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Multidimensional poverty analysis: an application for the states of Brazilian´s Southeastern region in the years of 2005, 2011 and 2015

Análise de pobreza multidimensional: uma aplicação para os Estados da região Sudeste nos anos de 2005, 2011 e 2015

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Abstract: Based on the theoretical contribution of the Capabilities Approach and using the Alkire-Foster method as a methodological reference, this article presents a multidimensional poverty index for the states of the Southeast region in the years 2005, 2011, and 2015, using data from the National Sample Survey of Households (PNAD). However, unlike other studies, the contribution of this article is to identify the indicators of greatest need for individuals residing in this region. The results indicate that Rio de Janeiro and São Paulo were the states that presented the lowest poverty rate and an increase in the intensity of poverty in the years researched. Furthermore, considering the four states examined, the most significant deprivations are not linked to income but rather to the control over one's environment.

Keywords: Multidimensional Poverty; Alkire-Foster Method; Southeast Region.
JEL classification: I300; I320; I390.

Resumo: A partir da contribuição teórica da Abordagem das Capacitações e tendo como referência metodológica o método Alkire-Foster, este artigo apresenta um índice de pobreza multidimensional para os estados da região Sudeste nos anos de 2005, 2011 e 2015, utilizando dados da Pesquisa Nacional por Amostra de Domicílios (PNAD). Todavia, diferentemente de outros estudos, a contribuição deste artigo está no esforço de identificar os indicadores de maior carência dos indivíduos residentes nesta região. Os resultados apontam que Rio de Janeiro e São Paulo foram os estados que apresentaram menor índice de pobreza e também, aumento na intensidade de pobreza, nos anos pesquisados. Além disso, considerando os quatro estados pesquisados, as maiores privações não estão ligadas à renda, e sim, ao controle sobre o próprio ambiente.

Palavras-chave: Pobreza Multidimensional; Método Alkire-Foster; Região Sudeste.
Classificação JEL: I300; I320; I390.

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1. Introduction

Poverty, as a research topic, has been gaining ground in social sciences, including economic science. In the context of economic development, its study has evolved towards a more multifaceted view of the concept and measurement methods, with implications for the formulation of policies to reduce it (Silva, 2017).

In the 1960s and 1970s, during the process of economic growth in some underdeveloped countries (for example, Latin American countries), the causal relationship between the elimination of poverty and the increase in income began to be questioned (Estenssoro, 2003). As a result, it was possible to observe that poverty in underdeveloped countries could not be analyzed solely from the point of view of monetary income, i.e. in a one-dimensional way. It was necessary to broaden the scope of the discussion and define poverty in a way that considers multiple dimensions (Sen, 2000). Despite everything, the one-dimensional perspective has strength in literature to this day: although institutions such as the World Bank and the University of Oxford reinforce how outdated this methodology is for measuring poverty, it is still very present in empirical analyses.

In the multidimensional approach, poverty is analyzed in economic, social, cultural and political terms, which influence people's well-being by covering multiple aspects of life (Alkire; Foster, 2009). For Alkire and Roche (2011), the definition of multidimensionality follows the thoughts of Amartya Sen, in which individuals need to have the freedom to make the choices that seem most valuable to them in life, going beyond the limits of monetary income. These choices will only be possible if real opportunities are created. Going beyond the limits of monetary income means guaranteeing the individual the right to access literacy, to belong to a social group, to vote in elections, to care for a child, to travel, among others.

Amartya Sen's (2000) capabilities approach offers a different view about development, in which income is just one of the means and not its crucial end. This approach has reinforced the multidimensional viewpoint on studying poverty and, along with the basic needs approach[1], has openly challenged the purely monetary approach. However, in the context of poverty analysis and public policy planning, the one-dimensional approach is still highly prevalent.

Contrary to the preponderance of the unidimensional approach found among popular studies[2], this paper adopts the multidimensional approach to the study of poverty by considering that poverty is a complex phenomenon that, according to Lacerda (2009), does not manifest itself and cannot be treated only through the single prism of monetary income or consumption of goods.

[1] Basic needs include food, housing, clothing and essential services such as drinking water, sanitation, public transport, medical services and schools.

[2] For instance: Ravallion and Chen (2003), Kageyama and Hoffman (2006), Silva (2010), Tabosa *et al*. (2012) and Castelar *et al*. (2013).

The objective of this article[3] is to analyze poverty in the states of the Brazilian's Southeast region, not only as an insufficiency of income, but as the result of a set of nearby elements, measured using the Alkire-Foster Multidimensional Poverty Index (Alkire; Foster, 2011), in the years 2005, 2011 and 2015.

The ten-year period was selected due to the economic and social transformations experienced by Brazilian society in this period, which saw economic growth of 3.8% on average per year between 2005 and 2013, expansion of the policy to combat poverty, economic stagnation and recession between 2014 and 2015, raising the question of how poverty indicators evolved in this period. The availability of data from the National Household Sample Survey (Pesquisa Nacional por Amostra de Domicílios - PNAD) limited the final period to 2015, the last year of data publication.

The choice of the territorial scope – states in the Southeast region – is based on intra-regional inequality: although the Southeast region is the most economically developed region in Brazil, with a GDP contribution of 54% in 2015, with income per capita of R$ 38,584.63, above the national average[4], and which contained the highest population concentration given its extension, there is a discrepancy in the distribution of this growth. To illustrate, and using the concept of poverty as monetary insufficiency, data from IJSN (2016), derived from the 2015 PNAD, indicates that 9.7% of the Southeast region's population lived below the poverty line. The study also calculates poverty based on a multidimensional perspective, albeit in a different manner from that proposed by this study and finds that more than 800 thousand people were in this condition.

Using data from the PNAD, we have created an overview of the living conditions of the population living in the Southeast region. This allows us to answer questions such as: has there been a reduction in extreme poverty in this region? Have improvements been observed in other dimensions alongside this reduction in poverty? What are the prospects for poverty for these states?

The central hypothesis of this study is that part of the population residing in this region is experiencing severe deprivations that cannot be fully captured by a unidimensional analysis of poverty. It is questionable whether monetary income alone can capture all the ways in which poverty manifests itself. The theory of multidimensional poverty can help provide a more complete analysis. Studies like this are important because they are a preliminary step towards the elaboration/construction of more effective public policies aimed at reducing this social phenomenon.

Dotter and Klasen (2014) argue that one of the key benefits of the Alkire-Foster poverty index is its simplicity, which allows for international comparisons and competitive benchmarking against established poverty lines. Furthermore, this index enables the identification of the main needs of the population, as well as the verification of improvements that may have occurred, monitoring developments, and enabling the construction of public policies with greater focus and effectiveness.

[3] This article is the result of Ferreira's master's thesis (2018).

[4] The data is from the IBGE Regional Accounts 2016, as reported by the IJSN (2018).

Studies such as those by Brites *et al*. (2017) even conducted a diagnosis of multidimensional poverty for the Southeast region, without breaking down the results for states. Fahel, Leite and Teles (2014) apply the Alkire-Foster method to construct a multidimensional poverty index in order to capture regional nuances at the state level. To achieve this, they utilize data collected by Fundação João Pinheiro in the years 2009 and 2011. However, this data is limited by its territorial scope, as the analyses are conducted exclusively for a single state (Minas Gerais), precluding any form of comparison.

In contrast to the aforementioned studies, it is possible to conclude that, in addition to the difference in the proposed time frame, these studies do not analyze the results by state for the purpose of comparison, as is the proposal of this work. Another key differentiator of this study from existing literature on the subject is the individual assessment of the various indicators that comprise the index. This approach allows us to identify those indicators that have posed challenges for individuals residing in the specific geographical area under analysis at various points in time. It is also worth noting that some of the variables included in the index are not part of any other study in the national literature.

In addition to the introductory section, this study is comprised of four additional sections. The second section presents a brief theoretical discussion about the concept of poverty, followed by a review of empirical evidence. The third section outlines the methodology employed in this study, namely the Alkire-Foster method, and how it was applied to the states of the Southeast region. The fourth section presents the results acquired from the application of the method in question. Finally, the final considerations are presented.

2. Theoretical framework

Poverty is a situation in which individuals are unable to access the basic opportunities required to develop as citizens. This can be characterized as a range of forms of deprivation (Sen, 1997; Rocha, 2003; Kageyama; Hoffmann, 2006; Santos, 2009). These deprivations can be absolute, relative or subjective in nature. Absolute poverty is defined as having less than a pre-established minimum; relative poverty is having less than others in one's social environment; and, subjective poverty is feeling that one does not have enough to live a dignified life (Kageyama; Hoffmann, 2006; Crespo; Gurovitz, 2002).

The varying conceptualizations of poverty not only illustrate the conceptual evolution that this phenomenon has undergone in recent times, but also provide insight into how this evolution has shaped the way poverty is understood and addressed in different contexts. If a country's development process is associated with the generation of monetary income, it is evident that the most effective measures to be taken in the development process will be monetary ones, represented by per capita income (Marin; Ottonelli, 2008). However, if the development process is associated with personal capabilities, the most appropriate measures for the development process and combating poverty are

multidimensional measures, linked to a broader vision than poverty dictated by insufficient monetary income (Marin; Ottonelli, 2008).

An effective poverty measure allows for the evaluation of the impact of projects, crises, and public policies on poverty. It enables the comparison of poverty over time and facilitates cross-country comparisons. Furthermore, it aims to benefit the poor by reducing their level of deprivation (World Bank, 2005). The World Bank (2001) asserts that measuring poverty enables a broader, more comprehensive view that goes beyond individual aspects. This approach facilitates the verification and formulation of hypotheses about the causes of poverty, which in turn allows governments and the international community to establish measurable targets for evaluating their actions and maximizing results.

Anand and Sen (1997), in addition to presenting poverty as the worst form of deprivation for a person, claim that it involves the absence of opportunities to live a minimally bearable life, hence the need for a multidimensional aspect to this phenomenon.

Criticism of the multidimensional approach focuses on the criteria for selecting needs and the minimum limits to be established in the calculations (Salama; Destremau, 2002). From a qualitative point of view, this approach to poverty can create a conflict between the selected causes to be analyzed and real poverty, which can lead to an underestimation, for example, of the role of income in the phenomenon of poverty. However, as a counter-critique, Sen (2004) argues that the problem is not the breadth of options for choosing criteria and boundaries to set, but rather the "setting" of measurement criteria. The poverty to be measured constantly changes with time and with the public policies adopted, and “setting” criteria would not lead to future discussions about the possibility of adapting it to new realities of what should be included or not.

The multidimensional perspective of poverty is still misunderstood today. For Mattos (2006), this multidimensionality extends far beyond relating the results of diverse variables to the poor individual and simply analyzing them, i.e., it is not selecting those who earn less than the established poverty line and analyzing their health conditions and education. Poverty is much deeper; it is necessary to classify the individual as poor or not.

According to Sen (2000), this multidimensional approach has the advantage of identifying deprivations not only in impoverished areas (in which the most common deprivations are premature death, malnutrition and illiteracy), but also in more developed societies.

Ravallion (1998) notes that there has been a growing focus on developing reliable poverty measures. These measures can serve as effective tools for identifying the living conditions of the poor and informing political decisions on poverty reduction. Furthermore, the World Bank (2005) highlights: a correctly presented poverty profile has considerable value, as it defines the facts about poverty and how it varies according to geographic differences, cultural characteristics and family conditions.

Studies such as that by Paes de Barros, Carvalho and Franco (2006) corroborate the importance of already renowned indices, such as the Human Poverty Index (HPI)

developed by the United Nations Development Programme (UNDP) to measure poverty, but highlight serious difficulties that this presents, such as the inability to accurately assess a family's level of necessity.

Therefore, the definition of the poverty measure must consider the objective proposed in the research, i.e., if the need is to identify the number of poor people, the establishment of a poverty line, via monetary income, is appropriate. However, if the purpose is to verify the deprivations suffered by individuals and their impact, a multidimensional measure is more appropriate (Ottonelli *et al*., 2011).

2.1. Literature review[5]

This study aims to contribute to the identification of factors that can prevent the incidence and deepening of poverty, as well as act to overcome it. It presents the possibility of analysis beyond monetary income. To this end, the Multidimensional Poverty Index (MPI) was created, using the Alkire-Foster Method (AF) and supported by the Capabilities Approach.

Several studies have been conducted using alternative methodologies to explain or analyze poverty, each with its own peculiarities, but have in common the focus on multidimensional poverty as the main factor in their analyses. The Alkire-Foster method is an illustrative example of this type of methodology. Table 1 presents a selection of studies, and the dimensions utilized to apply this method.

The studies referenced in Table 1 utilized the methodology described in this study and are accessible in both national and international literature. Costa and Costa (2014) applied the Alkire-Foster methodology to the state of Minas Gerais to calculate a multidimensional poverty measure for the year 2011. The indicators include standard of living, education and health, distributed across nine indicators. Among the indicators are education level, school attendance, mortality, health status, access to clean water, basic sanitation, household flooring, possession of durable goods and household density.

Mosaner (2016) used data from the National Survey of Children and Women's Health (Pesquisa Nacional da Saúde da Criança e da Mulher - PNDS), in 2006, using the methodology developed by Alkire-Foster to measure multidimensional poverty, specifically for child poverty. The authors concluded that, despite the difficulty of obtaining primary data, multidimensional measures provide more comprehensive insights for the more robust formulation of public policies. Furthermore, distinct poverty profiles were identified in urban Southeast and rural Northeast regions within Brazil's five macro-regions.

[5] This study's literature review makes use of research that has applied the Alkire-Foster methodology as a point of reference.

Table 1: Dimensions of poverty used in research that applied the AF methodology

Analysis Unit	Dimensions	Method
Costa e Costa (2014)		
Minas Gerais	Education Health Standard of living	Alkire-Foster
Suppa (2015)		
Germany	Social participation Education Housing Health Practical reason	Alkire-Foster
Mosaner (2016)		
Macroregions (rural and urban)	Access to water Basic sanitation Access to housing Access to information Health Nutrition	Alkire-Foster
Brites *et al.* (2017)		
Macroregions	Access to basic survival conditions Access to work and income Access to knowledge Control over one's environment	Alkire-Foster
Serra (2017)		
Municipalities in Brazil (rural and urban)	Standard of living Education	Alkire-Foster
Vieira *et al*. (2017)		
Rio Grande do Sul	Education Home conditions Health Sanitary conditions Income Work	Alkire-Foster
Cunha and Marcelino (2023)		
Brazil	Education Health and basic services Housing conditions	Alkire-Foster

Source: original work.

Serra (2017) created an index capable of measuring multidimensional poverty in Brazilian municipalities by applying the method proposed in this study, also using the hierarchical model suggested by Permanyer to replace the deprivation count. To achieve, data from the Demographic Census from the years 2000 and 2010 was used. The author

believes that this distinction makes the target audience for public policies more assertive. As a result, a higher prevalence of poverty was observed in municipalities located in the North and Northeast regions. The analysis distinguished between rural and urban areas and revealed that the reduction of multidimensional poverty was lower in rural micro-regions even in the face of an increase in household income per capita, while the agricultural and service sectors were crucial for reduction in rural areas.

In order to investigate poverty, Vieira *et al.* (2017) sought to apply the Alkire-Foster Method as a measure of multidimensional poverty for the municipalities of Rio Grande do Sul, in the years 2000 and 2010. The data used was from the Demographic Census and the considered dimensions were: education (using literacy and years of study as indicators); household conditions (housing occupancy status, electricity and household items were the indicators); health and sanitary conditions (water supply, sanitary facilities, type of drain in sanitary facilities, waste disposal and number of bathrooms were used as indicators); and income and work (household income and employment as indicators). As a result, it was possible to list the municipalities in Rio Grande do Sul with the highest and lowest multidimensional poverty index (Mo) for each of the years proposed in the study. A high level of deprivation was also identified regarding the population's years of study and employment, both in 2000 and 2010.

In Cunha and Marcelino (2023), the analysis of multidimensional poverty focused on Brazil, for the period from 2005 to 2015. The Alkire-Foster method was used to assess ten indicators, distributed across three dimensions: education, health and basic services and housing conditions. The results showed that there was a drop in multidimensional poverty, both in incidence and intensity. The greatest deprivations were in the education dimension and the smallest in the housing conditions dimension.

In the study presented by Suppa (2015), on multidimensional poverty in Germany, five dimensions were established: social participation, education, housing, health and practical reason. In the social participation dimension, the activity index, internet access and frequency of meetings with friends were used as indicators. Education and number of books at home were the indicators selected to measure the education dimension. Regarding the health dimension, the indicators were body mass and physical abilities. The practical reason dimension, which is based on experimental economics, had as an indicator whether or not the individual had life insurance, a pension, or their own home, was unemployed or had a precarious job, and was unable to put money aside for emergencies. The analyzes were carried out for the years 2001, 2006 and 2011, with data collected from the German Socio-Economic Panel (SOEP). The primary finding was that the concentration of poverty is among individuals aged 16 to 30 who are still pursuing their studies.

The difference in the dimensions used in the construction of national indicators to international ones is notable, since countries like the United States already benefit from much more advanced exploratory data on social issues (well-being, for example) than the information that Brazil has made available to date. Furthermore, national databases and analyses rely heavily on the Demographic Census, which is conducted every ten years and includes micro-monitoring data not captured by any other survey with a shorter periodicity.

These studies, as will be presented in Section 3, served as a reference in choosing the variables that were used in the construction of the multidimensional poverty index. The variables were selected with great care, considering the main shortcomings presented by the individuals indicated in the literature. This approach ensured the consistency of results for the identification of important public policies for each state in the Southeast region.

Furthermore, individual analyses were conducted on each of the relevant variables in the PNAD databases to identify any unusual cases in the existing literature, ensuring the index's optimal efficiency.

As illustrated in this section, studies employing multidimensional analysis do not specifically encompass the states within the Southeast region. Brites *et al*. (2017) conducted their analysis using a multidimensional methodology to the Southeast region, but it is not possible to identify the behavior and participation of each state.

Therefore, this article makes a valuable contribution to the field of poverty studies and provides valuable insights that can inform the development of more effective public policies. It is important to note that this study is not merely a critical discussion of methodology or authors. Rather, it is based on the practical manipulation of secondary data, and descriptive and comparative analyses.

3. Methodology

In order to identify multidimensional poverty and its manifestations in individuals residing in the states of the Southeast region, a Multidimensional Poverty Index (IMP) was created, calculated using the Alkire-Foster Method (2009, 2011, 2019). In this method, the researcher must select the region to be studied, the aspect of poverty considered in the analysis (e.g. education, housing conditions, income, etc.), which is called dimension, and the variables that will measure poverty in each dimension, called indicators by the authors. The main advantage of this method is its use of two cut-off points, as well as its decomposition into dimensions, indicators, and regions. This allows for a more efficient analysis to identify the main needs of each segment to be analyzed (Alkire; Foster, 2009).

Even though the method allows a wide range of index decompositions (Alkire; Fang, 2019), this particular study focuses on the results pertaining to the territorial space (represented by the four states of the Southeast region), keeping a special look for individually selected indicators.

Thus, this phase of the study consists of calculating the multidimensional measure of poverty for the states of the Brazilian's Southeast region, in the years 2005, 2011, and 2015. To this end, the data used was from the PNAD[6] and the analysis was conducted using STATA software.

In the pursuit for successful measurement of poverty, such as the Alkire-Foster method, other methodologies that have multidimensional analysis parameters also stand

[6] This study employs an individual-level analysis, with data aggregated by state due to the PNAD database's maximum availability of information at that level.

out. The *Fuzzy* Sets methodology (see Diniz and Diniz 2009, Brites *et al*. 2015, Pacheco *et al*. 2010 and also Costa and Costa 2016) and the Multivariate Statistics methodology (see Araújo, Morais and Cruz, 2013) are two examples of methods that have already been applied and are also capable of measuring multidimensional poverty with individual specificities, but they do not allow the level of disaggregation that can be achieved using the Alkire-Foster method.

The Alkire-Foster method is a simple methodology, composed of twelve steps that are presented and described in Table 2. The choice of selected dimensions and variables is based on the construction of the theoretical framework of this study, as shown in Table 3.

Table 2: Alkire-Foster Methodology applied to PNAD data (beginning)

Step	Description	Adopted definition
1	Choice of unit of analysis	Four states in the Brazilian's Southeast region
2	Choosing evaluation dimensions	Home conditions; Work and income; Education; Control over one's environment[7]
3	Definition of indicators for each dimension	15 PNAD indicators, analyzing four dimensions (detailed in Table 3)
4	Definition of the cut-off points for each indicator	Defined according to the literature (details in Table 3)
5	Application of the first cut-off point	Equal weights were assigned to the four dimensions
6	Counting the number of deprivations	Identify the number of deprivations that each individual suffers
7	Definition of the second cut-off point (k)	Counting the number of indicators in which each person showed deprivation. In this case, $0 \leq k \leq 7$
8	Application of the second cut-off point	Application of the k line to obtain the multidimensionally poor group and individuals. Being poor, the individual who presents $k \geq 7$
9	Calculation of the Incidence of Poverty (H)	Total of people who are deprived in k or more indicators (q) by the overall sample total (n) $H = \frac{q}{n}$

Source: original work based on Alkire-Foster (2009, 2011).

[7] The dimensions were defined based on the studies cited in Section 2.1 (literature review) of this article, which are also highlighted in Table 1.

Table 2: Alkire-Foster Methodology applied to PNAD data (conclusion)

10	Calculation of Average Poverty Intensity (A)	Sum of the total share of deprivations each person suffers (p) and divide by the total number of multidimensionally poor people (s) in k or more indicators $$A = \frac{\left(\frac{p}{s}\right) + \left(\frac{p}{s}\right) + \left(\frac{p}{s}\right)}{s}$$
11	Calculation of Incidence Adjusted to Poverty Intensity (Mo)	Mo = H × A (steps 9 and 10)
12	Measurement decomposition	The decomposition was carried out by dimension, by indicator

Source: original work based on Alkire-Foster (2009, 2011).

Ferreira and Marin (2016), Brites *et al*. (2017) and Vieira *et al*. (2017), in their studies, defined *k* as a value close to 50% of the total indicators considered in the research. Alkire and Seth (2009) highlight the importance of establishing intermediate values for *k*, because, if the public manager or researcher adopts the position that poor people are those who are deprived in one or more indicators, it is assumed that 100% of the sample will be subject to being deprived. A middle ground is therefore essential.

Table 3 shows the selected dimensions with their respective indicators and cut-offs that were considered in the present study. The housing conditions dimension captures not only the structural conditions of the dwelling, but also the living condition in which it is found, aiming to provide a better quality of life for the people who live there. Basic items such as adequate lighting, running water, the materials used on the construction and roofing, and whether it is owned or not, are the parameters used in the study to measure this dimension.

For the work and income dimension, the aim is to verify the monthly household income per capita, considering not only the main job but also other jobs (if any). Individuals are considered deprived if their income is less than or equal to half of the minimum wage[8]. It also presents characteristics of their work, such as the type of activity they perform. A person who has a formal job, is in the military, is an employer, a civil servant or is self-employed is not considered deprived. Whether or not the individual has had any type of social security contribution will also help to determine (if they have no income at the time of the research) whether they have already had some type of income in the last 365 days or have carried out an activity that allowed them to contribute. The individual will be considered deprived if this contribution is not identified (IBGE, 2015).

[8] As the minimum wage definition is being used, no "poverty line" is used.

Income is a means or a right of exchange that people have, and through it they have access to the basket of goods. However, it cannot be considered the only factor, since it can come through government transfers to expand people's right to exchange through social programs such as unemployment insurance, retirement or Bolsa Família (a Brazilian social welfare program) (Sen, 1999).

According to Sen (2000), the education dimension influences the individual's freedom to have a better life, as the lack of this, in terms of access to knowledge, acts as a barrier to participation in economic activities. Literacy is an acceptable minimum for all people, regardless of their financial and/or social condition. Those who are not literate are considered deprived.

Access to higher education and the number of years an individual has managed to study reflects not only their level of education but can also open doors to compete for jobs with better pay, thus leading to a better condition of life for people.

A person is also considered deprived if he or she hasn't completed at least six years of schooling or hasn't finished high school. According to the National Common Core Curriculum (BNCC, 2017) and Alkire and Santos (2010), six years is the minimum time required for a person to learn the basics of education, such as reading, writing, and developing the most basic mathematical reasoning. According to a study by UNICEF (2018), 14.6% of the population residing in the Southeast region, aged between 4 and 17, is deprived of the right to access education, failing to acquire a minimum knowledge of basic education.

In an initial analysis, to help select the indicators that would constitute the educational dimension, in all the analyzed years there was a high number of people who had more than six years of study, but did not complete secondary education, which directly affects the intensity with which multidimensional poverty manifests itself. The distribution of educational indicators allows us to improve the identification of the intensity with which individuals are deprived in this segment, which is one of the pillars proposed by the index.

The control over one's own environment dimension considers issues that can directly affect an individual's well-being. The first variable selected in this dimension was the daily commute time. Long commutes, which occupy a large part of the hours that a person could spend on leisure activities, reflect a high level of deprivation and most of the time it is not a situation of choice, but rather a condition. The activity condition allows us to identify as deprived those individuals who have not been economically active in any type of activity in the last 365 days, either due to lack of opportunity or by choice (Araújo, Morais and Cruz (2013); Brites *et al.* (2017)).

Table 3: Dimensions, indicators and cut-off points selected for calculating the multidimensional index (start)

Dimensions	Indicator	Individual considered deprived if...	Reference
Home conditions	Form of household lighting	Household lighting that is not electric (from the grid, generator, or solar)	Mosaner (2016); Vieira *et al.* (2017)
	Predominant material used in the construction of the building's exterior walls	The predominant material in the construction of the building's external walls is not masonry or fitted wood	Mosaner (2016)
	Has a bathroom or toilet in the house or property	There is no bathroom or toilet in the house or property	Vieira *et al.* (2017)
	Has piped water in at least one room of the house	There is no piped water in at least one room of the house	Mosaner (2016); Vieira *et al.* (2017)
	Housing occupancy status	Not owned already paid for, owned still paying or rented	Vieira *et al.* (2017)
	Predominant roofing material	Not tile, concrete slab, wood siding, zinc or salvaged wood	Araújo, Morais and Cruz (2013); Brites *et al.* (2017)
Work and income	Per capita monthly household income range	Monthly income less than $^1/_2$ minimum wage	Vieira *et al.* (2017)
	Position in the main occupation	Have not been employed with a formal job or military or statutory public servant or domestic worker with a signed work card or self-employed or are an employer	Ferreira and Marin (2016); Brites *et al.* (2017)
	Had some type of contribution to the social security institute (in any job)	There was no contribution in the reference period	Araújo, Morais and Cruz (2013)

Source: original work.

Table 3: Dimensions, indicators and cut-off points selected for calculating the multidimensional index (conclusion)

Education	Knows how to read and write	Doesn't know how to read and write	Vieira *et al*. (2017)
	Highest course completed	Did not complete at least 2nd degree	Tavares, Souza and Ponczek (2014)
	Years of study	If the person has not completed six or more years of schooling	Alkire and Santos (2010); Brites *et al.* (2017)
Control over one's environment	Daily commute time	Commute time is more than 1 hour	Alkire and Santos (2010); Brites *et al.* (2017)
	Condition of activity in the year	Is not economically active, i.e., does not have income and/or perform economic activity	Vieira *et al*. (2017)
	Families with children aged 5 to 16	When a child works	Brites *et al.* (2017)

Source: original work.

The last variable, and no less important, is to identify families with children between five and sixteen years old who work, because families that have to send their children and/or adolescents to work, whether out of necessity to help with household expenses or for other reasons, limit or even deprive them of access to human development that occurs at this age (IBGE, 2015).

Finally, it is worth noting that the sample used consists of 357,311 valid interviews in the three years studied (125,634 in 2005, 120,174 in 2011 and 111,503 in 2015) and, being a sample survey, this number represents approximately 162 million people in each of the years. To be considered valid, a response must be identified for the same person in both the people and household databases, and there must be a response rate of at least 60% for the indicators studied.

It is worth mentioning that in the three years studied, 22,000 people (considering the weights applied) were identified in only one of the databases (people or household), making it impossible to combine the 15 indicators considered in the survey. They were therefore excluded from the sample. After combining the databases (people and households), it was found that not all people had a 100% response rate for the indicators considered in the survey. To ensure that people with a high volume of non-responses did not influence the calculation of the multidimensional poverty index, it was decided to work only with people who had a 60% or more response rate – eliminating 2,800 people from the sample.

4. Analysis and discussion of results

The number of multidimensionally poor individuals for each state in the Southeast region, in 2005, is presented in Table 4, according to each cut-off point (*k*) that could be defined. In this study, as explained in the methodology, *k* has been defined as equal to seven (*k* =7), so that the individual will have to have seven or more deprivations (out of the 15 indicators) to be considered multidimensionally poor.

As can be seen in Table 4, in 2005, no individual had 14 or 15 (maximum number) deprivations and, in all states, there were individuals who had at least one deprivation. This result is consistent with the study by Brites *et al*. (2017), in which 76% of people residing in the Southeast region experienced at least one deprivation.

Table 4: Individuals identified as multidimensionally poor – number and % of the total population, in 2005

k / State	Minas Gerais	%*	Espírito Santo	%*	Rio de Janeiro	%*	São Paulo	%*	Southeast	%*
1	18,200,108	94.6	3,354,204	98.4	15,077,815	98.0	39,011,992	96.5	75,644,119	96.4
2	18,103,676	94.1	3,153,272	92.5	14,974,271	97.3	39,002,384	96.4	75,233,603	95.9
3	18,021,956	93.7	3,000,615	88.0	14,392,473	93.6	38,024,720	94.0	73,439,764	93.6
4	14,021,159	72.9	2,562,833	75.2	11,128,084	72.3	28,103,968	69.5	55,816,044	71.1
5	11,697,194	60.8	2,100,997	61.6	9,328,405	60.6	22,992,184	56.9	46,118,780	58.8
6	9,920,486	51.6	1,741,875	51.1	8,178,962	53.2	19,947,528	49.3	39,788,851	50.7
7	4,552,669	23.7	825,273	24.2	3,032,203	19.7	7,950,697	19.8	16,360,842	20.8
8	998,108	5.2	148,883	4.4	320,478	2.1	1,056,539	2.6	2,524,008	3.2
9	289,973	1.5	18,073	0.5	17,562	0.1	152,439	0.4	478,047	0.6
10	104,289	0.5	12,365	0.4	4,347	0.0	67,495	0.2	188,496	0.2
11	25,221	0.1	6,179	0.2	3,726	0.0	46,311	0.1	81,437	0.1
12	5,455	0.0	3,327	0.1	2,484	0.0	35,626	0.1	46,892	0.1
13	2,727	0.0	2,376	0.1	1,242	0.0	13,394	0.0	19,739	0.0
14	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
15	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

*Proportion of the population considered multidimensionally poor = poor individuals in *k* / total population.
Note 1: as these are sample survey data, the values presented already have the PNAD weight applied. Note 2: quantities are cumulative.
Source: original work based on microdata analyzed from PNAD.

Applying *k* = 7, 20.8% (16,360,842) of individuals in the Southeast region were considered multidimensionally poor in 2005. When analyzed by state, 23.7% (4,552,669) of the population residing in the state of Minas Gerais were considered multidimensionally poor. In Espírito Santo, 24.2% (825,273) of the population was identified in this condition.

As for Rio de Janeiro and São Paulo, 19.8% (3,032,203) and 19.7% (7,950,697) of individuals, respectively, were identified as multidimensionally poor.

In 2011, as shown in Table 5, 6.6% (5,322,378) of the population of the Southeast region was considered multidimensionally poor when observing the minimum number of 7 or more deprivations (k=7). The maximum number of deprivations identified in 2011 was 13, for the four states surveyed.

Table 5: Individuals identified as multidimensionally poor – number and % of the total population, in 2011

k / State	Minas Gerais	%*	Espírito Santo	%*	Rio de Janeiro	%*	São Paulo	%*	Southeast	%*
1	19,212,860	97.4	3,241,111	91.4	15,039,464	93.3	38,447,861	92.5	75,941,296	93.8
2	17,014,221	86.2	3,096,402	87.3	14,744,170	91.5	30,907,438	74.3	65,762,231	81.2
3	13,020,329	66.0	2,981,762	84.1	10,330,917	64.1	26,012,542	62.5	52,345,550	64.6
4	9,441,706	47.9	2,789,467	78.6	7,524,586	46.7	21,913,394	52.7	41,669,153	51.5
5	8,264,391	41.9	1,957,537	55.2	4,837,940	30.0	13,800,852	33.2	28,860,720	35.6
6	5,075,850	25.7	283,917	8.0	1,784,494	11.1	8,099,201	19.5	15,243,462	18.8
7	1,539,080	7.8	203,454	5.7	1,056,076	6.6	2,523,768	6.1	5,322,378	6.6
8	488,096	2.5	85,224	2.4	101,410	0.6	469,201	1.1	1,143,931	1.4
9	134,428	0.7	12,894	0.4	20,140	0.1	131,606	0.3	299,068	0.4
10	78,894	0.4	11,727	0.3	4,055	0.0	73,485	0.2	168,161	0.2
11	17,641	0.1	4,091	0.1	3,996	0.0	51,268	0.1	76,996	0.1
12	4,261	0.0	1,933	0.1	2,850	0.0	16,729	0.0	25,773	0.0
13	1,424	0.0	1,043	0.0	2,091	0.0	9,215	0.0	13,773	0.0
14	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
15	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

*Proportion of the population considered multidimensionally poor = poor individuals in *k* / total population.
Note 1: as these are sample survey data, the values presented already have the PNAD weight applied. Note 2: quantities are cumulative.
Source: original work based on microdata analyzed from PNAD.

Table 6 presents the number of multidimensionally poor individuals for each state and in the Southeast region, in 2015. As in 2005 and 2011, this year none of the individuals analyzed presented the maximum number of deprivations. The maximum number of deprivations recorded was 12, one less than recorded in the previous years analyzed.

From 2005 to 2015, there was a significant decrease in the number of individuals considered multidimensionally poor in the region, when k = 7. From 16.3 million people in 2005, the number of individuals in this condition decreased to 5.3 million in 2011, reaching 806.1 thousand in 2015, with this gradual reduction observed in all states. In Minas Gerais, only 1.1% (219,775) of the population was identified as multidimensionally poor in 2015. In Espírito Santo, the value was 1.0% (40,779) of the population, while in Rio de Janeiro

and São Paulo the percentage was, respectively, 0.7% (115,497) and 1.0% (430,111) of individuals, in 2015.

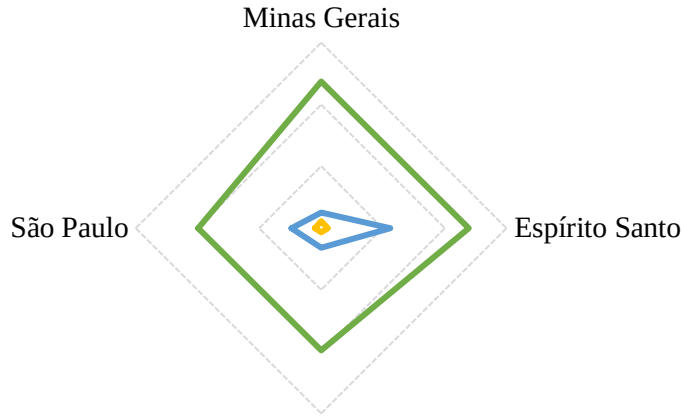
Table 6: Individuals identified as multidimensionally poor – number and % of the total population, in 2015

k / State	Minas Gerais	%*	Espírito Santo	%*	Rio de Janeiro	%*	São Paulo	%*	Southeast	%*
1	16,836,184	80.7	3,150,789	80.2	13,064,955	8.9	33,211,140	74.8	66,263,068	77.3
2	13,724,034	65.8	2,592,482	66.0	10,356,745	62.6	26,258,214	59.1	52,931,475	61.7
3	11,612,350	55.6	2,224,265	56.6	8,800,071	53.2	22,085,256	49.7	44,721,942	52.2
4	9,075,547	43.5	1,677,351	42.7	6,486,973	39.2	16,656,107	37.5	33,895,978	39.5
5	6,289,408	30.1	1,201,796	30.6	4,308,076	26.0	11,661,267	26.3	23,460,547	27.4
6	1,781,844	8.5	366,421	9.3	914,571	5.5	3,009,588	6.8	6,072,424	7.1
7	219,775	1.1	40,779	1.0	115,497	0.7	430,111	1.0	806,162	0.9
8	40,053	0.2	4,795	0.1	32,532	0.2	149,101	0.3	226,481	0.3
9	10,528	0.1	2,997	0.1	24,862	0.2	111,452	0.3	149,839	0.2
10	3,149	0.0	1,799	0.0	17,830	0.1	80,037	0.2	102,815	0.1
11	2,736	0.0	1,799	0.0	11,479	0.1	57,803	0.1	73,817	0.1
12	1,187	0.0	1,199	0.0	3,833	0.0	5,594	0.0	11,813	0.0
13	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
14	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
15	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

*Proportion of the population considered multidimensionally poor = poor individuals in *k* / total population.
Note 1: as these are sample survey data, the values presented already have the PNAD weight applied. Note 2: quantities are cumulative.
Source: original work based on microdata analyzed from PNAD.

The next steps of the Alkire-Foster method generate measures of incidence (H), intensity (A) and intensity-adjusted incidence (Mo) of poverty for each state in the Southeast region. These results can be seen in Figures 1, 2, 3 and 4, successively. The highest proportion of multidimensionally poor individuals in 2005 was located in the state of Espírito Santo, as was the case in 2011. Comparing 2005 with 2015, Minas Gerais was the state that showed the greatest reduction in the number of multidimensionally poor individuals; 0.237 in 2005, to 0.011 in 2015, a 95% reduction.

Figure 1: Incidence (H) for the states of the Southeast region, in 2005, 2011 and 2015



	Minas Gerais	Espírito Santo	Rio de Janeiro	São Paulo
H 2005	0,237	0,239	0,198	0,199
H 2011	0,025	0,112	0,032	0,048
H 2015	0,011	0,011	0,007	0,010

Source: original work based on the application of the methodology.

As for the registered Intensity (A) (Figure 2), which differs from the incidence by capturing how poor the individual is and not just whether he or she is poor, it is observed that the state of Minas Gerais, despite presenting the greatest reduction in the number of multidimensionally poor individuals, did not reduce the intensity with which poverty manifests itself in its residents.

Espírito Santo, like Minas Gerais, is a state that, within the period analyzed, also did not show a reduction in the intensity of poverty, as can be seen in Figure 2. Rio de Janeiro and São Paulo were states that showed a reduction in the number of multidimensionally poor individuals (Figure 1), as well as a reduction in the intensity of poverty (Figure 2). In the state of Rio de Janeiro, the intensity went from 0.519 in 2005 to 0.490 in 2011, and reached 0.474 in 2015; in São Paulo, the values went from 0.529 in 2005 to 0.489 in 2011 and 0.478 in 2015. In general, individuals residing in the states of the Southeast region are deprived, on average, in 50% of the indicators considered in the study.

Figure 2: Intensity (A) for the states in the Southeast region, in 2005, 2011 and 2015

	Minas Gerais	Espírito Santo	Rio de Janeiro	São Paulo
A 2005	0,488	0,487	0,519	0,529
A 2011	0,491	0,491	0,49	0,489
A 2015	0,484	0,482	0,474	0,478

Source: original work based on the application of the methodology.

When the intensity and incidence of poverty identified in the study are related, the temporal effects become clearer (Figure 3). From 2005 to 2011, there was a drastic reduction in the proportion of poor people (H), with the exception of the state of Espírito Santo, where the reduction was less significant over the period. Comparing 2005 and 2015, the reduction in the number of poor people is significant in all states. However, this result draws attention to the state of Espírito Santo, where a reduction in the number of poor people (H) is observed between years, while the intensity (A) with which this population is affected remains continuous over the three years studied.

The same movement of significant reduction in the number of poor people, accompanied by a stability in the intensity with which multidimensional poverty manifests itself, is observed for Minas Gerais.

The stability in the intensity of poverty recorded in the states of Espírito Santo and Minas Gerais, is partly due to the increase in the number of deprivations that individuals begin to suffer, i.e., multidimensional poverty covers a smaller number of people in 2015 when compared to 2005 and 2011, at the same time that, as in 2005, it severely affects those in poverty.

São Paulo and Rio de Janeiro were states that, correlating intensity (A) and number of poor people (H), showed significant reductions in both composite indicators. For example, in 2005 these states had the highest registered intensities, in 2011 the intensity was close to the other states, and in 2015 it was lower, demonstrating a balance in the

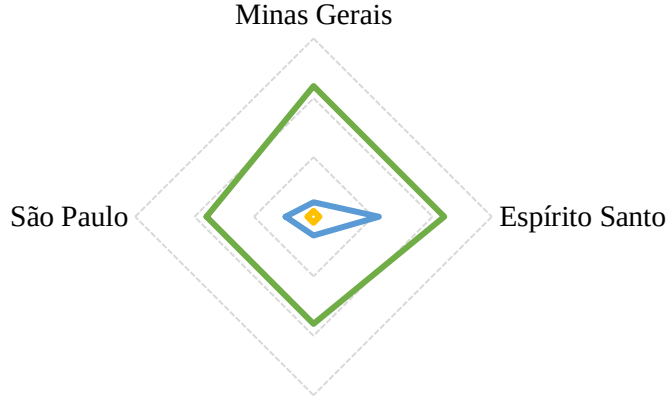
reduction of multidimensional poverty while not only reducing the number of multidimensionally poor individuals as well as the severity with which those still characterized as poor are affected.

Figure 3: Intensity (A) vs. Incidence (H), by state

Source: original work based on the application of the methodology.

The analysis of the Multidimensional Poverty Index, which represents the Incidence Adjusted to Intensity (Mo), showed that the highest concentration of poverty in 2005 was recorded in the states of Minas Gerais and Espírito Santo, followed by São Paulo and Rio de Janeiro (Figure 4). In 2011, among all four states analyzed, the state of Espírito Santo maintained the highest index (0.055), while the other states showed more significant reductions. Comparing 2005 and 2015, all states showed a reduction in the index, although no significant decrease in intensity was observed. São Paulo and Rio de Janeiro were the states with the lowest poverty index (Mo) in two of the three years analyzed, 0.090 in 2005 and 0.005 in 2015 for both states.

Figure 4: Incidence adjusted to intensity (Mo) for the states of the Southeast region, in 2005, 2011 and 2015



	Minas Gerais	Espírito Santo	Rio de Janeiro	São Paulo
Mo 2005	0,110	0,110	0,090	0,090
Mo 2011	0,012	0,055	0,016	0,023
Mo 2015	0,005	0,005	0,005	0,005

Source: original work based on the application of the methodology.

In analyzing the factors that may have caused this result, it was noted that Rio de Janeiro had a high coverage of basic services, such as electricity and drinking water services within the analyzed period. According to the Federal Government Transparency Portal (2017), it was also the second state in the Southeast region, in 2015, to receive the largest income transfer per capita via Bolsa Família, which may have directly contributed to the low-income population having greater access to these services.

Looking at the dimensions that make up the multidimensional poverty index, this significant reduction over the ten-year period analyzed was mainly due to the reductions in deprivation observed in the dimensions of Work and income, Education and Control over one's environment (Table 7). In the Control over one's environment dimension, all indicators for all states demonstrated a reduction in the number of people experiencing

deprivation, with particular focus on “activity status during the year”, indicating the reduction in the number of people without income and/or economic activity, and the reduction in the number of families with children aged 5 to 16 carrying out some activity.

Following the introduction of the Bolsa Família Program in 2003, income transfers to the population increased. In return for these transfers, beneficiaries were required to guarantee that their children would attend school regularly. This may have contributed to the reduction observed in the indicator "families with children aged 5 to 16 carrying out some activity". The greatest reductions were observed in the states of Rio de Janeiro (-5.57 percentage points (p.p.)), Minas Gerais (-3.07 p.p.), and São Paulo (-2.01 p.p.), Minas Gerais (-5.42 p.p.), Espírito Santo (-3.07 p.p.), and São Paulo (-2.01 p.p.).

In the Work and income and Education dimensions, we note a reduction in the number of individuals with a monthly per capita household income of less than half the minimum wage and a decline in the number of people who cannot read and write. The state of Minas Gerais (-6.07 p.p.) experienced the most significant decline in the 2005-2015 comparison for the indicator “income range of monthly household income per capita”, followed by São Paulo (-4.27 pp), Rio de Janeiro (-3.77 pp) and Espírito Santo (-2.79 pp). For the indicator “doesn’t know how to read and write”, the order remains the same: Minas Gerais (-2.73 pp) also showed the most significant decline in the period, followed by São Paulo (-2.34 pp), Rio de Janeiro (-2.07 pp) and Espírito Santo (-1.77 pp).

While the results demonstrate a significant decline in multidimensional poverty between 2005 and 2015, some indicators in various states indicate an increase in the number of individuals facing deprivation. Most of these indicators are included in the Household Conditions dimension. The indicator “inadequate home lighting” saw an increase in two of the four states (Rio de Janeiro: 2.18 pp; and Espírito Santo: 0.43 pp), which shows that from 2005 to 2015 there was an increase in the number of individuals who began to live in environments lacking this service. The use of inadequate material in the construction of walls and the roofing of homes represented an increase in deprivation for residents in Espírito Santo (1.67 pp and 1.71 pp, respectively) and in São Paulo (1.30 pp and 1.31 pp). The lack of access to a bathroom or toilet in the home increased in São Paulo (1.82 pp), while the lack of access to piped water in at least one room in the home increased in Rio de Janeiro (3.07 pp).

In summary, the states of Minas Gerais and Espírito Santo demonstrated improvement in their indicators during the period under review. This was reflected in a reduction in the incidence of poverty in these states, although the intensity with which poverty affects people living wasn’t significantly reduced. In contrast to the developments observed in these two states, São Paulo and Rio de Janeiro witnessed a gradual improvement in eleven of the fifteen indicators (Table 7), resulting in a decline not only in incidence but also in intensity.

Table 7: Variation in deprivation of indicators in the Southeast region, 2005-2015 (% and pp)

Variable	Minas Gerais			Espírito Santo			Rio de Janeiro			São Paulo			Southeast		
	2005	2015	Var. (pp)	2005	2015	Var. (pp)	2005	2015	Var. (pp)	2005	2015	Var. (pp)	2005	2015	Var. (pp)
Home conditions															
Inadequate home lighting	3.8%	2.9%	-0.9	1.5%	1.9%	0.4	4.0%	6.2%	2.1	5.4%	4.8%	-0.6	4.6%	4.5%	-0.1
Inadequate predominant material in the construction of the external walls of the building	2.6%	1.9%	-0.7	1.5%	3.2%	1.6	6.2%	4.8%	-1.4	4.1%	5.4%	1.3	4.1%	4.4%	0.3
There is no bathroom or toilet in the house or property	2.2%	1.8%	-0.4	2.4%	1.8%	-0.5	2.6%	2.2%	-0.4	3.3%	5.2%	1.8	2.9%	3.7%	0.7
There is no piped water in at least one room of the house	4.4%	2.6%	-1.8	2.4%	1.4%	-1.0	1.6%	4.6%	3.0	6.8%	4.8%	-2.0	5.1%	4.1%	-0.9
Housing occupancy status	2.4%	3.7%	1.3	6.5%	4.5%	-2.0	8.3%	6.1%	-2.2	9.8%	6.4%	-3.4	7.6%	5.6%	-2.0
Inadequate predominant roofing material	3.1%	2.1%	-1.0	1.9%	3.6%	1.7	5.0%	3.9%	-1.1	3.6%	4.9%	1.3	3.7%	3.9%	0.3
Work and income															
Per capita monthly household income range	8.8%	2.7%	-6.0	4.8%	2.0%	-2.8	8.2%	4.4%	-3.7	9.4%	5.1%	-4.2	8.8%	4.3%	-4.6
Position in the main occupation	6.3%	3.1%	-3.2	7.6%	3.3%	-4.3	7.8%	4.0%	-3.7	7.9%	6.0%	-1.7	7.5%	4.9%	-2.7
Did not have any type of contribution to social security	6.4%	7.7%	1.3	5.4%	4.8%	-0.6	9.0%	6.5%	-2.5	8.0%	9.5%	1.5	5.8%	6.4%	0.6
Education															
Doesn't know how to read and write	5.9%	3.2%	-2.7	3.8%	2.1%	-1.7	4.1%	2.0%	-2.0	5.3%	3.0%	-2.3	5.2%	2.9%	-2.4
Highest course completed	6.3%	3.1%	-3.1	5.4%	3.4%	-1.9	4.5%	5.0%	0.5	6.2%	2.5%	-3.7	5.5%	2.8%	-2.7
Years of study	2.3%	2.9%	0.6	3.2%	2.9%	-0.2	5.2%	4.0%	-1.1	6.3%	5.3%	-0.9	5.0%	4.4%	-0.6
Control over one's environment															
Daily commute time	7.4%	4.2%	-3.2	5.6%	4.0%	-1.5	14%	12%	-2.2	11.5%	9.8%	-1.6	9.6%	7.4%	-2.1
Activity status during the year	7.1%	1.9%	-5.2	7.1%	3.1%	-4.0	11.1%	6.6%	-4.5	12.9%	6.1%	-6.7	8.5%	2.6%	-5.8
Families with children aged 5 to 16 carrying out some activity	7.5%	2.1%	-5.4	4.9%	1.8%	-3.0	8.0%	2.5%	-5.5	5.2%	3.2%	-2.0	6.4%	2.8%	-3.6

Source: original work based on microdata analyzed from PNAD.

Lastly, the analysis of poverty using the multidimensional method and disaggregated by indicators, as shown in Table 7, allows us to explain not only the variations in poverty rates over time, but also to identify the factors that characterize this complex phenomenon. The data reveals that the indicators of greatest deprivation vary between states and within them over time.

The data in Table 8 lends further support to this conclusion. It shows that education and work/income have had a greater impact, with a notable decline in the illiteracy rate and an increase in real average income in R$. This has led to the impressive results observed in 2015. The average income for all jobs across all states has increased by over 100%, reflecting a reduction in income inequality indicators such as the Gini index. As Sen (2000) observed, while income is not the sole means of reducing poverty, it remains a crucial dimension of this phenomenon.

While results varied between states, the indicators of access to a bathroom at home and running water (Table 7) showed improvement in the period, a result corroborated by the increase in coverage in the basic sanitation service (Table 8), contributing to the reduction of multidimensional poverty.

Table 8: Evolution of social indicators and basic data for states in the Southeast region, 2005, 2011, and 2015

	Gini Index	Basic Sanitation (%)	Illiteracy rate (%)*	Average real income from all jobs (R$)**	Mo
MG 2005	0.525	97.10	11.80	R$ 850	0.110
MG 2011	0.499	98.96	8.58	R$ 1,119	0.012
MG 2015	0.491	99.22	7.42	R$ 1,218	0.005
ES 2005	0.555	98.88	11.07	R$ 934	0.110
ES 2011	0.497	99.60	7.57	R$ 1,191	0.055
ES 2015	0.488	99.74	7.08	R$ 1,225	0.005
RJ 2005	0.555	99.73	6.61	R$ 1,171	0.090
RJ 2011	0.530	99.65	4.84	R$ 1,358	0.016
RJ 2015	0.530	99.78	4.23	R$ 1,524	0.005
SP 2005	0.528	99.78	7.42	R$ 1,253	0.090
SP 2011	0.485	99.81	5.01	R$ 1,457	0.023
SP 2015	0.482	99.89	4.75	R$ 1,524	0.005

*people aged 5 and over.

**values corrected by INPC.

Source: IBGE – PNAD statistics and PNAD microdata. Original work.

In Minas Gerais, the main deprivations, in 2005, were in the indicators “per capita monthly household income range” (8.84%) and “Families with children aged 5 to 16 years carrying out some activity” (7.52%), while in 2015 the main deprivations became “Did not have any type of contribution to social security” (7.71%) and “Daily commute time” (4.23%).

In Espírito Santo, "Position in the main occupation" (7.64%) and "Activity status during the year" (7.18%) were the main deprivations recorded in 2005, indicating that individuals were engaged in informal or unremunerated work. In 2015, "Did not have any type of contribution to social security" (4.83%) and "Housing occupancy status" (4.56%), if living in rented or improvised homes, were the main deprivations.

In São Paulo, the main deprivations in 2005 were "Activity status during the year" (12.95%) and "Daily commute time" (9.86%), while, in 2015, "Daily commute time" (11.53%) became the main deprivation, followed by "Didn't have any type of contribution to social security" (9.54%).

On the other hand, in Rio de Janeiro, the main deprivations remained the same between the years analyzed: "Daily commute time", with 14.60%, in 2005, and 12.40%, in 2015, of the population; and "Activity status during the year", with 11.10%, in 2005, and 6.60%, in 2015, of the population without income and/or economic activity.

In terms of comparison, the results achieved in this study are similar to those of other studies mentioned in the literature review, such as Serra (2017) and Cunha and Marcelino (2023). These studies also demonstrated a reduction in multidimensional poverty over time. However, it was also observed that, although education indicators improved in the period, they continue to be a major concern regarding deprivation for individuals, as highlighted by Brites *et al.* (2017), Vieira *et al.* (2017) and Cunha and Marcelino (2023).

This information provides crucial insight for the development of effective public policies to combat poverty. While a universal foundation of income and education access serves as a crucial starting point for federal programs, the reduction of poverty will require the implementation of state-level public policies that consider each region's unique characteristics, such as access to better urban mobility in the large centers of São Paulo, Rio de Janeiro, and Minas Gerais; access to better housing conditions in Espírito Santo; and even improved access to formal work and public welfare, through professional qualification.

In light of the aforementioned studies and, in particular, the insights of Amartya Sen (2000), as well as the data presented here, there is a clear need for policies that aim to reduce inequality across all dimensions of poverty, extending beyond income transfer programs.

5. Conclusion

In light of the evolving characterization of poverty over time, we have developed a definition of the concept that encompasses the social complexity of the phenomenon in Southeast Brazil. This characterization was based on the definitions of Amartya Sen (2010), who understands that poverty can be defined as deprivation of basic capabilities that go beyond income conditions.

Thus, taking this debate into account, the Alkire-Foster (2009) method was adapted to align with the specific context under examination. Utilizing data from the public-use microdata of the National Household Sample Survey (PNAD) for the years 2005, 2011, and 2015, the Multidimensional Poverty Index (IMP) was developed for the states within the Brazilian's Southeast region. The index is comprised of four dimensions, each with fifteen indicators, and was analyzed for all states in the region within the defined time frame.

The method applied offers several advantages over methods based solely on monetary income. It considers the different dimensions that make up the complex phenomenon of poverty, providing a more comprehensive understanding of the issue. This methodology also enabled the disaggregation of the poverty measure by indicator, allowing for the identification of the dimension or indicator with the greatest impact on poverty incidence. Furthermore, the methodology employs two cut-off lines: the first for each indicator and the second for individual classification as deprived or non-deprived. This enables the identification of those who are multidimensionally poor.

The results demonstrate a reduction in poverty levels across all Southeast region states in 2015, with Minas Gerais and Espírito Santo showing particularly notable improvements compared to 2005. In 2015, all states maintained their relative positions in the multidimensional poverty index. The states of Espírito Santo, Minas Gerais, and São Paulo, respectively, had the highest multidimensional poverty indices in the three years analyzed.

Regarding the elements that comprise the multidimensional index, the variables identified as being most depriving for individuals residing in Minas Gerais were "per capita monthly household income range" (8.84% in 2005 and 2.77% in 2015) and "families with children aged 5 to 16 years old carrying out some activity" (7.52% in 2005 and 2.10% in 2015). In Espírito Santo, the main indicators were "position in the main occupation" and "activity status during the year" (7.64% in 2005 to 3.34% in 2015; and 7.18% in 2005 to 3.19% in 2015). In São Paulo "daily commute time" (11.53% in 2005 and 9.86% in 2015) and "housing occupancy status" (9.88% in 2005 and 6 .42% in 2015) were the main shortcomings. Finally, Rio de Janeiro stood out in two key indicators: "daily commute time" (10.62% in 2005 and 8.49% in 2015) and "Activity status during the year " (9.1% in 2005 and 6.60% in 2015).

Both Rio de Janeiro and São Paulo had the lowest poverty rates in 2005 and 2015. However, these are also the states that saw an increase in the intensity of poverty in the period analyzed. The study showed that the greatest deprivations are not linked solely to income, but rather to control over one's environment.

It is clear that public managers must address the ongoing issue of poverty in the Southeast, a region with a strong economy, but which has a sizeable proportion of its population facing economic difficulties. Actions based on local diagnoses that incorporate heterogeneities are capable of generating more efficient results. This is evidenced by the individual results achieved in this study.

During the course of this study, some information gaps were identified that could be addressed to further enhance the analysis. The PNAD microdata lacks a great deal of information on health, such as whether the individual has needed medical or dental care recently, how many times and whether they received it. This creates an opportunity for future research using databases that contain information on this subject.

Still regarding future research, the results presented here indicate a reduction in poverty between 2005, 2011 and 2015, a period in which there was average economic growth of 3.8% p.a. The expansion of anti-poverty policies, coupled with economic stagnation and recession in 2014 and 2015, respectively, prompts the question of the impact of macroeconomic variables and public policies on the multidimensional poverty of the Brazilian population.

Poverty is a social issue that limits the human development of millions of people, depending on the opportunities available to them. In light of the recent changes in the country, there is a likelihood of a decline in social indicators, potentially reversing the reduction in poverty observed in this study. This could have a significant impact on the most vulnerable population, leading to an unsatisfactory minimum standard of living.

References

ALKIRE S.; SETH, S. Multidimensional Poverty and BPL measures in India: A comparison of methods. **Oxford Poverty & Human Development Initiative,** University of Oxford, Working Paper, v. 15, p. 1-49, 2009.

ALKIRE, S., FANG, Y. Dynamics of multidimensional poverty na unidimensional income poverty: An evidence of stability analysis from China. **Social Indicators Research**, p. 1-57, 2018.

ALKIRE, S.; FOSTER, J. Counting and multidimensional poverty measurement. **Oxford Poverty & Human Development Initiative**, University of Oxford, Working Paper, v. 32, 2009.

ALKIRE, S.; FOSTER, J. Counting and multidimensional poverty measurement. **Journal of Public Economics**. v. 95, n. 8, p. 476-487, 2011.

ALKIRE, S.; ROCHE, J. Beyond Headcount: Measures that Reflect the Breadth and Components of Child Poverty. **SSRN Electronic Journal**. v. 95, n. 7, p. 476-487, 2011. DOI:10.2139/ssrn.2118547

ALKIRE, S.; SANTOS, M. E. Acute Multidimensional Poverty: A New Index for Developing Countries. **Oxford Poverty & Human Development Initiative,** University of Oxford, Working Paper, v. 38, p. 1-139, 2010.

ANAND, S.; SEN, A. Concepts of human Development and poverty: a multidimensional perspective. New York: United Nations Development Programme, 1997.

ARAÚJO, J. A.; MORAIS, G. S.; CRUZ, M, S. Estudo da pobreza multidimensional no estado do Ceará. **Revista Ciências Administrativas**. v. 19, n. 1, p. 85-120, 2013.

BANCO MUNDIAL (EUA). Relatório sobre o desenvolvimento mundial (2000/2001): luta contra a pobreza. Washington, 2001.

BRASIL. Base Nacional Comum Curricular: Educação é a Base. Brasília, MEC/CONSED/UNDIME, 2017.

BRASIL. Portal da transparência. Transferência de recursos por programa. Disponível em: <http://www.transparencia.gov.br/PortalTransparenciaTRProgramaPesquisaPrograma.asp?Exercicio=2015&Pagina=2> Acesso em: 10 setembro 2017.

BRITES M.; MOURA, A. C.; FERREIRA, T. R. S.; MARIN, S. R.; LANZA, T. Pobreza feminina nas grandes regiões brasileiras (2012): uma aplicação do método Alkire Foster (AF). **Revista Brasileira de Economia de Empresas**, v. 17, n. 1, p. 81-100, 2017.

BRITES, M.; MARIN, S. R.; ROHENKOHL, J. E. Pobreza relativa multidimensional no Rio Grande Do Sul (2010): aplicação dos conjuntos fuzzy. In: ENCONTRO DE ECONOMIA DA REGIÃO SUL, 18, 2015, Porto Alegre. Anais... Fortaleza, 2015. Disponível em: < https://www.ufrgs.br/fce/event/xviii-encontro-de-economia-da-regiao-sul/>. Acesso em 5 setembro 2017.

CASTELAR, P. U. C.; TABOSA, F. J. S.; IRFFI, G. D. Impacto do crescimento econômico e da desigualdade de renda na pobreza do Brasil. In: ENCONTRO REGIONAL DE ECONOMIA, 18, 2013, Fortaleza. Anais... Fortaleza, 2013. Disponível em: < http://www.caen.ufc.br/wp-content/uploads/2013/06/impacto-do-crescimento-economico-e-da-desigualdade-de-renda-na-pobreza-do-brasil.pdf>. Acesso em 20 setembro 2017.

COSTA, B. L. D.; COSTA, M. M. Concepções de pobreza e operacionalização do Índice de Pobreza Multidimensional para Minas Gerais. **Cadernos da Escola do Legislativo**. v. 16, n. 25, p. 75-99, 2014.

COSTA, R. F. R.; COSTA, G. C. Pobres no campo, ricos na cidade? Uma análise multidimensional da pobreza. **Revista de Economia e Sociologia Rural**, v. 54, n. 3, p. 537-560, 2016. DOI: http://dx.doi.org/10.1590/1234-56781806-94790540308

CRESPO, A. P. A., GUROVITZ, E. A pobreza como um fenômeno multidimensional. **RAE-eletrônica**, São Paulo, v. 1, n. 1, p.2-12. 2002. DOI: https://doi.org/10.1590/S1676-56482002000200003

CUNHA, M. S.; MARCELINO, G. C. Pobreza multidimensional no território brasileiro: uma análise para domicílios rurais e urbanos. **Textos de Economia**, Florianópolis, v. 26, n. 1, p. 01-27, 2023. DOI: https://doi.org/10.5007/2175-8085.2023.e90525

DINIZ, M. B.; DINIZ, M. M. Um indicador comparativo de pobreza multidimensional a partir dos objetivos do desenvolvimento do milênio. **Economia Aplicada**, v. 13, n. 3, p. 399-423, 2009. DOI: https://doi.org/10.1590/S1413-80502009000300003

DOTTER C.; KLASEN S. The Multidimensional Poverty Index: Achievements, Conceptual and Empirical Issues. **Human Development Report Office**. Occasional paper. p. 01-43. 2014.

ESTENSSORO, L. E. R.; Capitalismo, desigualdade e pobreza na América Latina. 2003. 286 f. Tese (Doutorado em Sociologia). Faculdade de Filosofia, Letras e Ciências Humanas, Universidade de São Paulo, São Paulo, 2003.

FAHEL, M. C. X.; LEITE, G. P.; TELES, L. R. Pobreza Multidimensional no estado de Minas Gerais: uma mensuração para além da renda. **Revista Brasileira de Monitoramento e Avaliação**, v. 8, p. 50-69, 2014. DOI: https://doi.org/10.4322/rbma201408004

FERREIRA, T. R. S.; MARIN, S. R. Uma aplicação do método Alkire Foster (AF) nas grandes regiões brasileiras nos anos de 2001 e 2011. **Pesquisa & Debate**, v. 27, n. 1, p. 174-192, 2016.

FERREIRA T. R. S. FERREIRA, T. R. S. Pobreza Multidimensional Nos Estados Brasileiros De 2003 a 2015: Mensuração E Determinantes. 2018. 84 f. Dissertação de Mestrado. Universidade Federal do Espírito Santo. Espírito Santo. 2018.

IBGE. Estudos e Pesquisas Estruturais. 2017. Disponível em: <http://www.ibge.gov.br/home/estatistica/-pesquisas/pesquisa_resultados.php?id_pesquisa=40> Acesso em: 08 setembro de 2018.

IBGE. Séries históricas, síntese de indicadores sociais 2001 – 2015. 2015. Disponível em: <https://www.ibge.gov.br/estatisticas-novoportal/sociais/rendimento-despesa-e-consumo/9127-pesquisa-nacional-por-amostra-de-domicilios.html?=&t=series-historicas> Acesso em: 16 setembro de 2018.

IJSN. Compêndio distribuição de Renda - PNAD 2015. 2016. Disponível em: <http://ijsn.es.gov.br/artigos/4705-compendio-distribuicao-de-renda-pnad-2015>. Acesso: 11 de janeiro de 2019.

IJSN. Espírito Santo: Produto Interno Bruto (PIB) 2016. 2018. Disponível em: <http://ijsn.es.gov.br/artigos/5190-produto-interno-bruto-pib-estadual-2016>. Acesso: 11 de janeiro de 2019.

KAGEYAMA, A.; HOFFMANN, R. Pobreza no Brasil: uma perspectiva multidimensional. **Economia e Sociedade**, v. 15, n. 1, p. 79-112, 2006.

LACERDA, F. C. C. A pobreza na Bahia sob o prisma multidimensional: uma análise baseada na abordagem das necessidades básicas e na abordagem das capacitações. 2009. 212 f. Dissertação de Mestrado. Instituto de Economia, Universidade Federal de Uberlândia. Minas Gerais, 2009.

MARIN, S. R.; OTTONELLI, J. Medida multidimensional de pobreza: um exercício em Palmeira das Missões - RS. **Revista Redes**, v. 13, n. 3, p. 241-265. 2008. DOI: https://doi.org/10.17058/redes.v13i3.470

MATTOS, E. J. Pobreza Rural no Brasil: Um enforque comparativo entre a abordagem monetária e a abordagem das capacitações. 2006. 151 f. Dissertação (Mestrado em Desenvolvimento Rural) – Programa de Pós-Graduação em Desenvolvimento Rural, Universidade Federal do Rio Grande do Sul, Porto Alegre, 2006.

MOSANER, M. S. Pobreza infantil no Brasil: aplicação da metodologia Alkire-Foster de mensuração de pobreza multidimensional. **Economia Aplicada**, v. 20, n. 4, p. 489-507, 2016. DOI: http://dx.doi.org/10.1590/1413-8050/ea156652

OTTONELLI, J.; MARIN, S. R.; PORSSE, M., GLASENAPP, S. A importância das medidas multidimensionais de pobreza para a administração pública: um exercício em Palmeira das Missões (RS). **Revista de Administração Pública**, v. 45, n. 3, p. 837- 859, 2011. DOI: https://doi.org/10.1590/S0034-76122011000300012

PNAD. Microdados da PNAD 2005, 2011 e 2015. Disponível em: <http://www.ibge.gov.br/home/estatistica/populacao/trabalhoerendimento/pnad2014/microdados.shtm> Acesso em: 22 junho 2017.

RAVALLION, M. Poverty Lines in Theory and Practice. Living Standards Measurement Study, Working Paper, Washington, The World Bank, n. 133, 1998.

RAVALLION, M.; CHEN. S. Measuring Pro-Poor Growth. Economics Letters. v. 78, n. 1, p. 93-99, 2003. DOI: https://doi.org/10.1016/S0165-1765(02)00205-7

ROCHA, S. Pobreza no Brasil: afinal, de que se trata? ed. 3. Rio de Janeiro: Editora FGV, 2003.

SALAMA, P.; DESTREMAU, B.; Medidas de pobreza desmedida: economía política de la distribuición del ingreso. Santiago: LOM Ediciones, 2002.

SANTOS, M. Pobreza urbana. São Paulo: Hucitec, 2009.

SEN, A. Desenvolvimento como liberdade. São Paulo: **Companhia das Letras**, 2000.

_____. Pobreza e fomes - um ensaio sobre direitos e privações. **Terramar**, 1999. 355p.

_____. Poverty in the human development perspective: concept and measurement. **Human Development Report**, New York, p. 15-23, 1997.

_____. Capabilities, lists, and public reason: continuing the conversation. Feminist Economics, v. 10, n. 3, p. 77-80, 2004. Disponível em: <https://doi.org/10.1080/1354570042000315163>. Acesso em: 25 set. 2020.

SERRA, A. S. Pobreza multidimensional no Brasil rural e urbano. 2017. 161p. Tese (Doutorado em Desenvolvimento Econômico) – Instituto de Economia, Universidade Estadual de Campinas, Campinas, 2017.

SILVA, A. F.; SOUZA, J. S.; ARAÚJO, J. A. Evidências sobre a pobreza multidimensional na região Norte do Brasil. **Revista de Administração Pública**. v. 51, n. 2, p. 219-239, 2017. DOI: https://doi.org/10.1590/0034-7612160773

SILVA, M. O. S. Pobreza, desigualdade e políticas públicas: caracterizando e problematizando a realidade brasileira. **Rede de Revistas Científicas de América Latina y el Caribe**, España y Portugal. p. 155-163, 2010. DOI: https://doi.org/10.1590/S1414-49802010000200002

SUPPA, N. Towards a multidimensional poverty index for Germany: Parents' employment and children's school success in Germany, SOEP papers on Multidisciplinary Panel Data Research, n. 736, 2015.

TABOSA, F. J. S.; ARAÚJO, J. A.; KHAN, A. S.; MAYORGA, R. D. Relacionamento de preços dos principais produtos comercializados entre o mercado produtor de Tianguá e mercados atacadistas de Fortaleza e Teresina. **Revista Econômica do Nordeste**, v. 43, n. 1, p. 171-185, 2012.

TAVARES, P. A.; SOUZA, A. P. F.; PONCZEK, V. P. Uma análise dos Fatores associados à frequência ao ensino médio na Educação de Jovens e Adultos (EJA) no Brasil. **Pesquisa e Planejamento Econômico**, v. 44, p. 7-35, 2014.

UNICEF. Pobreza na infância e na adolescência. Brasília (DF). Escritório da Representação do UNICEF no Brasil, 2018.

VIEIRA, C. de A.; KUHN, D. D.; MARIN, S. R. Método Alkire-Foster: uma aplicação para a medição de pobreza multidimensional no Rio Grande do Sul (2000-2010). **Revista Planejamento e Políticas Públicas**, n. 48, p. 263-295. 2017.

WORLD BANK (EUA). Introduction to poverty analysis. Washington, 2005.