaceutical products and on health services with respect to total expenditures. These were relatively low, at 0.67 and 0.84, respectively, and for each we rejected the null hypothesis that the elasticities were equal to one (H_o: $\eta =1$). We include, however, expenditures on health insurance. This is in line with Oliveira et al. (2016) and justifiable, given that these can be seen as welfare-enhancing.
   - *Nonmonetary education consumption.* Although there are arguments to exclude education expenditures from the consumption aggregate, the general recommendation is to include them (Deaton and Zaidi, 2002). We follow this recommendation but excluded nonmonetary education

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[10] We did not include school meals if they were obtained via nonmonetary means, since these could be publicly provided and as such are difficult to value.

consumption. This is because these are likely to be publicly provided goods and, as such, the imputation of values is not straightforward.

- *"Lumpy" items and occasional expenditures.* The exclusion of lumpy items and relatively infrequent expenditures is recommended because they can introduce noise to the consumption aggregate (Deaton and Zaidi, 2002). We hence exclude expenditures made on ceremonies, jewelry, property, vehicles, and construction. There are a few other categories that are composed of both items that rather qualified as durables and items that could be purchased more frequently; these categories are toys and recreational goods and services, domestic electrical appliances, domestic nonelectrical appliances, and furniture. Given the large number of items (496) in these four categories, instead of determining case by case whether a certain item would be included, we take the following approach. We apply a visual inspection of the distribution of expenditures for all items in these categories. Then, we define a threshold for expenditure above which items would be considered lumpy. This threshold, R$500, is roughly equivalent to half a minimum wage in Brazil in 2018 and generally does a good job at categorizing the items in these categories. For instance, in the "toys and recreational goods and services" category, we classify as lumpy musical instruments like pianos, violoncellos, and gym equipment, but we keep in the consumption aggregate items like board games and strings. Appendix A provides a list of the items that were excluded using this rule.[11]

  As far as durable goods are considered, instead of including expenditures reported on these in the reference period, it is recommended to calculate the flow of services that they yield over the reference period. For this, a detailed inventory of durable goods is needed, including information on their value (either original purchase date and value, or current replacement value). POF, however, collects information only on quantity, mode of acquisition, year, and state (new or used) in its durable goods inventory, but not on values. Therefore, an estimate of flow of services cannot be reliably obtained for durable goods owned by the household.[12] For the calculation of poverty rates, however, the omission of the flow of services from a number of durable items from the consumption aggregate may be of relatively little concern (World Bank, 2007).

- *Other miscellaneous items.* In addition, following the guidelines in Deaton and Zaidi (2002), we excluded loan and interest payments, other capital account transactions, remittances and other transfers (for instance, child support), and property-related taxes that do not bear any relation to services provided. A list of the excluded items is provided in Appendix B.

3) *Housing.* The consumption aggregate also includes the value of rent for households that rent their dwelling. For households that own their house or do not pay rent for any other reason, we include implicit rent in the consumption aggregate. There are different ways to arrive at a value for housing services consumed by nonrenters, which have different advantages and disadvantages (see Deaton and Zaidi, 2002). In POF, households that own their dwelling (even if still paying the mortgage) or that

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[11] In a variation of the main specification, we exclude all toys and recreational goods and services; domestic electrical appliances; domestic nonelectrical appliances; and furniture, regardless of the average amount spent on these. Results are presented in section 4.

[12] Oliveira et al. (2016) calculate and include in their aggregate the value of services provided by the following durable goods: Goods in modules "Machines, equipment and household utilities acquisition" and "Vehicles acquisition." However, the estimation is only partial (i.e., goods need to be registered in the inventory of durable goods) and potentially biased (as all valuations are from items acquired in the last 12 months prior to the survey).

are being provided with housing by others (e.g., employer, relatives, other arrangements) are asked what they would estimate the rent for their dwelling to be. We used this self-reported value in the consumption aggregate for these households.

The consumption aggregate is computed at the household level in *per capita* terms. We consider as household members those people in the household who share expenses. As such, we exclude domestic workers, their relatives, lodgers, and nonrelatives who do not share expenses from the calculation of the welfare aggregate.[13]

Temporal and spatial price adjustment. To make the consumption aggregate and average costs per calorie comparable across households, we adjust expenditure values temporally and spatially. POF was collected throughout a full year and its reference periods go back up to 12 months. Figure 2 shows the temporal variation of prices for different Brazilian states over the reference period of the survey. On average, prices increased by 26.8 percent over the reference period – a monthly average of 1 percent. IBGE (2020) provides temporal deflators in the publicly available data, which we use to deflate prices and the consumption aggregate to express all monetary values in January 2018 values.

For Brazil, among the largest countries in the world and covering an area of over 8.5 million square kilometers, spatial differences in prices should be a concern in the estimation of the poverty line and in welfare measurement. While there is no spatial price level index available for Brazil that one could use to adjust for these differences, research suggests that these differences exist and should be taken into account. Ferreira, Lanjouw, and Neri (2003) calculate spatial price indices for Brazil and find that they matter for ranking poverty across regions. More recently, Azzoni and Almeida (2016) show that overall price-level differences in Brazilian metro areas can diverge, with levels as low as −19 percent and as high as +14 percent from the national average. We hence use the data from POF to calculate Paasche price indices that we use to spatially deflate the expenditures registered in the survey.

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[13] There are several differences between our consumption aggregate and other studies using POF data. In one of the most recent ones (Oliveira et al. 2016), the authors aim to measure and analyze welfare, poverty (using the administrative "poverty'' line equivalent to half a minimum wage), inequality, and vulnerability. Thus, the differences found with our work are somewhat expected. For instance, while we exclude observations with zero food expenditures from our analysis, Oliveira et al. (2016) impute food expenditures for these households to be able to include them in the estimations. Our main objective is to estimate a poverty line and not necessarily to reproduce the population distribution of expenditures. Any imputation method chosen would potentially bias our results because it would necessarily rely on observed characteristics such as family composition and location. Instead, we want the line to rest on actual data. Other differences emerge as we apply closely the recommendations in Deaton and Zaidi (2002): Oliveira et al. (2016) include all education expenditures, without distinguishing by mode of acquisition as we do; the authors also exclude costs of mass transportation (bus, subway, train, ferryboat, alternative transportation and their connection), often used to go to and return from work and often higher for those who live far away.

Figure 2. IPCA price level by State (January 2018 = 1)
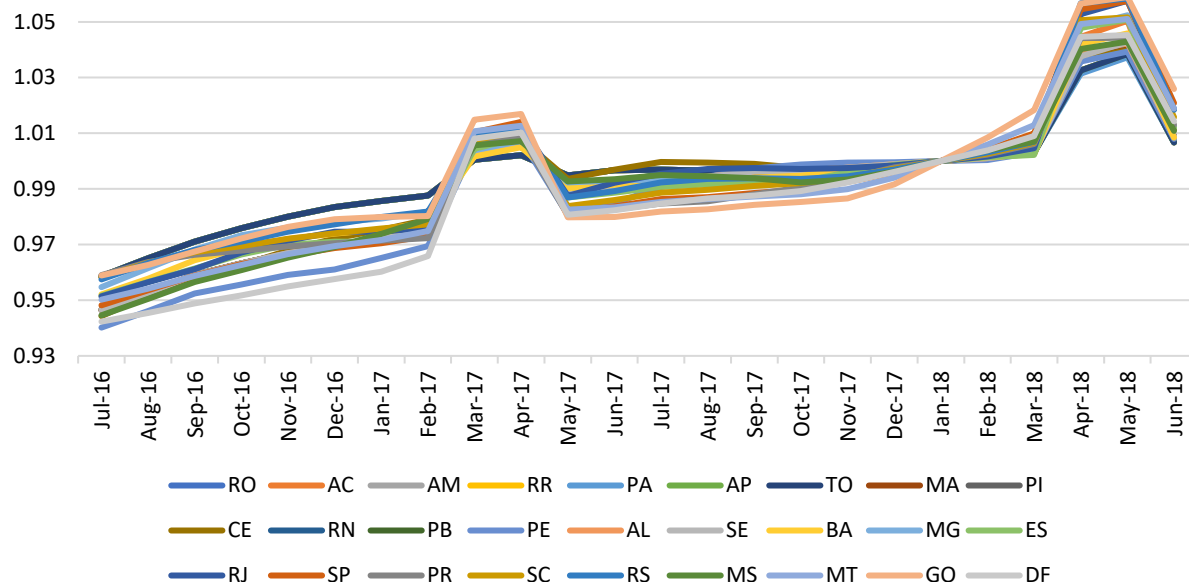
We use household-specific Paasche food price indices to adjust average cost per calorie for spatial price differences:

$$P_F^h = \left(\sum_{i=1}^{I} w_{h,i} \frac{p^{0,i}}{p^{PSU,i}} \right)^{-1} \tag{3}$$

where the reference price $p^{0,i}$ is the median price of item i observed from individual households in the urban Southeast. $p^{PSU,i}$ is the median price of item i paid by households in primary sampling unit PSU and $w_{h,i}$ is the share of household h's food budget devoted to item i. We use the median price of item i paid by households in the same PSU to minimize the impact of outliers on household-level Paasche food price indices. In the calculation, following Deaton and Zaidi (2002), we used the following approximation:

$$lnP_F^h \approx \sum_{i=1}^{I} w_{h,i} \, ln \left(\frac{p^{PSU,i}}{p^{0,i}} \right) \tag{4}$$

To adjust the consumption aggregate, which included nonfood expenditures and rent in addition to food expenditures, we used an overall price index that included rent prices (actual as well as implicit) in addition to food prices. Based on rent prices, we calculated household-specific Paasche rent price indices. The overall index is a weighted average of the food price index and the rent price index, where the weights

are the budget shares of food and nonfood items (excluding rent) for the food price index and the budget share of rent for the rent index. The formula of the overall index is expressed below:[14]

$$P_P^h = w_{F,NF}^h \left(\sum_{i=1}^{I} w_{h,i} \frac{p^{0,i}}{p^{PSU,i}} \right)^{-1} + w_r^h \frac{r^h}{r^0} \tag{5}$$

where $p^{0,i}$: median price of food item i observed from individual households in the urban Southeast
$p^{PSU,i}$: median price of food item i paid by households in PSU primary sampling unit
r^h: rental value paid by or implicit rent for household h
r^0: median rental value paid by or implicit rent for individual households in the urban Southeast
$w_{h,i}$: share of household h's food budget devoted to food item i
$w_{F,NF}^h$: share of household h's total budget devoted to food and nonfood, nonrent expenditures
w_r^h: share of household h's total budget devoted to rent

Each household's welfare aggregate was then divided by the household-specific overall price index. Table 3 presents the average indices by region. Compared to the Southeast-Urban reference, prices are lower in all other regions. Differences are smallest for South-Urban price indices and larger for price indices in the Northeast and North. These results are in line with differences in economic performance across the regions. Moreover, within major geographic region, urban-rural differences are as expected, with urban price indices being higher. Differences in food prices are relatively smaller. This result is in line with earlier work on Brazil and Brazil's level of economic development (World Bank, 2007; Deaton and Dupriez, 2011). The largest differences in terms of urban-rural as well as regional differences in prices are observed in the cost of rent.

Finally, using the spatial and temporal deflated welfare aggregate, we use the population in the bottom 40 percent as the reference group for the estimation of the food poverty line. This group is selected based on the expectation that it includes the poor and vulnerable sectors of the Brazilian population. By using this group and its consumption patterns, our approach aims to reflect how much necessities consumed by the less well-off cost. Incidentally, it is worth noting that the calorie mapping described above yields a projected average daily caloric intake of 2,368kcal per capita. The estimated average for the bottom 40 percent is 1,243kcal per capita per day. This further reflects the level of destitution of the reference group chosen.[15]

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[14] To calculate the rent price Paasche index, we used the same approximation as in the calculation of the food price index (equation 4).

[15] This back of the envelope calculation is done as follows. Daily caloric intake is calculated based on the caloric intake assignment to quantities of food items purchased, using our main calorie mapping specification. We complement this with an extrapolation of the calorie intake to account for unassigned expenditures (coming from a small share of food consumed at home and away from home).

Table 3. Paasche price indices (regional averages)

Region	Paasche Index Food	Paasche Index Rent	Overall Paasche Index
North-Urban	0.972	0.707	0.901
North-Rural	0.969	0.334	0.801
Northeast-Urban	0.963	0.578	0.868
Northeast-Rural	0.959	0.252	0.792
Southeast-Urban	*1.000*	*1.000*	*1.000*
Southeast-Rural	0.986	0.592	0.884
South-Urban	0.990	1.009	0.999
South-Rural	0.957	0.669	0.890
Midwest-Urban	0.993	0.942	0.985
Midwest-Rural	0.997	0.671	0.933

Source: Own calculations using POF 2017/18 data.

Note: Prices in the urban Southeast are the reference prices. While we use household-specific price indices in our estimations, for ease of presentation we calculated regional averages of household-specific indices and divided them by the Southeast-Urban average.

Table 4 shows the results for our food poverty line, based on our main specification as well as an alternative calculation. The food poverty line in our main specification is based on the minimum calorie requirement of 2,100 calories per person per day and average cost per calorie of the bottom 40 percent of the welfare distribution, with calories having been assigned in a two-step procedure and deflated by household-specific Paasche indices, as described above. This yields a food poverty line of R$258 in 2018 urban Southeast prices. In the alternative specification, an additional step has been taken to assign calories to food items registered in the POF household expenditure questionnaire on frequent purchases (POF 3). The cost per calorie in this alternative scenario is minimally higher, leading to a food poverty line of R$259 in 2018 urban Southeast prices. Moving from assigning calories to 1,413 items accounting for 86.6 percent of total expenditures on food consumed at home to 4,020 items accounting for 98.6 percent of total expenditures on food consumed at home, following our approach, leaves the cost per calorie estimation and thus the food poverty line largely unchanged.

Table 4. Food poverty line – Main and alternative specification, in 2018 urban Southeast prices

	Main specification	Alternative imputation (using broad food groups)
Cost per calorie	0.0040	0.0041
Food poverty line	R$258	R$259

Source: Own calculations using POF 2017/18.

Note: Main specification estimates the cost per calorie based on assigning food items in POF to the TBCA and imputation for food items at the 5-digit level (i.e., steps 1 and 2 described above). The alternative specification extends the imputation to larger food groups based on categorization by IBGE (2020).

Estimating the total poverty line

As described in section 3.1, we adjust the food poverty line to account for essential nonfood consumption, deriving a lower and an upper (total) poverty line. There are different ways to implement such adjustments. We apply a parametric and a nonparametric approach.

Parametric approach. For the parametric approach, we follow World Bank (2007) and estimate the following regression:

$$\frac{Expenditures\ on\ Food_h}{Total\ Expenditures_h} = a_0 + \beta\ ln\left(\frac{Total\ Expenditures_h}{FPL}\right) + \gamma X_h + \varepsilon_h \tag{6}$$

with FPL being the food poverty line, and X_h including sex-age group shares in household h, occupational status of the household head, and average years of study in the household, and ε_h being an error term.

For the lower poverty line adjustment, we first predict the food share for households with *total per capita expenditures* equal to the food poverty line as:

$$s_L^F = \hat{\alpha} = \hat{a}_0 + \hat{\gamma}\bar{X}_h \tag{7}$$

where s_L^F is the share of food expenditures for the lower poverty line and $\hat{\gamma}\bar{X}_h$ represents the average household characteristics of households in the reference population (the bottom 40 percent of the welfare distribution). This food share is then used to obtain the lower total poverty line as follows:

$$PL_{lower} = FPL + (1 - s_L^F)FPL = 2FPL - s_L^F FPL = (2 - s_L^F)FPL \tag{8}$$

For the upper poverty line adjustment, we use the estimates of equation (6) to get the food share of households with *food expenditures per capita* equal to the food poverty line by solving numerically the following equation:

$$s_U^F = \hat{\alpha} + \hat{\beta} ln\left({1}/{s_U^F}\right) \tag{9}$$

where s_U^F is the estimated share of food expenditures. The upper poverty line is then calculated as:

$$PL_{upper} = \frac{FPL}{s_U^F} \tag{10}$$

Table 5 shows the distribution of total food expenditures as a proportion of total household expenditures (the welfare aggregate) across welfare deciles. In line with the poverty line literature, we find a declining trend with increasing position in the welfare distribution. This finding is consistent with wealthier households spending a higher share of their budget on other (non-food) goods and services.

Table 5. Total food expenditures as proportion of total household expenditures

Welfare decile	1	2	3	4	5	6	7	8	9	10
Share of food in total expenditures	24.9%	23.9%	22.9%	22.3%	22.0%	22.2%	22.2%	21.5%	20.7%	17.4%

Source: Own calculations using POF 2017/18.

Table 6 shows the upper and lower poverty lines yielded by this parametric approach, based on the food poverty line of R$258, coming from our main specification. Being able to cover very essential nonfood needs (as represented by the lower poverty line) almost doubles the amount of the poverty threshold.

Table 6. Total poverty lines – Parametric approach, in 2018 urban Southeast prices

	Lower	Upper
Total poverty line	R$455	R$1,061
s^F	0.235	0.243

Source: Own calculations using POF 2017/18 data.
Note: These total poverty lines are based on the food poverty line of R$258, coming from our main specification, which is based on the minimum calorie requirement of 2,100 calories per person per day and average cost per calorie of the bottom 40 percent of the welfare distribution, with calories having been assigned in a two-step procedure and deflated by household-specific food-price Paasche indices, as described earlier in this section.

Nonparametric approach. To complement this result, we apply a nonparametric approach to estimating the food expenditure shares for the lower and upper poverty line. The approach taken here was to obtain the average food share of households with either total expenditures (for the lower poverty line) or food expenditures (for the upper poverty line) in the range of +/– 10 percent of the food poverty line. These estimated shares are used to obtain the lower and upper poverty lines following equations (8) and (10), respectively. Table 7 shows the results. The poverty lines remain generally robust to changes in the approach to the nonfood adjustment, with values being similar across the two approaches, especially for the lower poverty line.

Table 7. Total poverty lines – Nonparametric approach, in 2018 urban Southeast prices

	Lower	Upper
Total poverty line	R$452	R$ 973
Average food share	0.2457	0.2649

Source: Own calculations using POF 2017/18 data.
Note: These total poverty lines are based on the food poverty line of R$258, coming from our main specification, which is based on the minimum calorie requirement of 2,100 calories per person per day and average cost per calorie of the bottom 40 percent of the welfare distribution, with calories having been assigned in a two-step procedure and deflated by household-specific food-price Paasche indices.

4. Assessing (a few) variations in the assumptions of the CBN methodology

Without a doubt, the application of the CBN methodology relies not only on the availability of very detailed information on households' consumption and expenditure patterns, but also on a series of decisions that can potentially affect the ultimate result. In the section above, we showed that our results are robust to the expansion of the calorie-food mapping between POF and TBCA. We also find that applying a parametric or nonparametric approach to the estimation of the lines does not affect the results greatly.

Following, we continue exploring the potential effects of changing five different assumptions of our main specification: energy requirement, treatment of food away from home, reference group, incorporating implicit rent, and the treatment of lumpy items.

Energy requirement

The energy requirement of an individual has been defined by WHO (1985) as that level of energy intake from food that will balance energy expenditure when the individual has a body size and composition consistent with long-term good health and that will allow for the maintenance of economically necessary and socially desirable physical activity. Our main specification uses a 2,100 calorie intake because we believe it to be a good benchmark. It is also placed roughly in the middle of several sources consulted (Table 1).

We explore how changing such a benchmark could influence our results. The US National Research Council (1989) estimated energy requirements by age group and sex. Based on this, and using the detailed data on Brazil's demographic profile from the POF 2017/18 data, we calculate a population-weighted average required calorie intake. Moreover, this requirement could be estimated for the bottom 40 percent of the population – in other words, our reference group. As shown in Table 8, an estimate for the required calorie intake of a demographic population that resembles the bottom 40 percent in Brazil would be 2,268 kcal.[16]

We round the caloric needs benchmark down to 2,250 kcal per day and re-run our CBN specifications. Table 9 shows the results. The table shows that, while the food poverty line increases proportionally with the required calorie intake (+7.1%), as expected the lower poverty line changes from R$455 to R$487.

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[16] An alternative method could also be to directly use the information from the POF 2017/18 and the consumption patterns of the consumption per capita distribution to estimate the actual kcal consumed and apply those to estimate the food poverty line. However, as has been documented in many other studies (for instance World Bank, 2019; Myanmar Ministry of Planning and Finance and WBG, 2017), the relatively poor households do not typically consume enough to cover their caloric needs. In POF 2017/18, a simple extrapolation of the average calories consumed in the bottom 40 percent is about 1,190. Thus, the definition of a food poverty line is normative and uses a benchmark instead of actual caloric consumption.

Table 8. Energy requirement by demographic group and share in the Brazilian population

Category	Age (years) or condition	Per day required calorie intake	% Brazil population	% bottom 40% population
Infants	0-1	750	1.2%	1.7%
Children	1–3	1,300	3.8%	5.3%
	4–6	1,800	4.1%	5.7%
	7–10	2,000	5.4%	7.6%
Males	11–14	2,500	3.2%	4.4%
	15–18	3,000	3.4%	4.5%
	19–24	2,900	4.7%	4.9%
	25–50	2,900	17.9%	16.5%
	51+	2,300	11.8%	8.3%
Females	11–14	2,200	2.9%	4.0%
	15–18	2,200	3.2%	4.1%
	19–24	2,200	4.5%	5.0%
	25–50	2,200	19.7%	18.6%
	51+	1,900	14.3%	9.6%
Population-Weighted Average Required Calorie Intake			2,286	2,268

Source: Own compilation using data from US National Research Council and POF 2017/18.
Note: Bottom 40% refers to the population in the poorest two quintiles of the consumption-based per capita welfare distribution.

Table 9. Poverty lines and headcounts using 2,250 kcal/day requirement

Methodology	Food Poverty	Lower Total Poverty
Parametric	R$276	R$487
Nonparametric	R$276	R$484

Source: Own calculations using POF 2017/18.

Food away from home

In Brazil, 30 percent of households' expenditures on food take place where it will be consumed – that is, away from home. Table 10 shows the distribution of the share of expenditures on food consumed away from home in total food expenditures. Food consumed away from home accounts for a sizeable proportion in terms of food expenditures, ranging from 19 percent in the bottom decile of the income distribution to 43 percent in the top decile, and continually increasing across the welfare distribution.

However, as explained in previous sections, we were not able to calculate cost per calorie for food to be consumed away from home because of data limitations. While we cannot tackle this caveat directly, we run the following alternative specification. We assume that calories are typically more expensive when food is purchased away from home than when purchased to be consumed at home (for instance, from a grocery store). In particular, we apply a cost per calorie to FAFH that is 1.5 times the household-specific average cost per calorie for food purchased to be consumed at home. The new weighted average cost per

calorie including FAFH is then calculated as a weighted average of the average costs per calorie for FAFH and food purchased for consumption at home, where the weights are the budget shares of FAFH and food purchased for consumption at home. Using such a factor to adjust cost per calorie is also the approach used in World Bank (2007) and Silveira et al. (2007). We re-run our CBN estimation with this adjusted cost per calorie. Table 11 shows the results. The food poverty line increases by about 11 percent, to R$287, while the lower total poverty line reaches R$503.

Table 10. Expenditures on food consumed away from home as proportion of total food expenditures

Welfare decile	1	2	3	4	5	6	7	8	9	10
Share of FAFH in total food expenditures	19.0%	21.2%	23.4%	24.5%	26.9%	26.7%	29.2%	30.7%	35.1%	42.8%

Source: Own calculations using POF 2017/18.
Notes: FAFH refers to food purchased away from home.

Table 11. Poverty lines and headcounts using 1.5 factor on food away from home

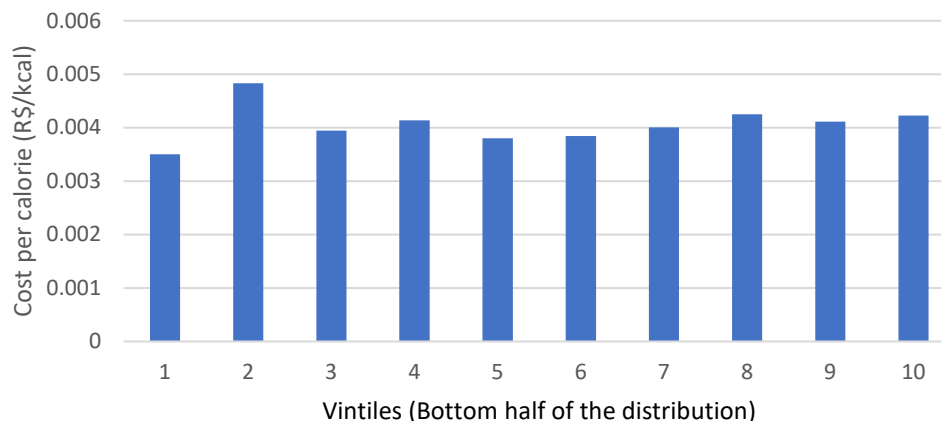| Total Poverty Estimation	Food Poverty	Lower Total Poverty
Parametric	R$287	R$507
Nonparametric	R$287	R$503

Source: Own calculations using POF 2017/18.

Reference group

An important part for the definition of the food basket and the following calculations is the selection of the reference group. Our specification of the bottom 40 percent of the consumption per capita distribution aims to include the poor population as well as a group of households that may not be poor, but that are certainly vulnerable to fall back into poverty. The choice remains arbitrary. We hence explore how selecting another reference group would affect our findings. Figure 3 shows that, in the bottom half of the consumption distribution, the cost per calorie varies only slightly among households. Each consumption vintile's food basket varies slightly, around R$0.004/kcal.

Following World Bank (2007), we run our CBN approach while redefining the reference group to include households that belong to the second and third consumption deciles. Table 12 shows the results. The table shows a drop in both food and total poverty lines, although their levels remain relatively close to our main results.

Figure 3. Cost per calorie by consumption vintile among the bottom half of the distribution

Source: Own calculations using POF 2017/18 data.

Table 12. Poverty lines using 2nd and 3rd consumption deciles as reference group

Total Poverty Estimation	Food Poverty	Lower Total Poverty
Parametric	R$251	R$443
Non-parametric	R$251	R$441

Source: Own calculations using POF 2017/18.

Poverty lines based on alternative treatment of items in "lumpy" modules

In section 3 we described our approach to exclude lumpy items and relatively infrequent expenditures from the consumption aggregate used to determine the reference population, as well as from the nonfood component when estimating the total poverty line. In our main specification we exclude expenditures made on ceremonies, jewelry, property, vehicles, and construction, while in the following categories of goods and services, we exclude items that have average expenditures above R$500: toys and recreational goods and services, domestic electrical appliances, domestic nonelectrical appliances, and furniture. In a variation of this main specification, we exclude all toys and recreational goods and services; domestic electrical appliances; domestic nonelectrical appliances; and furniture, regardless of the average amount spent on these. Results are presented in Table 13 and show that poverty lines remain basically unchanged.

Table 13. Poverty lines based on alternative treatment of items in "lumpy" modules

Total Poverty Estimation	Food Poverty	Lower Total Poverty
Parametric	R$258	R$455
Nonparametric	R$258	R$452

Source: Own calculations using POF 2017/18.

Consumption without rent

Deaton and Zaidi (2002) advert to the fact that implicit rent, as elicited in POF and used here, is a hypothetical concept that could lead to estimations that are not usable. In the survey, heads of the household estimate their implicit rent themselves. There are also a few cases where IBGE imputed values in certain households in which values were not in line with similar dwelling characteristic combinations of other households, which happened in about 5 percent of the households with implicit rent.

Given this possibility and the fact that other methods to estimate a value of rent for nonrenters are not ideal either, we also calculate a variant of the poverty line in which we exclude this implicit rent as well as explicit rent. We exclude explicit rent (i.e., rent actually paid by renters) as a way to maintain consistency across households. That is, if we would exclude only implicit rent for owners and in-kind dwellers while keeping explicit rent for renters, we would mechanically make the first group relatively poorer because we are neglecting housing services in their welfare aggregate. We recognize that this approach is not necessarily ideal, but we present the results here as a further robustness check. Table 14 shows the results, which remain similar.

Table 14. Poverty lines using consumption without rent

Total Poverty Estimation	Food Poverty	Lower Total Poverty
Parametric	R$264	R$449
Nonparametric	R$264	R$451

Source: Own calculations using POF 2017/18.

5. Final remarks

In this paper we have presented our estimate of a poverty line for Brazil, using the CBN approach and based on the most recent data (POF 2017/18). Our preferred specification results in a food poverty line, accounting only for nutritional requirements, of R$258 (in 2018 Southeast urban prices) per person per month. The total poverty line – which accounts for other nonfood necessities as well – is estimated at R$455 in our preferred specification.

The estimation of a poverty line as presented here is an academic exercise that requires a range of decisions at different steps of the procedure. As such, it could be argued that our preferred results for the food and total poverty line depend on the specific choices taken and assumptions made along the estimation process. We aim to be transparent about the assumptions and choices made in the estimation of our poverty line, as well as about the sequencing of it. Moreover, we conduct a series of checks that allow us to test how modifying assumptions at different stages of the implementation of the methodology would affect our estimates. Results remain qualitatively similar, showing that our preferred poverty lines are robust to alternative choices and assumptions regarding the preferred specification. These include (a) increasing the number of food items in the calculation of the average cost per calorie by adding an additional step to the assignment of calorie intake to food items, (b) using a nonparametric approach to estimate food shares used to estimate the lower and upper poverty lines, (c) excluding from the estimation all items in categories that at least partially include lumpy and infrequently purchased items, (d) using a higher energy requirement, (e) assigning a higher cost per calorie to FAFH, (f) using a different

reference group, and (g) excluding rent expenditures (explicit as well as implicit) from the estimation. Estimates for the food poverty line coming out of these different specifications range from R$250 to R$280. Estimates for the (lower) total poverty line range from R$440 to R$500. This highlights that our preferred estimate constitutes a rather lower bound for the poverty line, with the choice of a relatively low minimum calorie requirement and assuming that the cost per calorie of FAFH is the same as food purchased for consumption at home.

In comparison with earlier work, mainly based on POF 2003, our poverty lines are generally similar in real values, although methodologies differ, and consumption patterns have likely changed over time. Converted to January 2018 prices and considering São Paulo (mostly metropolitan) lines in the case of regional lines, previous estimates range from R$485 to R$532 (Rocha, 2007; Silveira et al., 2007). Ferreira et al. (2003) used POF 1996 and estimated a lower poverty line of R$477 in January 2018 metropolitan São Paulo prices. Only World Bank (2007) estimated a considerably lower poverty line of R$272 in January 2018 metropolitan São Paulo prices.

Comparing our results with the World Bank poverty lines used for global poverty monitoring, by expressing them in 2011 purchasing power parities (PPP), we find that the total poverty line of R$455 is equivalent to approximately US$6.10 a day, and hence in the range of upper-middle income countries.[17] Moreover, it is very much in line with the societal poverty line one would obtain for Brazil using POF 2017/18 data.[18] The food poverty line of monthly R$258 is equivalent to a daily US$3.46 in 2011 PPP, above the international poverty line of US$1.90 per person per day.

The value of the total poverty line found here is also close to the income threshold used to define eligibility to register in the Cadastro Único (R$477, or half a minimum wage in 2018). Thus, our results could be interpreted as providing empirically backed evidence of the relevance of such a value as a way to identify the destitute and vulnerable populations in Brazil.

In the absence of an official poverty line that takes into account the local Brazilian context, this work has estimated a poverty line based on the most recent data available. The results can help inform the policy dialogue around the recent Supreme Court order to set up a basic income scheme for the poor,[19] starting in 2022. The ability to appropriately identify the poor population will be key in this endeavor.

As for the contribution of this work for poverty monitoring in Brazil, more research is needed. In Brazil, poverty monitoring is not based on POF. Instead, another survey – the Pesquisa Nacional por Amostra de Domicílios Contínua (PNADC), which collects information on income instead of consumption – is used. Regular poverty monitoring conducted by IBGE is hence done using an income aggregate. Developing approaches to use the poverty line estimated here for regular poverty monitoring with the income aggregate based on PNADC is beyond the scope of this paper; however, related work has shown that very

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[17] The US$5.50 international poverty line for upper-middle income countries is the median of poverty lines in countries with this level of national income.
[18] The societal poverty line defines someone as suffering from societal poverty if they live on less than $1 plus half of what the median person in their country consumes (see Jolliffe and Prydz, 2017). With median consumption per capita per person per day from POF 2017/18 expressed in 2011 PPP US$ being 10.18, the societal poverty line would be US$6.09 in 2011 PPP per person per day for Brazil.
[19] The ruling was done in April 26th, 2021. The *voto* of Minister Mendes can be found here:
https://static.poder360.com.br/2021/04/voto-gilmar-mendes-valor-renda-basica-26-abr-2021.pdf

similar income aggregates can be obtained between POF and PNADC (Paffhausen et al., 2021), which could be exploited in further work in this direction.

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Appendix A. List of "lumpy" items excluded based on R$500 rule

Our main specification for the poverty line estimations defines an expenditure threshold of R$500 to classify lumpy (all above) and not lumpy (all below) items. Items that are above the threshold are thus not included in the consumption aggregate as it is assumed that they are infrequently purchased, and in many cases, an accurate incorporation into the poverty line calculation would be by estimating a value of the flow of services they provide to the owner. The data required to run those estimations is not available in POF 2017/18.

Below we list the items that were excluded in our main specification by POF module.

Module – Toys and recreational goods and services:
    4303501 - ORGAO
    4303801 - ACORDEAO
    4305501 - VIOLONCELO
    4303601 - PIANO
    4303001 - SAXOFONE
    4302601 - CONTRABAIXO
    4301202 - ESPINGARDA DE CACA
    4300705 - ESTEIRA DE CAMINHAR (GINASTICA)
    4305601 - DRONE
    4300707 - APARELHO DE MUSCULACAO
    4301101 - ARMAS DE FOGO (EXCETO DE CACA)
    4303201 - TROMBONE
    4300401 - MAQUINA FOTOGRAFICA
    4303101 - CLARINETE
    4301701 - BATERIA MUSICAL
    4302201 - VIOLA
    4300612 - MESA DE PINGUE-PONGUE
    4301002 - LONA PARA ACAMPAMENTO
    4300402 - CAMERA FOTOGRAFICA
    4301601 - TECLADO
    4303701 - SANFONA
    4301401 - GUITARRA
    4300624 - PRANCHA DE SURFE
    4300203 - XBOX
    4300630 - REDEA DE CAVALO
    4300201 - CONSOLE DE VIDEO GAME
    4303301 - TROMPETE
    4300501 - FILMADORA
    4300629 - CELA DE CAVALO (RECREACAO)
    4300703 - BICICLETA ERGOMETRICA
    4301102 - ESPINGARDA (EXCETO DE CACA)
    4300704 - ESTEIRA DE GINASTICA

4302501 - VIOLINO
4399901 - AGREGADO
4302401 – BANJO

Module – Domestic electrical appliances:
1507501 - PAINEL DE ENERGIA SOLAR
1511801 - MAQUINA PARA FAZER CERVEJA
1507502 - AQUECEDOR SOLAR
1500802 - LAPTOP
1506401 - GERADOR DE ENERGIA
1512301 - COOLER ELETRICO
1512001 - CILINDRO DE MASSAS ELETRICO
1511101 - ALARME
1511301 - PROJETOR DE IMAGENS
1503401 - MAQUINA DE SECAR ROUPAS
1509201 - MOTOSSERRA
1500801 - NOTEBOOK
1511901 - BABA ELETRONICA
1500701 - MICROCOMPUTADOR
1504202 - MOTOR DE BOMBA DE AGUA
1510201 - CAMERA DE SEGURANCA
1500201 - TELEVISAO DE LED, PLASMA OU LCD
1508301 - FATIADOR DE ALIMENTOS
1503501 - MAQUINA DE LAVAR PRATOS
1500702 - COMPUTADOR
1501301 - AR-CONDICIONADO
1501701 - GELADEIRA
1501801 - FREEZER
1510101 - CERCA ELETRICA
1503901 - PURIFICADOR DE AR
1501901 - MAQUINA DE LAVAR ROUPAS
1512201 - CHAPA ELETRICA
1509501 - INTERFONE
1503802 - DEPURADOR DE AR
1510801 - BATEDEIRA DE ACAI
1502701 - MAQUINA DE COSTURA ELETRICA
1500301 - TELEVISAO EM PRETO E BRANCO
1511401 - SELADORA DE EMBALAGEM
1508501 - MAQUINA DE CORTAR PISO ELETRICA
1504201 - BOMBA DE AGUA
1502101 - FOGAO ELETRICO
1501702 - FRIGOBAR
1512401 - MIXER
1509901 - COMPRESSOR DE AR

1508602 - SERRADEIRA ELETRICA
1503801 - EXAUSTOR
1500501 - EQUIPAMENTO DE SOM
1500901 - TABLET
1508001 - IOGURTEIRA
1501001 - IMPRESSORA
1510601 - ADEGA CLIMATIZADA
1507901 - HOME THEATER
1505301 - DEPILADOR ELETRICO

Module – Domestic nonelectrical appliances:
1601302 - PISCINA DE FIBRA
1601702 - MOENDA DE CANA
1603501 - MAQUINA DE CREPE A GAS
1601701 - MAQUINAS AGRICOLAS DE PEQUENO PORTE
1603701 - FORNO DE FUNDICAO
1602501 - AQUECEDOR DE AGUA A GAS
1600701 - MAQUINA DE COSTURA A PEDAL
1601601 - CORTADOR DE GRAMA NAO ELETRICO
1600801 - MAQUINA DE COSTURA MANUAL
1601901 - FORNO A LENHA
1600101 - FOGAO A GAS
1601801 - FORNO A GAS

Module – Furniture:
1710001 - ARMARIOS PARA SALA E QUARTOS
1709101 - COZINHA PLANEJADA
1710101 - SOFA E POLTRONAS
1709001 - COLCHAO MAGNETICO
1701606 - CLOSET
1701501 - DORMITORIO COMPLETO (QUARTO DE ADULTO)
1700602 - ARMARIO (SALA)
1708901 - CAMA BOX COM COLCHAO
1702401 - DORMITORIO COMPLETO (QUARTO INFANTIL)
1709201 - MESA E CADEIRA (COMODO NAO ESPECIFICADO)
1799901 - AGREGADO
1700201 - CONJUNTO ESTOFADO COM MESA
1705601 - CRISTALEIRA
1706801 - ESTANTE (QUARTO DE ADULTO)
1709401 - CADEIRA DE MASSAGEM
1708001 - GABINETE DE PIA (BANHEIRO)
1707901 - BUFE (COPA E COZINHA)
1700101 - CONJUNTO ESTOFADO
1701702 - CAMA BOX (QUARTO DE ADULTO)

1705203 - MESA DE VARANDA

1702403 - ENXOVAL DE BEBE

1703101 - MESA DE CABECEIRA (QUARTO INFANTIL)

1700302 - SOFA

1703601 - ARMARIO, MESA E CADEIRAS (COPA E COZINHA)

1700301 - SOFA OU SOFA-CAMA

1703801 - ARMARIO (COPA E COZINHA)

1701601 - ARMARIO (QUARTO DE ADULTO)

1700303 - SOFA-CAMA

1701502 - ARMARIO, CAMA E MESA DE CABECEIRA (QUARTO DE ADULTO)

1700901 - MESA COM CADEIRAS (SALA)

1706401 - BANCO (SALA)

1701605 - GUARDA ROUPA (QUARTO DE ADULTO)

1710301 - CAMA (QUARTO DE ADULTO) E COLCHAO

1704602 - CADEIRA PARA COMPUTADOR

1705502 - OMBRELONE

1701701 - CAMA (QUARTO DE ADULTO)

1705101 - MESA COM CADEIRAS (JARDIM, VARANDA, ETC.)

1704201 - COLCHAO

1706701 - CAMA E MESA DE CABECEIRA (QUARTO DE ADULTO)

1708801 - CABECEIRA DE CAMA

1702501 - ARMARIO (QUARTO INFANTIL)

1701002 - MESA DE CENTRO (SALA)

1701801 - BICAMA, BELICHE OU TRILICHE (QUARTO DE ADULTO)

1700703 - RACK PARA MICROCOMPUTADOR

1708401 - ARMARIO (QUARTO NAO ESPECIFICADO)

1708201 - ADEGA

1701001 - MESA (SALA)

1702701 - BICAMA, BELICHE OU TRILICHE (QUARTO INFANTIL)

1700601 - ESTANTE (SALA)

1705102 - MESA COM CADEIRAS DE JARDIM

1703701 - MESA COM CADEIRAS (COPA E COZINHA)

1709501 - CADEIRA (COMODO NAO ESPECIFICADO)

1702101 - MESA COM CADEIRAS (QUARTO DE ADULTO)

1703802 - GABINETE DE PIA (COPA E COZINHA)

1706301 - DIVISORIA DE AMBIENTES

1701602 - ARMARIO SIMPLES (QUARTO DE ADULTO)

1700603 - RACK (ESTANTE)

1700401 - POLTRONA

1701604 - ARMARIO EMBUTIDO (QUARTO DE ADULTO)

1704801 - BALCAO (MOVEL)

1705001 - ARMARIO DE BANHEIRO (NAO PLASTICO)

1709601 - PAINEL PARA TV

1706901 - PENTEADEIRA (QUARTO DE ADULTO)

1700701 - MESA PARA TV, SOM E VIDEO
1702505 - GUARDA ROUPA (QUARTO INFANTIL)
1707301 - ESTANTE (QUARTO INFANTIL)
1705202 - MESA DE JARDIM
1702402 - ARMARIO, CAMA E MESA DE CABECEIRA (QUARTO INFANTIL)

Appendix B. List of other miscellaneous items excluded, following the guidelines in Deaton and Zaidi (2002)

In all specifications of the poverty line estimation we exclude a series of items that do not reflect an increase in household's welfare or that reflect mere financial transactions. These items are listed below.

Module – Payment of loans, financial charges, pensions, contributions and transfers

4800101	PAGAMENTO DE EMPRESTIMO
4800102	EMPRESTIMO (PAGAMENTO)
4800201	JUROS DE EMPRESTIMO
4800501	PREVIDENCIA PUBLICA (INSS)
4800502	FUNRURAL
4800601	PREVIDENCIA PRIVADA ABERTA OU FECHADA
4800603	PREVIDENCIA PRIVADA FECHADA
4800901	PENSAO ALIMENTICIA EM DINHEIRO
4801201	DOACAO EM DINHEIRO PARA OUTRA UNIDADE DE CONSUMO
4801602	CREDITO EDUCATIVO (PAGAMENTO)
4801603	PAGAMENTO DE CREDITO EDUCATIVO
4801701	CAIXINHA ENTRE ASSOCIADOS (FUNCIONARIOS, AMIGOS, CASAIS, ETC.)
4801702	CONTRIBUICAO DE GRUPO (FUNCIONARIOS, AMIGOS, CASAIS, ETC.)
4801901	DINHEIRO ROUBADO
4802201	PAGAMENTO DE TITULO PROTESTADO
4802301	INDENIZACAO A TERCEIROS
4802401	EMPRESTIMO A TERCEIROS
4802602	PECULIO
4803001	ESMOLA
4803101	COMPLEMENTACAO DO IMPOSTO DE RENDA
4803102	IMPOSTO DE RENDA DO EXERCICIO ANTERIOR
4803301	TITULO DE CAPITALIZACAO (AQUISICAO)
4803302	AQUISICAO DE TITULO DE CAPITALIZACAO
4803401	CONTRIBUICAO PARA PARTIDO POLITICO
4803501	CONSORCIO DE DINHEIRO
4803701	DAS MICROEMPREENDEDOR INDIVIDUAL (MEI)
4899901	AGREGADO

Module – Rent, taxes, and other fees of the main residence

1000301	PRESTACAO DO IMOVEL
1000601	IMPOSTO PREDIAL E TERRITORIAL URBANO (IPTU)
1000602	IPTU
1000701	IMPOSTO SOBRE A PROPRIEDADE TERRITORIAL RURAL (ITR)
1000702	ITR
1000703	IPTR
1000801	ADICIONAIS DE PRESTACAO DO IMOVEL (JUROS, MULTA, ETC.)
1001101	ADICIONAIS DE IPTU (JUROS, MULTA, ETC.)