

# Cost of Inaction of the Early Childhood Programs for Brazil





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# 1 Introduction

According to the Center on the Developing Child at Harvard University (2007) early experiences affect the quality of the development of brain structure by establishing either a sturdy or a fragile foundation for the learning, health, and behavior that follow. Furthermore, changes in the period of Early Childhood reflect on the potential development achieved and impact productivity and financial returns in adult life (Campbell et al., 2008).

To this extent, the importance of investing in EC is unquestionable. Moreover, this also means the assurance of children's rights<sup>1</sup>, human development, social demand for child care, and economic returns to individuals, governments, and society. In addition, it is possible to insert EC in the context of social justice, especially when the service offered is provided to all children with the same level of quality, giving the same opportunity to all individuals, regardless of their characteristics such as race and socioeconomic level. As a result, policymakers all over the world have been working to ensure public policies focused on EC. These efforts are mainly focused on three areas: i) education, ii) health, and iii) social care.

The international literature points out three types of intervention in education: i) compensatory small-scale; ii) compensatory large-scale; iii) universal program.

- i) Compensatory interventions focus on vulnerable groups. Usually, these programs intend to promote not only educational skills but also socioemotional and executive function skills. The *Carolina Abecedarian* and *High/Scope Perry Pre-School Project* are examples of this type of intervention. The results suggest that this type of intervention can present a high return on the investment<sup>2</sup>; however, these programs are focused on specific groups and samples, compromising the external validity of these interventions.
- ii) Compensatory large-scale interventions are similar to small-scale interventions but are offered to more people. One example of a large-scale compensatory intervention is the *Head Start*. The results show a positive effect on cognitive development and social skills<sup>3</sup>; moreover, in the long run, gains in income and educational levels, and crime reduction<sup>4</sup>.
- iii) Universal programs are interventions that do not focus on a specific group; that is, they are freely accessible to everyone. Therefore, it becomes more difficult to measure the impact of this type of program. Brazilian preschools are an example of this type of intervention, as they aim to enroll 100% of children who are 4 and 5 years old.

With regards to health, a heavy literature body shows that nutrition is a key factor in physical and

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<sup>1</sup>In Brazil, for instance, since the Constitution of 1988 the child is settled as an individual of rights.

<sup>2</sup>See Blau and Currie (2006) and Campbell et al. (2001).

<sup>3</sup>See Blau and Currie (2006).

<sup>4</sup>See Garces et al. (2002).

cognitive development (Ruel and Hoddinott, 2008). In addition, lots of studies show that nutrition in EC can also affect outcomes in adulthood, such as productivity, school achievement and enrollment, and the number of pregnancies (Hoddinott et al., 2008, 2013; Nandi et al., 2018). Undernutrition can be defined as “inadequate food and nutrient intake and poor health” (Ruel and Hoddinott, 2008), so the programs that aim to tackle this issue should also focus on the composition of the nutrients offered to the individuals receiving these interventions. According to the World Bank (2005), the target of these programs should be pregnant women and children up to two years old, as poor nutrition would cause adverse and irreversible effects on several aspects of life and development. A wide evaluated program in Guatemala<sup>5</sup> shows that male children less than 3 years old who receive more nutritional components have higher hourly wages later in life, and this effect is larger when considering only children between 0 to 2 years old (Hoddinott et al., 2008). A Peruvian intervention shows that a conditional cash transfer program<sup>6</sup> related to child nutrition and health care to pregnant women is effective to improve nutritional status and cognitive outcomes, but only when children exposed to it are less than 4 years old (Sánchez et al., 2020).

When it comes to social care, one of the main issues to be addressed is the scope of different sets that this type of intervention can present. One of the most known interventions of this type in the developed world is the Nurse-Family Partnership, a program designated for low-income mothers in the United States who have had no previous live births. The results show that each dollar received creates up to US\$5.70 worth of value to the moms, families, and communities served<sup>7</sup>. In the developing countries, one of the first follow-up studies is the one by Gertler et al. (2014), which presents a low-cost EC intervention conducted in Jamaica from 1986 through 1988 and one of the main findings is that children in the group treated earned 25% more as adults than the children who received no treatment. Despite being diverse, some of the main issues established about assistance interventions are that: (i) these interventions for low-income families have the greatest effect when programs employ graduate professionals (Olds, 2002); (ii) ideally, they should start in the prenatal period and extend to the first grade of elementary school (Tolani et al., 2006); and (iii) participants classified as belonging to higher risk groups (e.g., low-income families) obtain better results than participants at lower risk (Olds, 2002, 2006; Kitzman, 2004).

This brief introduction brings an overall understanding of these three fields of interventions and some of the characteristics they should have in order to be effective. Following this introduction, the next section shows an overview of Early Childhood in Brazil, giving a context, briefly stating the main laws and policies, followed by a literature review. After that, the methodology and the results are presented.

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<sup>5</sup>This program randomized a nutrition supplement between two villages.

<sup>6</sup>Juntos is a program to reduce poverty that has 3 conditionalities: 1) health and nutrition care to children up to 59 months; 2) health care to pregnant women; 3) children from 6 to 14 years old must be enrolled at school with determined absence criteria (Sánchez et al., 2020).

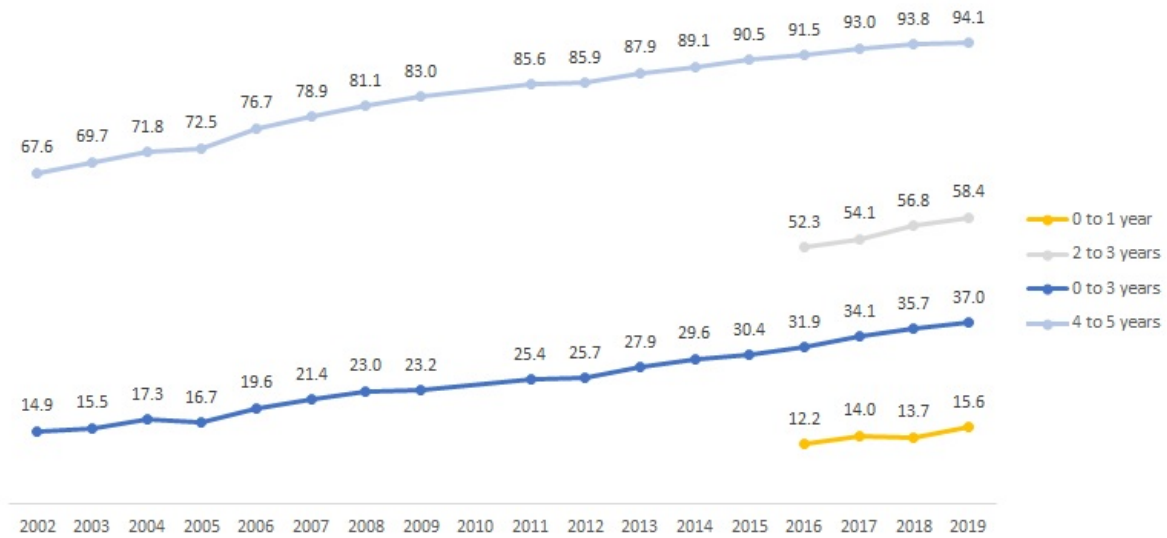
<sup>7</sup>Nurse-Family Partnership - Annual Report (2019).

## 2 Overview

### 2.1 Early Childhood Education

In Brazil, around 9 million children out of 15 million were enrolled in preschools or daycare centers in 2019<sup>8</sup>. Among children aged between 0 and 3 years old, the enrollment rate was 37 percent, equivalent to 3.8 million children. Among children aged from 4 to 5 years (preschool), the enrollment rate was 94.1 percent, adding up to 5 million children. Figure 1 shows the evolution of Early Childhood Education (ECE) access in Brazil.

Figure 1: Percentage of children enrolled in Early Childhood Education in Brazil



Source: Adapted from TODOS PELA EDUCAÇÃO (2019), TODOS PELA EDUCAÇÃO (2020), and TODOS PELA EDUCAÇÃO (2021).

However, the access to ECE was not always like this. Since the most recent change in the Brazilian Constitution in 1988, the country has been assuming significant steps for building public policies with different sectors focused on EC. The document, for the first time, settled the child as an individual of rights. Moreover, it established that the government is responsible to offer center-based daycare and preschool for all children from zero to 6 years old in all the national territory and added an educational intention to the program, as previously the daycare centers had a social care focus.

Despite these institutional advances, only in 1996 with the National Educational Bases and Guidelines Law (*Lei de Diretrizes e Bases da Educação Nacional* [LDB]) this right of children to access the education system established by the Brazilian Constitution is regulated. It was settled that ECE should be the first step of the basic education system in Brazil and the municipalities were responsible “to provide, accredit

<sup>8</sup>According to the analysis of *Todos pela Educação* using PNAD’s (Pesquisa Nacional por Amostra de Domicílios) data.

and monitor” the service<sup>9</sup>. Brazilian ECE offers two services: i) center-based daycare: from 0 to 3 years and 11 months; and ii) preschool: from 4 years to 5 years and 11 months. Both center-based daycare and preschool are universal programs, which means that they are freely accessible to everyone. Although there are two services in ECE, only the second is mandatory in Brazil as established with a constitutional amendment in 2009<sup>10</sup>.

It is worthy to mention that although only the preschool is mandatory in Brazil, the National Education Plan (2014-2024) established the Goal 1 that Brazil should ”Universalize, by 2016, ECE in preschool for children from 4 to 5 years old and expand the offer of ECE in daycare centers in order to meet at least 50% of children up to 3 years old by the end of the term of this PNE (2024)”<sup>11</sup>. As we could see in the figure 1, the goal of preschool was not achieved as in 2016 the enrollment rate covered for preschool was 91.5% and the estimates for the achievement of the goal to daycare aren’t promising.

Furthermore, even so Brazil had advanced in terms of enrollment rate more than doubling access to daycare centers and almost universalizing preschool in the last decades, the access seems to be unequal. Figure 2 shows the enrollment rate by major regions and age groups. In the first frame (0 to 1 year) it is possible to note that the difference in enrollment rate between the North and Southeast regions are almost 18 percentage points (pp), and in the second frame (2 to 3 years) this difference becomes 30 pp. However, as quoted before, only the preschool stage is mandatory in Brazil which means that the difference in the enrollment rate for children from 0 to 3 years old between the major regions could be explained by other variables. Nevertheless, in the last frame (4 to 5 years - preschool stage) it is possible to see that still existing differences between the major regions.

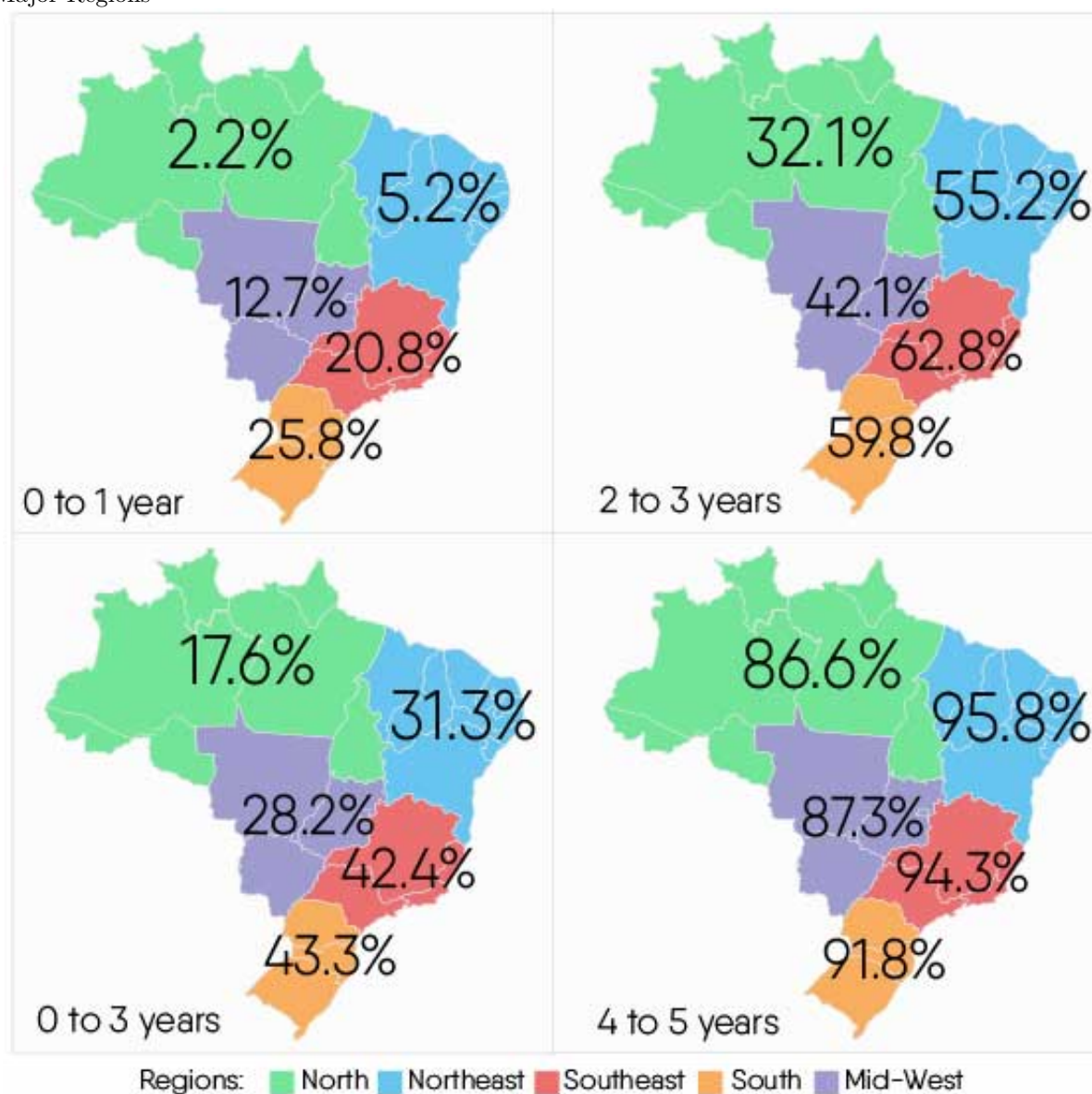
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<sup>9</sup>See Silveira (2009) apud Brasil (1996).

<sup>10</sup>Constitutional amendment number 59/2009.

<sup>11</sup>See Brasil (2015).

Figure 2: Percentage of children enrolled in Early Childhood Education in Brazil by age groups and Major Regions

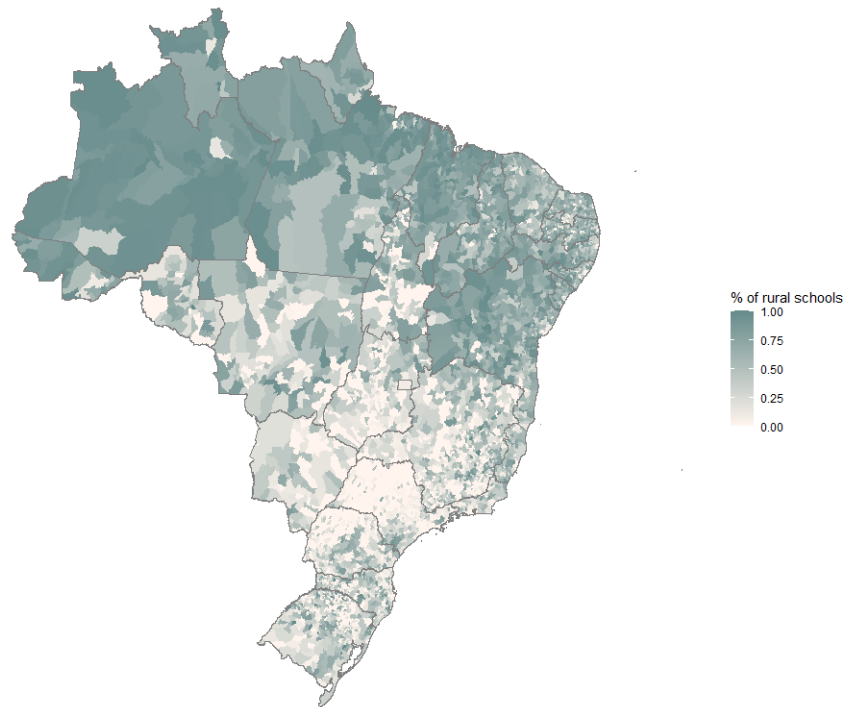


Source: Adapted from IBGE (2020) using 2019 Continuous National Household Sample Survey (*Pesquisa Nacional por Amostra de Domicílios Contínua* [PNADC]) data.

It is also possible to argue that the access to ECE in Brazil is not equitable by localization, race, and income. Figure 3 presents the map with the percentage of rural daycare centers and preschools in Brazilian municipalities. It is possible to notice that Brazil does not have a homogeneous configuration. This has a lot of implications, including that care must be taken when defining quality for an urban institution in the same way we define it for a rural institution. It is necessary to consider Brazil as a

complex, multifaceted and sometimes paradoxical country<sup>12</sup>. Figures 4 and 5 show the distribution of enrollment rate by race, income, and localization; followed by the table 1 which shows some characteristics of the children enrolled in each institution administrative system<sup>13</sup>. It also reveals the ethnic composition of the Brazilian children: in most cases, white and brown are the prevalent ethnicity.

Figure 3: Percentage of rural center based daycares and preschools for the Brazilian municipalities

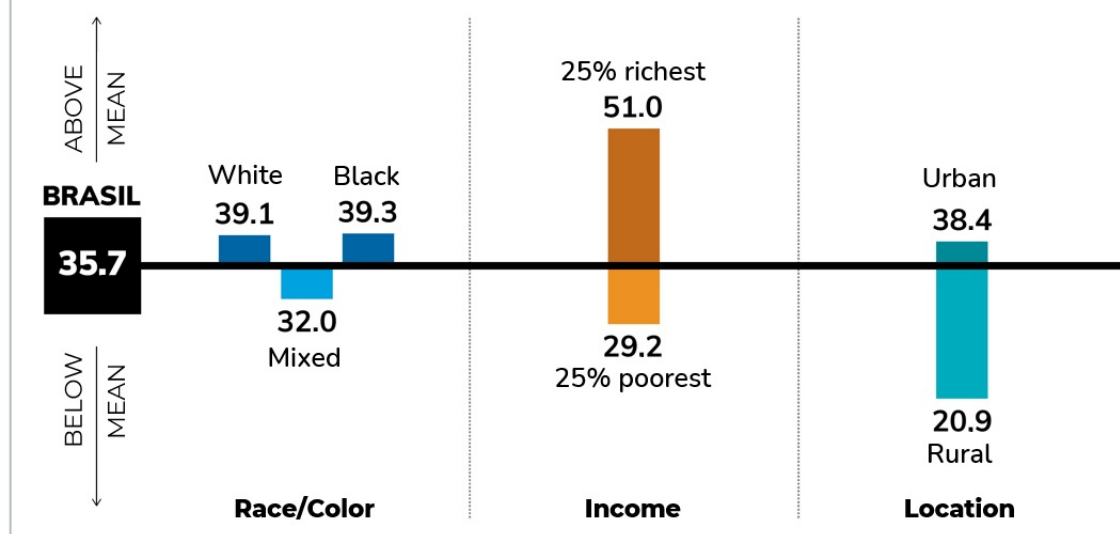


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<sup>12</sup>BRASIL. Parâmetros Curriculares Nacionais: pluralidade cultural, orientação sexual. Ministério da Educação. Secretaria de Educação Fundamental. v. 10. Brasília: MEC/SEF, 1997.p. 19

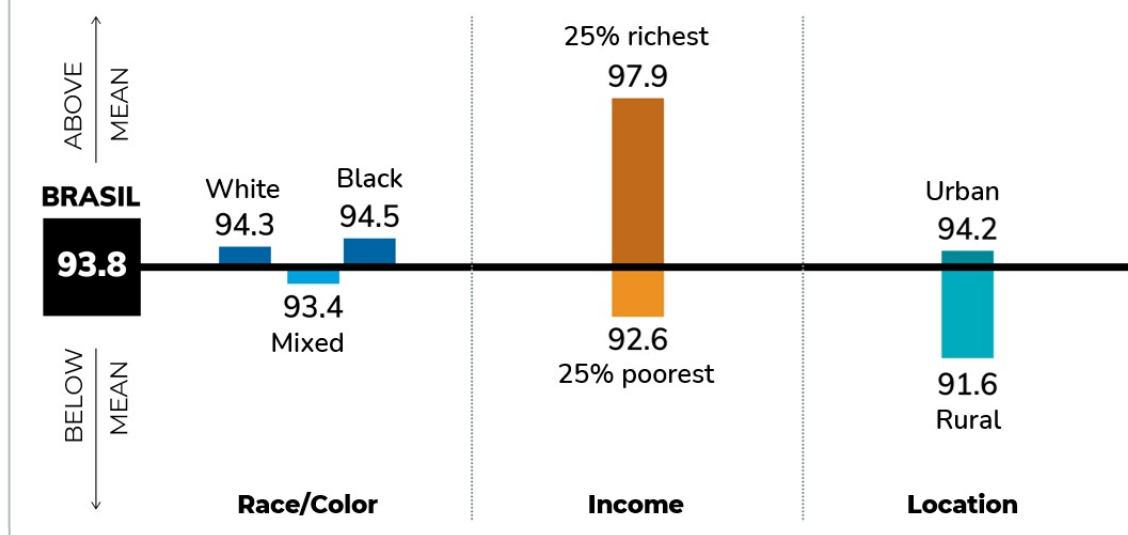
<sup>13</sup>Despite the municipalities' responsibility to offer ECE, there are still other institutions administrative offering the service as the table shows.

Figure 4: Percentage of children from 0 to 3 years old attending to Daycare in Brazil by race, income, and localization in 2018



Source: TODOS PELA EDUCAÇÃO (2020).

Figure 5: Percentage of children from 4 to 5 years old attending to Preschool in Brazil by race, income, and localization in 2018



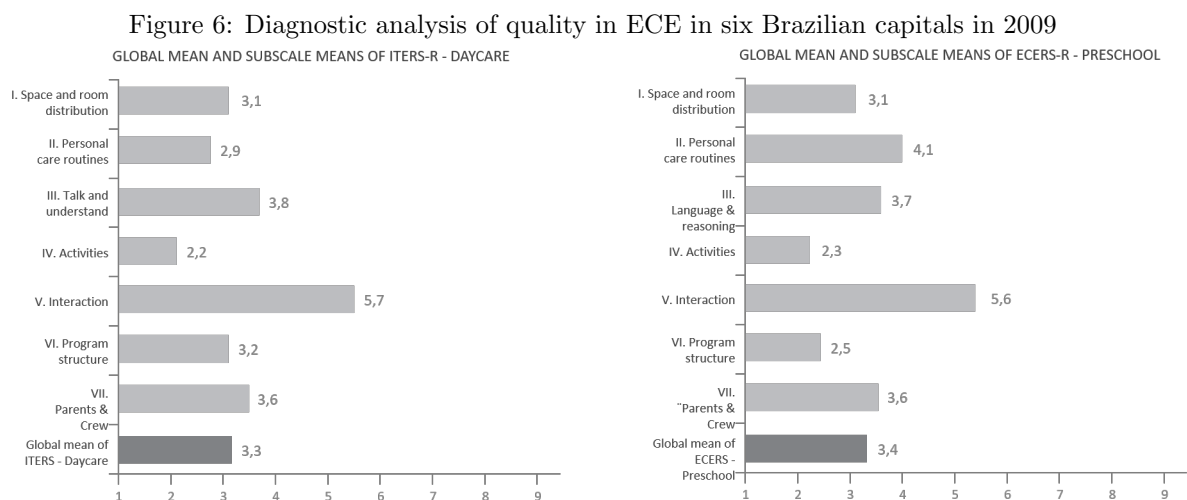
Source: TODOS PELA EDUCAÇÃO (2020).

Table 1: Descriptive statistic of enrolled children based on 2019 School Census

|                    | Day care center |       |           |           | Preschool |        |           |           |
|--------------------|-----------------|-------|-----------|-----------|-----------|--------|-----------|-----------|
|                    | Federal         | State | Municipal | Private   | Federal   | State  | Municipal | Private   |
| Female             | 0.50            | 0.48  | 0.48      | 0.49      | 0.49      | 0.49   | 0.49      | 0.49      |
| White              | 0.46            | 0.34  | 0.35      | 0.41      | 0.43      | 0.20   | 0.30      | 0.41      |
| Black              | 0.03            | 0.02  | 0.03      | 0.03      | 0.03      | 0.03   | 0.03      | 0.02      |
| Brown              | 0.10            | 0.16  | 0.32      | 0.21      | 0.17      | 0.33   | 0.36      | 0.23      |
| Yellow             | 0.00            | 0.01  | 0.00      | 0.00      | 0.00      | 0.01   | 0.00      | 0.00      |
| Indigenous         | 0.01            | 0.21  | 0.00      | 0.00      | 0.00      | 0.10   | 0.01      | 0.00      |
| Not declared       | 0.40            | 0.26  | 0.30      | 0.35      | 0.37      | 0.34   | 0.30      | 0.34      |
| Age                | 2.79            | 3.02  | 2.96      | 2.89      | 5.06      | 5.26   | 5.16      | 5.04      |
| Rural              | 0.01            | 0.23  | 0.12      | 0.02      | 0.01      | 0.17   | 0.20      | 0.03      |
| Number of students | 1,161           | 3,677 | 2,440,895 | 1,296,691 | 1,497     | 54,972 | 3,940,560 | 1,203,518 |

Note: The calculation includes all children enrolled in Early Childhood Education in 2019 using 2019 School Census' data.

It is important to highlight that regardless of the advances in offering ECE quoted before for the case of Brazil, what has been highlighted in the literature is that not only the access to ECE and intervention in the first years of life are important, but also the quality of ECE that has been offered. The study by Campos (2011) performs a diagnostic analysis of quality in 147 daycare centers and preschools in six Brazilian state capitals during the second semester of 2009. The instruments applied for the observation of classes were the translated versions of the Infant/Toddler Environment Rating Scale Revised Edition (ITERS-R)<sup>14</sup> for daycare centers and the Early Childhood Environment Rating Scale Revised Edition (ECERS-R)<sup>15</sup> for preschools<sup>16</sup>. In addition, questionnaires for principals and for teachers of the observed classes were also applied. The authors find that both daycare centers and preschools' average scores were at the basic level<sup>17</sup>. Moreover, the lowest scores received were related to Activities (daycare and preschool)<sup>18</sup>, Personal care routines (daycare)<sup>19</sup>, and Program structure (preschool)<sup>20</sup>.



Source: See Campos (2011).

For the results shown in Figure 6, it seems that in Brazil the concern should be far beyond an access

<sup>14</sup>ITERS-R contains seven subscales: 1) Space and furniture; 2) Personal care routines; 3) Speak and understand; 4) Activities; 5) Interaction; 6) Program structure; and 7) Parents and staff.

<sup>15</sup>ECERS-R contains seven subscales: 1) Space and furniture; 2) Personal care routines; 3) Language and reasoning; 4) Activities; 5) Interaction; 6) Program structure; and 7) Parents and staff.

<sup>16</sup>These instruments were revised and a rating of 1 to 3 means "Inappropriate", 3 to 5 means "Basic", 5 to 7 means "Adequate", 7 to 8.5 means "Good" and 8.5 to 10 means "Excellent".

<sup>17</sup>3.3 for daycare centers and 3.4 for preschool.

<sup>18</sup>The items that make up "Activities" for daycare centers are: Fine motor; Physical activity; Art; Music and movement; Blocks; Make-believe play; Play with sand and water; Nature/Sciences; Use of TV, video and/or computers; Promotion of acceptance of diversity. While for preschool, they are: Fine motor skills; Art; Music and movement; Blocks; Sand/water; Make-believe play; Nature/Sciences; Mathematics/number; Use of TV, video, and/or computers; Promotion of acceptance of diversity.

<sup>19</sup>The items that make up "Personal care routines" are: Arrival/departure; meal/snack; Sleep; Changing diapers/Using the bathroom; Health practices; Security Practices.

<sup>20</sup>The items that make up the "Structure of the program" are: Programming; Free activity; Group activity; Conditions for children with disabilities.

issue. These results are from 2009; however, it appears that they remain the same when we look at some recent diagnostic analyzes on quality using the Measuring Early Learning and Quality Outcomes (MELQO) instrument performed in a capital and a medium-sized city in the year 2019 shown in a policy brief by Santos et al. (2020a).

Table 2 below shows infrastructure information for all the Brazilian institutions according to the administrative system in 2019. It is important to notice that almost all the institutions, more than 99% of them, have municipal or private administration, which goes in the same direction as what was established in the LDB. Also, the table highlights that feeding is part of the majority of the government institutions, but this is not the case for the private ones. It is important to emphasize that food in public educational units is part of the National School Food Program (Programa Nacional de Alimentação Escolar [PNAE]) and that is why this result was already expected.

Table 2: Descriptive statistic of schools based on 2019 School Census

|                              | Day care center |       |           |         | Preschool |       |           |         |
|------------------------------|-----------------|-------|-----------|---------|-----------|-------|-----------|---------|
|                              | Federal         | State | Municipal | Private | Federal   | State | Municipal | Private |
| Rural                        | 0.06            | 0.53  | 0.41      | 0.01    | 0.05      | 0.62  | 0.55      | 0.01    |
| Government partnership       | —               | —     | —         | 0.20    | —         | —     | —         | 0.08    |
| Green Area                   | 0.72            | 0.38  | 0.30      | 0.33    | 0.70      | 0.39  | 0.28      | 0.33    |
| Kitchen                      | 1.00            | 0.96  | 0.97      | 0.84    | 1.00      | 0.93  | 0.96      | 0.79    |
| Covered Patio                | 0.78            | 0.52  | 0.48      | 0.70    | 0.80      | 0.45  | 0.44      | 0.73    |
| Uncovered Patio              | 0.78            | 0.31  | 0.42      | 0.62    | 0.80      | 0.27  | 0.39      | 0.62    |
| Playground                   | 0.94            | 0.37  | 0.41      | 0.84    | 0.90      | 0.39  | 0.30      | 0.84    |
| Refectory                    | 0.78            | 0.42  | 0.50      | 0.59    | 0.80      | 0.27  | 0.40      | 0.51    |
| Children rest room           | 0.06            | 0.02  | 0.04      | 0.13    | 0.00      | 0.00  | 0.01      | 0.06    |
| Number of rooms used         | 12.00           | 10.32 | 6.15      | 10.92   | 15.20     | 9.36  | 6.05      | 11.51   |
| Number of accessible rooms   | 3.50            | 1.09  | 0.82      | 2.30    | 6.05      | 1.39  | 0.94      | 2.62    |
| Amount of pedagogue teachers | 3.06            | 1.70  | 0.97      | 1.52    | 4.20      | 2.48  | 1.06      | 1.50    |
| Food                         | 0.89            | 0.94  | 1.00      | 0.38    | 0.90      | 0.99  | 1.00      | 0.27    |
| Children's material          | 0.94            | 0.63  | 0.74      | 0.97    | 0.95      | 0.61  | 0.63      | 0.96    |
| Musical material             | 0.72            | 0.18  | 0.15      | 0.32    | 0.75      | 0.12  | 0.16      | 0.31    |
| Games material               | 1.00            | 0.70  | 0.85      | 0.93    | 0.95      | 0.73  | 0.86      | 0.93    |
| Arts material                | 0.94            | 0.45  | 0.31      | 0.62    | 0.90      | 0.36  | 0.28      | 0.62    |
| Pedagogical Proposal         | 0.67            | 0.69  | 0.62      | 0.77    | 0.65      | 0.67  | 0.60      | 0.76    |
| Total of schools             | 18              | 118   | 42030     | 28676   | 20        | 809   | 72144     | 28643   |

Note: The calculation includes all school units that offer Early Childhood Education using 2019 School Census data.

After the LDB, the Education Ministry has been publishing documents to guide public policies in ECE and to establish parameters of quality. One of these actions was the creation of the Brazilian National Common Core (*Base Nacional Comum Curricular* [BNCC]) published in 2017 which intends to be a guideline to the curriculums of the municipalities, mainly emphasizing the structuring axes of the ECE in Brazil that is “educate and care” with quality interactions with children, in addition to placing the child at the center of learning. In Figure 7 it is possible to find a summary of the main Brazilian documents about what is considered quality in ECE.

Figure 7: Aspects related to quality in different Brazilian documents on Early Childhood Education

|                                         | Parâmetros <sup>1</sup> | Indique <sup>2</sup> | Caqi <sup>3</sup> | ANEI <sup>4</sup> | BNCC <sup>5</sup> |
|-----------------------------------------|-------------------------|----------------------|-------------------|-------------------|-------------------|
| <b>Infrastructure &amp; Supplies</b>    |                         |                      |                   |                   |                   |
| Facilities and security                 | ✓                       | ✓                    | ✓                 | ✓                 | —                 |
| Spaces, materials and room distribution | ✓                       | ✓                    | ✓                 | ✓                 | —                 |
| <b>Educational unit management</b>      | ✓                       | ✓                    | ✓                 | ✓                 | —                 |
| <b>Team</b>                             |                         |                      |                   |                   |                   |
| Description                             | —                       | —                    | ✓                 | —                 | —                 |
| Teacher training                        | ✓                       | ✓                    | ✓                 | ✓                 | —                 |
| Motivation                              | —                       | —                    | —                 | —                 | —                 |
| <b>Teaching methods</b>                 |                         |                      |                   |                   |                   |
| Learning opportunities                  | ✓                       | ✓                    | —                 | —                 | ✓                 |
| Feed and nutrition                      | ✓                       | ✓                    | —                 | —                 | ✓                 |
| Hygiene                                 | ✓                       | ✓                    | —                 | —                 | ✓                 |
| Diversity                               | ✓                       | ✓                    | —                 | ✓                 | ✓                 |
| Inclusion                               | ✓                       | ✓                    | —                 | ✓                 | ✓                 |
| <b>Interactions</b>                     | ✓                       | ✓                    | —                 | —                 | ✓                 |
| <b>Learning and development</b>         | ✓                       | —                    | —                 | —                 | ✓                 |

Note: <sup>1</sup>Parâmetros Nacionais de Qualidade da Educação Infantil; <sup>2</sup>Indicadores da Qualidade na Educação Infantil; <sup>3</sup>Custo Aluno-Qualidade inicial; <sup>4</sup>Avaliação Nacional da Educação Infantil; <sup>5</sup>Base Nacional Comum Curricular.

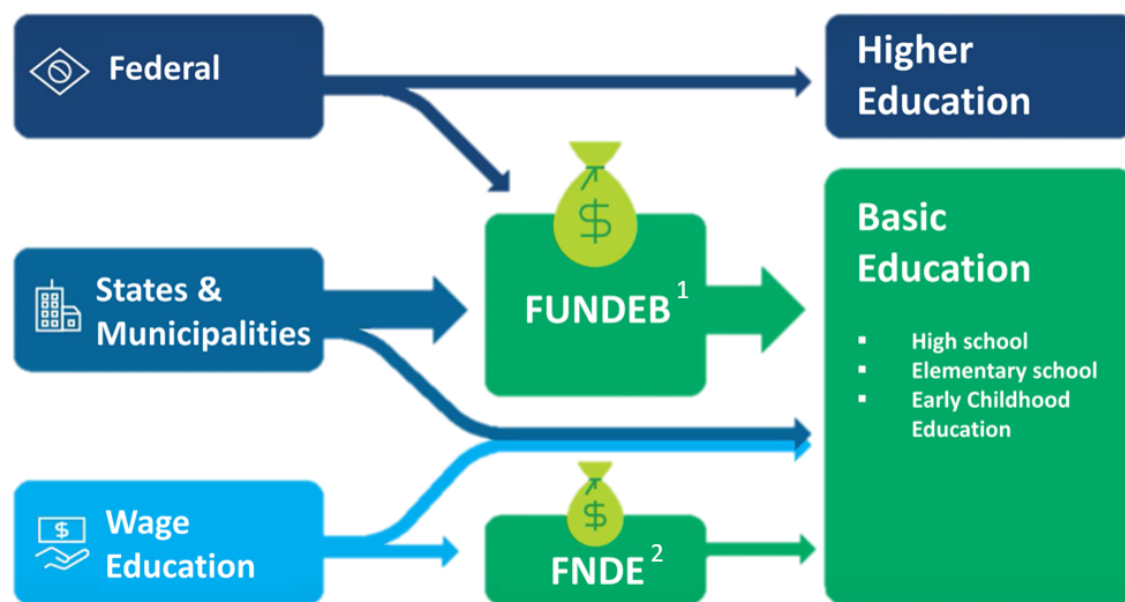
Source: Adapted from Santos et al. (2020a).

On the whole, Brazil has made significant advances in terms of access more than doubling access to daycare centers and almost universalizing preschool. However, the access is unequal by major regions, age group, income, race, and localization (rural or urban). In addition to that, the diagnostic analysis from some studies has been showing that possibly the inequality to ECE is bigger when it comes to the quality of the institutions that offer the service since they are considered at a basic level.

Finally, when it comes to the effective expenditure in ECE, second Almeida Jr. (2018) the real cost per child is not known until today. This is because it is difficult to measure the real cost practiced in the country as a whole with more than five thousand municipalities responsible to offer the service. In Brazil, the public expenditure on ECE depends on the amount available in each city for ECE. This means that the availability of money determines how much will be invested or not and not a fixed minimum amount per child to ensure minimum quality.

The figure below shows a summary of how Education financing works in Brazil.

Figure 8: Education financing in Brazil



Source: Adapted from Instituto Unibanco (2021). Notes: <sup>1</sup>FUNDEB is the Maintenance and Development of Basic Education and the Valorization of Education Professionals fund, it is made up of resources from taxes and transfers from the States, Federal District, and Municipalities linked to Education. <sup>2</sup>FNDE is the *Fundo Nacional de Desenvolvimento da Educação* (National Education Development Fund) a Federal Government agency linked to the Ministry of Education, which carries out transfers to municipalities and states due to some specific programs such as the National School Feeding Program (PNAE).

In short, the Brazilian Constitution settled that a minimum of 25% of state and municipal tax revenues and 18% of federal taxes must be spent on Education. However, the most part of these 25% of state and municipal tax revenues is sent to the Fund for the Maintenance and Development of Basic Education and the Valorization of Education Professionals (Fundo de Manutenção e Desenvolvimento da Educação Básica e de Valorização dos Profissionais da Educação [FUNDEB]). This fund is responsible for 63% of the resources for Education in Brazil; and the main objective of FUNDEB is to promote the redistribution of resources linked to Education. The redistribution of resources is made according to the number of

enrolled students, by stage of basic education, modalities, and types of educational establishment<sup>21</sup>. Considering the unequal and complex context of Education as shown before, this fund has been really important as an attempt to decrease the region's inequalities in resources for Education. It is important to emphasize that although the resources are destined for the city based on this information quoted, it is not guaranteed that the city actually allocates the resources in this way. That is, it may be that a city gives preference to the allocation for Elementary School and not for ECE.

In addition to that, The “Salário-Educação” (Wage Education) is another source settled on the Constitution in 1988. According to Abuchaim (2018) it is a social contribution aimed at financing programs aimed at Basic Education, which falls on the remuneration paid to employees by companies by 2.5% of the total amount of remuneration. From the amount collected, after some deductions<sup>22</sup>, 90% of the total is distributed in quotas: the National Education Development Fund (FNDE) receives 1/3 of the total collected and applies this resource to federal programs for basic education; while municipalities receive 2/3 and apply them to basic education. The remaining 10% of the amount of the Salary-Education collection is also directed to the FNDE (Abuchaim, 2018).

For last, a law known as the “Law of Royalties” earmark 75% of federal, state, and municipal revenues from royalties from oil and natural gas exploration for Education. In addition, this law also established that 50% of the Union's Social Fund (*Fundo Social da União*) is earmarked for Education until the goals of the National Education Plan (*Plano Nacional da Educação* [PNE])<sup>23</sup> are met.

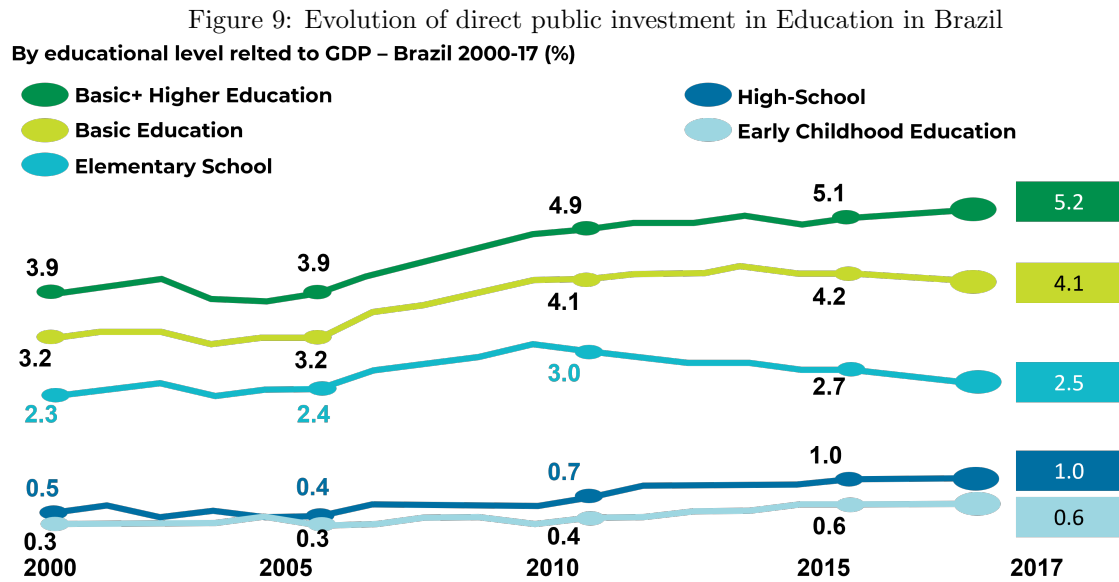
It is worthy to mention that ECE is the stage of Education that receives fewer resources in the whole in Brazil, representing a public expenditure of 11.2% of the total resources destined for this field. In relation to the Gross Domestic Product (GDP), this public expenditure was 0.6% of GDP in 2017.

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<sup>21</sup>See Abuchaim (2018).

<sup>22</sup>From the amount collected, the National Social Security Institute (INSS) retains 1% as an administration fee, and expenses with the Education Maintenance System (SME) are removed.

<sup>23</sup>See Brasil (2015).



Source: Adapted from Instituto Unibanco (2021).

Finally, besides the percentage of expenditure on Education relative to the GDP is high, it is worthy to mention that the expenditure per child in Brazil is still low compared with developed countries (Instituto Unibanco, 2021), representing 38% of the average expenditure per child in relation to Organization for Economic or Economic Cooperation and Development (OECD) countries in 2016.

## 2.2 Nutrition

In Brazil, nutrition programs were addressed jointly with the fight against hunger since the 20th century. Policies, such as the minimum wage in 1938, and the National Program of Milk to Vulnerable Children (Programa Nacional do Leite para Crianças Carentes) in 1986, are examples of this evolution over time<sup>24</sup>. However, only in 2006, it was established by Law<sup>25</sup> the creation of the National Food and Nutrition Security System (Sistema Nacional de Segurança Alimentar e Nutricional – SISAN) aiming to provide the human right of appropriate food to Brazilian citizens. And, finally, in 2010 the 1988 Brazilian Constitution made explicit the right of food to all citizens<sup>26</sup>.

Nowadays, preschools and center-based daycare are the main sources of Early Childhood nutritional programs. National Program of Food at School (Programa Nacional de Alimentação Escolar - PNAE) aims to offer food for all the public basic education system. The federal government spends an established value per student and day according to the grade of enrollment: 1.07 Brazilian Reais for center-based daycare children and 0.53 Brazilian Reais for preschool children. However, considering the fact that only

<sup>24</sup>For the complete trajectory, check Silva (2014).

<sup>25</sup>Law number 11346/2006.

<sup>26</sup>Constitutional amendment number 64.

preschool has a mandatory character and that in daycare centers most of the children enrolled are 3 years old, children with less than 3 years old are poorly benefited from these programs. As the evidence points out that nutritional programs are more effective for children with less than 3 years old (Hoddinott et al., 2008) and the PNAE will be considered on the ECE, we will focus on programs that are not related to Education.

Bolsa Família is the largest conditional cash transfer program in the world. It is destined for vulnerable families and its goal is to provide the right to food and access to health and education. More than 13.9 million families are benefited from this program. Families in extreme poverty and poverty<sup>27</sup> conditions receive a monthly stipend to supplement their income. Besides the core cash transfer of R\$ 89.00 per month ( $\sim$  17.8 US dollars), Bolsa Família also offers a variable stipend according to the demographic composition. Three of these variable benefits are related to Early Childhood and correspond to a R\$ 41.00 cash transfer per month: i) Benefício Variável Nutriz (Nutritional Variable Benefit) is destined for families that have a child between 0 and 6 months old and this benefit is valid for 6 months; ii) Benefício Variável à Gestante (Variable Benefit to Pregnant Woman) is destined to pregnant women and is valid for 9 months; iii) Benefício Variável de 0 a 15 anos (Variable Benefit for 0 to 15 years old) is destined to families that have at least one child or adolescent between 0 to 15 years old. These benefits contribute to the family and the child's nutrition. Nowadays, people are discussing the design of the Bolsa Família Program that can be substituted by "Auxílio Brasil".

In addition, there are programs that aim to provide a specific vitamin, such as Programa Nacional de Suplementação de Vitamina A (National Program of Vitamin A Supplementing), destined to children between 6 and 59 months old, and Programa Nacional de Suplementação de Ferro (National Program of Iron Supplementing) destined to children between 6 months and 2 years old. Also, Estratégia NutriSUS (NutriSUS Strategy) offers powder with mixed vitamins and minerals destined for children between 6 months and 2 years old. 1,044 municipalities are participating in this last program.

What concerns the most specialists and policymakers is undernutrition. According to UNICEF<sup>28</sup> "until the 1990s, child undernutrition was present in most of the poorest population groups in Brazil, increasing the incidence of infectious diseases and playing an important role in the sequence of events that led to death". That is why Brazilian studies usually analyze the mortality rate, which is taken into account in the cost of inaction equation.

Since then, there has been a considerable reduction in the rates of child malnutrition in the country. Between 1996 and 2006, chronic undernutrition (measured by the child's short stature for age) fell 50% in Brazil, from 13.4% to 6.7% of children under 5 years old. Acute undernutrition (low weight in relation to

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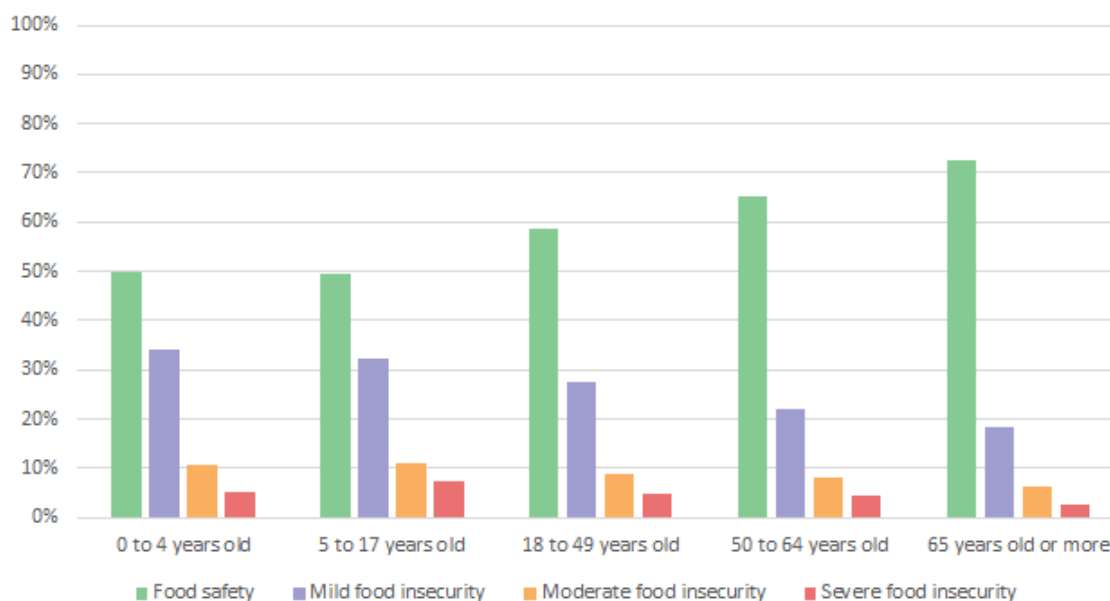
<sup>27</sup>Families in poverty conditions are required to have pregnant women or children or adolescents between 0 and 17 years old in the family in order to receive the cash transfer. Families in extreme poverty conditions are not subjected to this rule. <https://www.caixa.gov.br/programas-sociais/bolsa-familia/Paginas/default.aspx>

<sup>28</sup>UNICEF <https://www.unicef.org/brazil/desnutricao> Accessed on 30th of August, 2021.

height) was registered in only 1.5% of them. And this scenario has been falling in the country. The good results, however, do not reach the entire population. In Brazil, around 30% of indigenous children are affected by chronic undernutrition. Among the Yanomami, the percentage exceeds 80%. Indigenous girls and boys are more than twice as likely to die before reaching one year of age as other Brazilian children.

Between 2016 and 2017, as Figure 10 shows, half of the children under 5 years old in the country lived in households with some degree of food insecurity. Data released by the Brazilian Institute of Geography and Statistics (IBGE) shows that 5.1% of the population aged up to 4 years lived with severe food insecurity; 10.6%, moderate; and 34.2%, mild.

Figure 10: Distribution of Residents in Private Households, by Food Security Situation in the Household, According to Age Groups - Brazil - 2017-2018



Notes: Adapted from Brazilian Institute of Geography and Statistics (IBGE), Directorate of Research, Coordination of Work and Income, Family Budget Survey 2017 - 2018.

Beyond undernutrition, analyzing numbers of child obesity, currently in Brazil, among children under 2 years old, 18.9% are overweight. Part of it, representing 7.9% which is equivalent to 120 thousand children is obesity. In addition, when it comes to children between 2 to 4 years old 14.3% are overweight. From this total, almost half of it (6.5%) which is equivalent to 227.6 thousand children are obesity.

## 2.3 Home visiting

In Brazil, social care as a public policy is a right for every citizen who needs it. In addition, it is one of the three components of the Social Security system, which also includes public health and social welfare. Social care has three major moments in national history: the Constitution of 1988, the Organic

Social Care Law (LOAS), and the IV National Conference of Social Care. The Constitution presents in articles 203 and 204 the recipients of social care policy, its objectives, the main source of resources, and the guidelines for the government actions in this policy. After the Constitution, in 1993, the LOAS (Federal Law No. 8742 of 1993) is enacted with the objective of regulating aspects of the Constitution and establishing norms and criteria for the organization of social assistance. Finally, the IV National Conference of Social Assistance in 2003 deliberates the implementation of the Unified System of Social Care (SUAS), which is present all over the country through management, financing, and monitoring shared by the Union, States, Municipalities, and the Federal District.

Despite the fact that social care has a universal set in the country, Brazil's pioneering Early Childhood assistance intervention was PIM - Primeira Infância Melhor (BEC - Better Early Childhood), an action that seeks to promote integral development in Early Childhood, through the home and community visits carried out weekly to families at risk and social vulnerability, aiming at strengthening their skills to educate and care for their children. The program was developed in 2003 in the State of Rio Grande do Sul, implemented by the State Health Department (SES), and became a State Law (No. 12,544) on July 3rd, 2006. In the year 2020, the program has served more than 50,000 families<sup>29</sup>.

The BEC is based on the methodology of the Cuban project *Educa a tu Hijo*, of the Centro de Referencia Latinoamerica para la Educación Preescolar (CELEP), from whom it initially received support for the implementation. The program develops through two main modalities: (i) individual care: weekly home visits, lasting approximately one hour, for pregnant women and families with children aged from 0 to 3 years linked to the program; (ii) group attention: community visits, for families with children aged from 4 to 5 years, weekly, and for pregnant women and families with children aged from 0 to 3 years, once a month, in order to promote the integration of the family with the others in the community, who already participate in this type of care (Verch, 2017).

BEC is recognized as one of the most consistent social technologies for childcare in Latin America. The program is so important that it served as a methodological benchmark and support to different Early Childhood interventions in states and municipalities around Brazil, including: *Atenção à Primeira Infância e à Maternidade* - Munhoz de Melo/Paraná (2012), *Atenção Melhor à Infância* - Vila Velha/Espírito Santo (2012), *Programa Primeira Infância Ribeirinha* - Iraduba, Novo Airão and Manacapuru/Amazonas (2013), *Programa Cresça com Seu Filho* - Fortaleza/Ceará (2014), *São Paulo Carinhosa* - São Paulo/São Paulo (2014), *Projeto Atenção Nutricional e Estímulo ao Desenvolvimento da Primeira Infância* - 28 municipalities in Acre, Amazonas, Roraima, Rondônia, and São Paulo (2014) and *Primeira Infância Acreana* - Acre (2015) (Verch, 2017). Furthermore, it was the inspiration to the initiatives of the CF - Criança Feliz (HC - Happy Child) program, which will be discussed in detail later as it is currently the biggest home visiting program in the country.

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<sup>29</sup>BEC Data - Accessed 26 May 2021. <<http://www.pim.saude.rs.gov.br/site/o-pim/dados/>>

In the history of home visiting programs in Brazil other important initiatives include: *Estratégia Rede Cegonha* and *Programa Brasil Carinhoso*, Federal initiatives; *Programa Mãe Coruja* and *PADIN*, State ones. The *Estratégia Rede Cegonha* (Stork Network Strategy - Federal Directive No. 1459, 2011), proposed a new model of care for childbirth and child health in the early years and *Programa Brasil Carinhoso* (Affectionate Brazil Program), created in 2012, sought to contribute to integral care actions during early childhood by acting in different aspects, such as food and nutritional safety, and guaranteeing children the right to access and to remain in Early Childhood Education (Verch, 2017).

The first mentioned State initiative, *Programa Mãe Coruja* (Doting Mother Program), was implemented in 2007 (Decree No. 30,859), in Pernambuco State, to offer support to mothers, before and after the birth of their children, with the objective of providing comprehensive care to pregnant women and their babies using the Unified Health System (SUS), ensuring them a healthy and harmonious development during the first years of life. Finally, *PADIN* - *Programa de Apoio ao Desenvolvimento Infantil* (Child Development Support Program) was created in 2016 by the State Department of Education (SE-DUC) of Ceará with the objective of providing opportunities for families that currently do not have access to daycare to participate actively in the integral development of their children. In that way, *PADIN* does not intend to replace Early Childhood Education and does not have a charitable nature, but it aims for the sustainability of the development of children from 0 to 3 years.

In this context, it is noticeable that Brazil has made considerable progress in promoting home visiting programs, with a series of initiatives already implemented at the different levels of the administrative division of the country. However, the biggest achievement of the country for this kind of intervention happened in 2016, with the launch of the Happy Child (HC) program. HC is a resulting action of the Early Childhood Legal Framework<sup>30</sup>, a law that creates a series of programs, services, and initiatives aimed at promoting child development. HC is included in the Government Early Childhood Program at SUAS<sup>31</sup> and it was created by the Ministry of Development which is currently part of the Ministry of Citizenship. It is important to mention that HC is the largest visiting and Early Childhood care program in the world, with more than one million beneficiaries (BRASIL, 2020).

The main objectives of the program, according to the Ministry of Citizenship are: to promote human development based on the support and monitoring of integral child development in Early Childhood; support the pregnant woman and her family in preparing for birth and in perinatal care; collaborate in the exercise of parenting, strengthening bonds and the role of families in carrying out the role of care, protection and education of children aged up to six years old; Mediate the access of pregnant women, Early Childhood children and their families to the public policies and services they need; and integrate, expand and strengthen public policy actions aimed at pregnant women, Early Childhood children, and

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<sup>30</sup>Law No. 13,257, of March 8, 2016.

<sup>31</sup>National Council for Social Assistance Resolution 19, November 24, 2016.

their families. So, the program is quite comprehensive in its objectives.

The HC program is available to most of the municipalities in Brazil. To be eligible, the municipality must have at least one Social Care Reference Center (CRAS) and at least 140 people from the program's priority audience, which are: i) pregnant women and children up to three years old registered in the Cadastro Único<sup>32</sup>; ii) children up to six years receiving the Benefício de Prestação Continuada<sup>33</sup>; or iii) children up to 6 years old away from family life due to the application of the protection measure<sup>34</sup> (BRASIL, 2019).

The number of municipalities that joined the program grew between 2018 and 2019, maintaining 2622 municipalities in the last update. In two years the program followed 275,256 children and 37,111 pregnant, and of the 2.672 municipalities with active adhesion, 76,49% of them (2,044) already started the home visits <sup>35</sup>.

The finances of the program come from the Federal budget. The Union Budget, also known as the Federal Budget Law (LOA), is a plan presented every second half of the year that indicates how much and where the government will spend the federal public money over the next one-year period, based on the total amount collected by taxes. According to the LOA, the Ministry of Citizenship yearly budget for the HC program was, considering all the values in millions of dollars: 83,498,219.80 for 2017; 135,725,450.76 for 2018; and 95,818,527.92 for 2019.

When we look at these numbers, the first observation is that although the number of municipalities and beneficiaries, as mentioned before, has increased from one year to another or remained stable, the amounts allocated to the program for the year 2019 are lower than those for 2018. This is mentioned by the technical study of the National Confederation of Municipalities (CMN, 2017b) as juridical insecurity. As the program was established as a Decree<sup>36</sup> and not as a Federal Law, there is no guarantee of the continuity of the program or the regularity of the financial transfers, or the annual updating of the amounts transferred to the municipalities. To add to that insecurity factor, another point mentioned by the same study is that the values destined to the program would not be sufficient to cover the minimal costs of the intervention, at least for the values presented by the LOA for the year 2017, resulting in an underfunded program. This was later partially confirmed by another study of the same Confederation CMN (2017a) which revealed that of the 1,864 municipalities that already joined the program and participated in the survey, 78,4% of them stated that funding at that time was insufficient.

Thus, the general panorama of home visiting programs in Brazil seems to be positive. Many initiatives in different parts of the country have already been implemented, some with a broader focus and others

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<sup>32</sup>A national registry that identifies vulnerable families in order to offer social care and income redistribution programs.

<sup>33</sup>A benefit that consists of a minimum wage income for people with disability.

<sup>34</sup>Protection measure provided for in Article 101, caput, items VII and VIII, of Law No. 8,069, of July 13, 1990.

<sup>35</sup>Results Book, Ministry of Development - Accessed 29 May 2021.<[http://www.mds.gov.br/webarquivos/publicacao/caderno\\_resultados\\_2016\\_2018.pdf](http://www.mds.gov.br/webarquivos/publicacao/caderno_resultados_2016_2018.pdf)>.

<sup>36</sup>It was established by Decree No. 8869, of October 5, 2016, and amended by Decree No. 9,579, November 22, 2018.

with a more specific one. It is important to mention that despite the limitations presented about the scenario of these existing programs in Brazil, they could be seen as a potential to access the children in vulnerable situations and give them opportunities to develop.

## 3 Literature Review

### 3.1 Early Childhood Education

As mentioned in the overview section, it is important to highlight that Early Childhood Education (ECE) in Brazil has been changing in the last years not only by increasing access but also in the structuring of the program gaining an educational intention. In addition to that, both center-based daycare and preschool are universal programs in Brazil, i.e., they are freely accessible for everyone, despite only the preschool stage is mandatory. With these changes throughout the years, it is difficult to measure the impact of these interventions effectively. Furthermore, the heterogeneity of Brazilian regions makes it even more difficult to evaluate these programs, as there are more than five thousand municipalities<sup>37</sup>. Even so, there are some studies that aim to evaluate this service.

Early studies show that center-based daycare has a small or null impact on school performance, income, and employability (Barros and Mendonça, 1999; Curi and Menezes-Filho, 2006); still, Curi and Menezes-Filho (2006) finds that starting daycare studies means an increase in attained schooling of 1.1 years<sup>38</sup>. While attending preschool generates positive and significant impact around 0.25 standard deviation on different dimensions of school performance<sup>39</sup> and there are direct and indirect impacts on future income totaling from 6% to 16% (Barros and Mendonça, 1999; Curi and Menezes-Filho, 2006).

Nonetheless, Pinto et al. (2017) shows that the small or null impact of attending center-based daycares on school performance could be due to the heterogeneous effects: the impact varies according to mother’s education,  $-0.28$  standard deviation for mothers with no education to  $0.42$  standard deviation for mother’s with college or more. This highlights that children from families that are not in a vulnerable condition might be the ones that benefit the most from being enrolled in ECE and not the opposite as found in the international literature. This result is also valid for preschool, despite lower dispersion among the level of mother’s education<sup>40</sup>. One hypothesis to explain it is related to the quality of the institutions that children from different socioeconomic backgrounds are commonly enrolled.

In Brazil, there are few studies that attempt to investigate the impact of the ECE’s quality on

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<sup>37</sup>According to the Brazilian Institute of Geography and Statistics (IBGE), Brazil has 5568 municipalities in total. <https://www.ibge.gov.br/geociencias/organizacao-do-territorio/estrutura-territorial/15761-areas-dos-municipios.html?=&t=sobre>.

<sup>38</sup>Considering that 1 year is equivalent to an increase in future income of the 11% (Barros and Mendonça, 1999; Barros et al., 2021), these result is equivalent to an increase in future income of the 12%.

<sup>39</sup>See Felício and Vasconcellos (2007); and Santos (2015).

<sup>40</sup>From  $-0.004$  sd for mothers without education until about  $0.25$  sd for mothers with college or more.

children’s learning and development. This is largely due to the scarcity of data.

To investigate the effect of the quality of daycares centers on child development, Barros et al. (2011) measure the quality of the institutions with indicators covering 5 macro dimensions: 1. Infrastructure; 2. Health and sanitation; 3. Program activities and structure; 4. Human resources; and 5. Parents and community relations. The study used a random sample of 500 children from 100 public daycare centers in Rio de Janeiro. The conclusion is that the costs and impacts on child development may be different depending on what is considered quality. In addition, the results show that children who attended good quality institutions achieved, on average, 1.2 months<sup>41</sup> more at the age of development (i.e. 0 to 3 years old) in relation to children who attended low-quality institutions.

It is important to highlight that in this study the authors also showed that the quality was not correlated with family characteristics. In addition, Barros et al. (2011) also analyzes the relationship between quality and costs. The authors show that the dimension “Program activities and structure”<sup>42</sup> has a considerable impact on children’s development and, at the same time, it is the dimension that has the lowest cost. Second the authors, this means that if quality enhancement were to focus on improving program activities and structure, the child’s developmental age would increase by 3 months and this would only require a 6% increase in costs.

When it comes to preschool, Campos et al. (2011) aims to investigate the impact of preschool quality on children’s learning<sup>43</sup> in later years; for it, they use a multilevel analysis<sup>44</sup>. The results show that attending a good quality preschool means 12% more in learning than not attending preschool, according to the *Provinha Brasil* scale. Furthermore, it is found that 1.3% of the total variance of grades is due to variability in the quality of preschool.

With that, there is evidence of the benefits to be enrolled in ECE in Brazil over income and school performance; however, the benefits could be different depending on the quality of the ECE institutions. The tables 8 and 9 from the appendix show a complete summary of the studies carried out in Brazil until now and used on this project.

## 3.2 Nutrition

The nutrition of this time in life has impacts in several outcomes over the life span, such as educational (Glewwe et al. (2001)), labor market (Hoddinott et al., 2008), marriage age, menarcheal age (Nandi et al.,

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<sup>41</sup>Considering that the age of development of each child in daycare is 0 to 3 years.

<sup>42</sup>“Program activities and structure” comprises: i) Creative activities; ii) Social development; iii) Program structure. “Creative Activities” comprises: art; music and movement; building blocks/materials; sand/water; and multicultural perspective. “Social development” comprises: Child-child interaction; Adult-child interaction; and Discipline. “Program structure” comprises: Daily activity program; Supervision of daily activities; Team cooperation; and Adaptation for children with special needs.

<sup>43</sup>To measure the children’s learning was used the *Provinha Brasil* (National Literacy Exam) which is a test to investigate the initial skills in math and literacy in the Second grade of public schools.

<sup>44</sup>Level 1: children; level 2a: preschool; level 2b: the school of the second grade that the children were enrolled.

2018, 2020). It is difficult to measure early childhood nutrition programs in learning outcomes and future income, isolating its effects. The literature points out some key features to consider when aiming to have a well-designed quality nutrition intervention, such as age, target population, and nutritional components. In the Guatemalan experiment, explored in several papers, they randomize between villages two nutritional supplements: atole and fresco. Atole is a rich protein supplement and fresco contains no protein<sup>45</sup> (Hoddinott et al., 2008). Authors show an increase in the hourly wage of 0.67 per hour to the group with the rich protein supplement when they restrict it to children between 0-24 months old, which represents an increase of 46% in the wages in their sample. Maluccio et al. (2009) points that the costs of these supplements were US\$ 0.018 and US\$ 0.004 were to one cup of atole and fresco, respectively. So the annual cost was approximately 6.60 US dollars to atole and 1.50 US dollars to fresco, a very cheap intervention. (Hoddinott et al., 2008) find an impact of this intervention on the magnitude of 46% in the average wages or 0.67 US dollars per hour.

Glewwe et al. (2001) shows that early childhood nutrition has an impact on later academic achievement and that the impact is higher among children between 0 and 2 years old belonging to the most vulnerable group. Authors use height-for-age as a proxy of cumulative nutrition inputs over the different life periods, and they find an average improvement of 0.6 standard deviation impact on z-scores which is equivalent to an improvement from 6 to 12 months in school.

In Brazil, an important study shows the association between height and wages. Analyzing data from adult people located in urban areas from the South and Northeast regions in Brazil, Thomas and Strauss (1997) find that several health indicators, such as height, Body Mass Index (BMI), and protein intake are associated with higher wages. However, this study is focused on adult people.

When it comes to Bolsa Família, lots of studies explore the nutrition effect of the program during early childhood. Wolf and Barros Filho (2014) present a systematic literature review stressing the main contributions in the literature, considering both studies with adults and children samples. They highlight that the access to data makes it difficult to make longitudinal evaluations of the program. Pinho Neto and Berriel (2017) analyze the Bolsa Família Program impact on children and adolescents nutrition. For children less than 5 years old they find that in urban areas they were less likely to present inadequate weight to their age and that in rural areas they were less likely to present extreme low Body Mass Index (BMI) to their age. Paes-Sousa et al. (2011) considers a sample of underprivileged areas over Brazil, focused on the northeast and the north areas of the country: semi-arid regions, agrarian reform settlements, small municipalities in the Amazon state, and quilombola communities, which are spread nationwide. Their findings show that children less than 5 years old from families in these areas that receive the stipend from Bolsa Família were 26% more likely to have adequate height in their age and 26% more likely to have adequate weight for the age. However, there are no studies that show the

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<sup>45</sup> Atole has 6.4 g of protein and 91 kcal per 100 mL, while fresco contains no protein and 33 kcal per 100mL from sugar.

long-term results of this impact on learning outcomes or productivity later in life.

### 3.3 Home visiting

One of the main and oldest home visit programs in Brazil is PIM - Primeira Infância Melhor (BEC - Better Early Childhood) as presented in the overview section. This is one of the reasons why most of the available national literature for this kind of intervention refers to this program. Verch (2017) introduce some of the main evaluations ever carried out for BEC and show that two of the first studies conducted by Celep (2010) and Janus and Duku (2012) sought to find evidence of effects on child development. The first study is a qualitative evaluation through observation and interviews of the impact of BEC with 1,359 families distributed in 16 municipalities that participate in the program pointed out an improvement in the socio-affective, motricity, cognitive, and language indicators of the children who became served by the policy.

The second study from McMaster University used the Early Development Instrument (EDI) <sup>46</sup> in 670 children (433 of the treatment group) to measure if they developed according to their age expectations in five domains: physical well-being; social competence; emotional maturity; language and cognitive and communication development; and general knowledge. The authors discovered that the children who participated in BEC had slightly higher scores than the children in the control group. Although both studies cannot have their results interpreted as a real effect of the BEC, because the selection of the sample was not random, they have their importance once they were the first evaluation ever carried out for the program.

Some studies also sought to show information about the quality of BEC program. FGV/RJ (2014) evaluation survey conducted through a questionnaire with 1,600 respondents presented that 96% of the caregivers considered BEC to be important or very important, 87% answered that BEC impacted their preparation for providing child care and 95% of them said that they consider the activities oriented by BEC would contribute to improving the child's living conditions in the future. Also, more than 80% of respondents showed a high degree of confidence in the program; however, only 60% of them had the same home visitor during their participation in BEC. Although there is no consensus on the quality standards for a home visit, it is worthy to mention that the lessons learned from the Nurse-Family Partnership suggested that the same home visitor should accompany the family throughout the entire intervention, to maintain and strengthen the bond (Schneider and Ghesti-Galvão, 2016).

Another interesting study is presented by Leer et al. (2016) in which using the University of the West Indies instrument, that allows obtaining an approach of quality in visiting programs, the authors inquire about the interactions between the home visitor, parents, and children; the content of the activities and

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<sup>46</sup>The EDI is a short questionnaire completed by kindergarten teachers across Canada and internationally that measures children's ability to meet age-appropriate developmental expectations. More information can be found in <https://edi.offordcentre.com/>

the intervention strategies that occur during the visits carried out through seven home visiting programs (including BEC) in different Latin American and Caribbean countries. Through the observation of five home visits in the municipality of Ronda Alta, it appears that BEC visitors have a great understanding of the characteristics and needs of families and are able to adapt the activities to the interests of the children as well as prepare with sufficient time the content of the visits, but the visitor could work more on promoting caregiver participation. The principle limitations in these studies are that the sample size is small and, therefore, not representative of the quality of each program; the visits were scheduled beforehand, so there wasn't a completely natural environment; and, for the specific case of Brazil, the selected families did not correspond to the most vulnerable population.

In addition to the benefits related to child development, it is also known in the international literature that home visiting programs promote other benefits for children, those around them, and society (Michalopoulos et al., 2017; Barnett, 1993). Some BEC studies followed this path. Ribeiro et al. (2018) in one of the most rigorous evaluations in statistical terms conducted for BEC used government administrative data to investigate the effect of BEC on mortality caused by diarrhea in children under one year. The analysis made, using differences-in-differences, presented as the most important result that PIM reduces by -0.68 (statistical significance at 5%) deaths by external causes per 1,000 children in municipalities with an exposure time to the intervention equal to or greater than seven years. Also, the study of Wink Junior et al. (2021) about the effectiveness of BEC in reducing school violence, has pointed out a reduction of up to 10 percentage points in the indicators evaluated for the children who participated in the program. In addition, there is evidence that the effects are stronger as soon as the child receives the intervention, i.e., before the age of three, when the individual care modality is conducted. Despite the limitations of the studies, both of them are important to show that the impact of home visiting interventions overflows an individual sphere and is quite diverse.

Finally, it is important to mention the study of Brentani et al. (2021) which refers to the intervention carried out in the city of São Paulo. This study will be discussed in more detail as it will be fundamental for the analyzes carried out in the rest of the document related to the issue of home visiting programs. A randomized controlled trial to test the relative effectiveness of child development agents (CDAs) and community health workers (CHWs) as two possible delivery platforms for Early Childhood Development (ECD) focused home visiting intervention was conducted in the western region of the city. Using the curriculum originally developed in Jamaica (Grantham-McGregor et al., 1991), that later would be called Reach Up and Learn, adapted to the Brazilian context, the home visiting intervention was conducted in 12 months with the main objective of finding effects on the children's development who participated in the intervention (cognition, motor, language, and social emotional skills) assessed with the PRIDI and Caregiver-Reported Early Development Instruments tools. A total of 826 mother-child dyads were enrolled in the trial. In the intention-to-treat analysis, neither intervention arm improved study outcomes

and in the per-protocol (PP) analysis, the CDA program resulted in a 0.22 standard deviation increase in children’s development. More details about the program design, costs, and evaluation can be found in the appendix Table 27.

Table 26 in the appendix summarizes the contributions cited in this section about home visiting programs and the domain in which the studies sought to find evidence of improvement in children who participated in the intervention. In general terms, the Brazilian literature about home visiting programs and their evaluation are very recent. Some research is currently being developed and will contribute to increasing the information and the debate about the theme (Brentani et al., 2020; Santos et al., 2020b).

## 4 Methodology

The present study uses the Cost of Inaction (COI) Model as follows:

$$COI = \left( \sum_{j=a}^{t+a} \frac{PCI_j * i * e_j * s_j}{(1 + d)^j} - c \right) * N \quad (1)$$

Where  $N$  is the number of children covered;  $d$  is the discount rate;  $t$  is the benefit duration;  $a$  is the first year the benefit is obtained;  $i$  is the impact on individual income as a consequence of the intervention;  $c$  is the average intervention cost;  $PCI$  is the per capita income projection;  $e$  is the employment rate; and  $s$  is the probability to survive.

For all the interventions analyzed in this study, it was considered the discount rate ( $d$ ) equal to 3%, the growth rate to estimate the  $PCI$  equal to 1%, the first year the benefit is obtained ( $a$ ) as 18 years<sup>47</sup>, and the benefit duration ( $t$ ) equal to 43 years<sup>48</sup>.

In addition, it is worthy to mention that the Gross Domestic Product (GDP) was based on the World Bank national accounts data for 2019; the GDP per capita forecast was based on International Monetary Fund; the employment rates were based on ILO modeled estimates; and the survival rates were based on United Nations Population Division. For more information about the sources of these variables see Table 30 in Appendix E.

In the next subsection, it is possible to find the specific assumptions for  $i$ ,  $c$ , and  $N$  and the methodology for each intervention analyzed in the present study.

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<sup>47</sup>Despite the minimum age to start to work in Brazil is 16, it was settled 18 as at this age the student is supposed to be completed Basic Education.

<sup>48</sup>As the new Social Security Reform established the minimum age of 62 years old for women and 65 years old for men to retire and 90% of the people in the labor market at 2020 asked for retirement grants with 61 years old, it was chose a conservative age as 61 years as the year of retirement in this study.

## 4.1 Early Childhood Education

### 4.1.1 Benefits and costs

Considering all the information quoted in the previews sections about Early Childhood Education (ECE), the analysis will not focus in calculate the Cost of Inaction to offer this program because in Brazil the access has already been offered, but it will focus in calculate the cost to not offer ECE program alongside quality and equity.

Based on the literature review section, the values for the impact of ECE on future income will be a conservative choice of 6% and a moderate choice of 12%. Despite the scarcity of long-term studies and limitations of the studies presented in the literature review, there is evidence that the impact on future income could vary between 6% to 12% by direct effect or indirect effect by schooling years.

However, as Barros et al. (2021) quoted the social return is larger than the private return. Second the authors, the productivity gains resulting from a worker's higher education typically extend far beyond the place or company in which they work and are generally not appropriated by the worker himself in the form of remuneration but need to be included in the social return on education. Hence, based on the national literature the authors calculate that one additional year of schooling is equivalent to an impact of 14.2% on the Gross Domestic Product (GDP) per capita<sup>49</sup>. Accordingly, this value was used to estimate the social benefit of the ECE program. Therefore, the impact on future income considered of 6% to 12% is equitable to the impact on GDP per capita of 7.74% to 15.62%.

In connection with the COI equation (1), the number of children ( $N$ ) defined for the analysis to ECE was settled in two ways: i) the 2019 enrollment rate based on the TODOS PELA EDUCAÇÃO (2021) analyses using Continuous National Household Sample Survey data (*Pesquisa Nacional por Amostra à domicílio Contínua* [PNADC]); and ii) the enrollment rate settled on the National Education Plan (PNE) which established an enrollment rate for daycare centers of 50% and for preschool of 100%. The analysis was done separately with the intention to be compared.

With regard to cost, as the study aims to calculate the social cost of the intervention it was considered the expenditure in ECE by families which enroll their children in private school and by the government representing the public expenditure in the enrollment in public school. In Brazil, usually, there is no expenditure in ECE by families that enroll their children in public school as public school is maintained by the taxes.

As a result, the cost was estimated by a weighted cost considering private expenditure by families and the public expenditure by the government. This weighted cost is shown below.

$$Cost = \alpha_1 * cost_1 + \alpha_2 * cost_2$$

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<sup>49</sup>See Barros et al. (2021).

Where,

- $\alpha_1$  and  $\alpha_2$  are the enrollment rates in private and public schools respectively based on the 2019 School Census<sup>50</sup>;
- $cost_1$  is the average expenditure with ECE in a year by families which enroll their children in a private school;
- $cost_2$  is the estimated annual cost by some levels of quality shown below.

This estimated annual cost by some levels of quality was based on the national documents about quality quoted in the overview section. The present study will analyze three definitions of costs along with quality as follow.

#### 1. Minimum Maintenance Cost (Model 2)

The calculation of this cost was based on the definition of the Initial Student Quality Cost (*Custo Aluno Qualidade inicial* [CAQi]) with some adjustments and aims to represent the minimum cost per child to maintain the offer of the program in accordance with some quality standards such as the child-teacher ratio. Second CAMPANHA NACIONAL PELO DIREITO À EDUCAÇÃO (2018), the CAQi represents an inversion in the logic of financing educational policies in Brazil, i.e. investment, previously subordinated to the budget availability resulting from the constitutional linkage of resources allocated to the area, is now linked to the need for a minimum investment per child to be guaranteed.

This definition includes the conditions and the minimum material and human inputs necessary for children's learning. To perform this calculation, the CAQi considers conditions such as class size, training of education professionals, salaries and careers compatible with the responsibility of education professionals, adequate facilities, equipment, and infrastructure. In addition, the methodology uses the School Census data to make some decisions, for instance, the percentage of enrollment in the full-time shift.

The CAQi's methodology adapted to the present study includes 27 steps divided into five parts. In Appendix B there is an example of calculation for a municipality adapted from Silveira et al. (2020)<sup>51</sup>.

It is worthy to mention that the adjustment from CAQi's methodology to calculate the "Minimum Maintenance Cost" is based on the addition of food cost and on the exclusion of the cost in continued formation that it will be considered under another cost definition. The addition of food costs is

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<sup>50</sup>The enrollment rate for public daycare is 81,1% and for preschool 79,7%. The enrollment of private daycare and preschool is the remainder of the total enrollment rate.

<sup>51</sup>Note that in this example the value used by Silveira et al. (2020) is based on the year 2020. However, for the estimated costs it was used the values for 2019.

based on the offering of the National School Feeding Program (*Programa Nacional de Alimentação Escolar* [PNAE]) which offers school meals and nutrition education actions to students in all stages of basic education in public schools. Appendix C shows all the parameters used to calculate this cost.

One important thing to highlight is that as Silveira et al. (2019, 2020) considered based on the legislation and some official documents, the salary of the teacher in the present study is based on the remuneration of the National Salary Floor for Public Teaching Professionals (*Piso Salarial Nacional para os Profissionais do Magistério Público da Educação Básica* [PSPN]), Law No. 11.738/2008, for the year 2019. For teachers with higher education, based on target 17 in the National Education Plan (2014-2024), the value of the salary corresponds to 90% of the average remuneration of other workers with the same level of education, calculated based on PNADC's data. For postgraduate level training, 15% was added to the value of higher education to ensure the appreciation of postgraduate professionals. The importance of considering these values for the teacher's salary is due to the fact that ECE teachers usually receive a low salary compared to other professionals, including in the area of Education.

Finally, it is important to mention that for teachers who teach in rural areas, there is a 15% increase in their salaries to encourage their continuity in the profession and location due to difficult access.

## 2. Minimum Structural Quality Cost (Model 3)

The calculation of this cost considers the Minimum Maintenance Cost quoted before with additional construction costs.

According to Silveira et al. (2020) the National Education Plan (*Plano Nacional de Educação* [PNE]) establishes as strategies for Brazilian Education the idea of restructuring and equipping educational units with a view to regionally equalizing educational opportunities. In addition, it establishes that all public schools must ensure access to electricity, treated water supply, sanitary sewage, and solid waste management. As well as guaranteeing access to spaces for the practice of sports, cultural, and artistic goods and guaranteeing accessibility for people with disabilities.

Accordingly, the additional construction costs were calculated in two parts: i) the cost to guarantee the minimum infrastructure as such water supply for all schools, for example; ii) the cost of building to guarantee the minimum classrooms needed to attend the demand according to the teacher-child ratio considered on the study<sup>52</sup>. The items considered to calculate the first part are items listed in the 2019 School Census data and can be found in the table 23 with the parameters in Appendix B. However, it is worth mentioning that it is possible to identify fewer infrastructural items required for ECE than found in the data, which means that we may be underestimating this cost. Finally, with

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<sup>52</sup>See Table 18 in the Appendix B.

regard to the cost of building new classrooms or new schools, the price per square meter was based on the "High Standard Basic Unit Cost", which is periodically released by the Civil Construction Industry Unions of each state as considered by Silveira et al. (2020)<sup>53</sup>.

Therefore, the two parts of the additional construction costs were added and divided by the number of children enrolled in ECE in 2019 based on the School Census data, and added to the Minimum Maintenance Cost to obtain the Minimum Structural Quality Cost per child.

### 3. Learning opportunities Cost (Model 4)

Based on the literature about quality's ECE, it is known that structural quality is not enough for learning, despite the structural quality being in part responsible for the opportunities of learning. Considering it and the available data, it was added in the "Minimum Structural Quality Cost" the cost for continuous formation for educational professionals and the costs of salaries considering the initial formation as higher education as settled for all teachers in the target 15 of the National Education Plan (PNE).

Finally, in order to compare, it was calculated the average effective public expenditure per child by the government using FINBRA data (Municipal Finance) called Model 1. This cost is the only one that was not weighted with private expenditure by the families. As quoted, despite its limitation of it, the intention is just to compare with the estimated costs.

#### 4.1.2 Data description

The calculation was based on the 2019 year because of the available data at the moment of the study and the Brazilian and world scenario in normal conditions as 2020 began the COVID-19 pandemic.

A brief description of the databases used in the cost calculation is presented below.

##### 1. Continuous National Household Sample Survey (*Pesquisa Nacional por Amostra à domicílio Contínua* [PNADC])

According to the Brazilian Institute of Geography and Statistics, the Continuous National Household Sample Survey aims to monitor quarterly fluctuations and the evolution, in the short, medium, and long term, of the workforce, and other information necessary for the study of the country's socio-economic development. Each quarter has a specific subject addressed. One of these subjects is Education and through this information, the enrollment rate was calculated at each stage of ECE.

##### 2. Family Budget Survey (*Pesquisa de Orçamentos Familiares* [POF])

According to the Brazilian Institute of Geography and Statistics, the Family Budget Survey assesses the structures of consumption, expenditure, income, and part of the variation in wealth for families,

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<sup>53</sup>See Table 25 on the Appendix C.

offering a profile of the population's living conditions based on the analysis of household budgets. The last available data at the moment that this study was conducted is from 2017-2018 and because of it, the values found about the expenditure by families were corrected by the Broad National Consumer Price Index (IPCA). This data was used to calculate the private expenditure per child by families which enroll their children in private schools.

### 3. School Census (*Censo Escolar*)

According to the National Institute of Educational Studies and Research Anísio Teixeira (Inep), the School Census is the main instrument for collecting information on basic education and the most important educational statistical survey in Brazil. It is coordinated by Inep and carried out in collaboration between the state and municipal departments of education and with the participation of all public and private schools in the country. The data were used to calculate the estimated cost per quality level. Information on the structural characteristics of educational units, number of education professionals, location of schools, demand for teachers, among others, was used.

### 4. Municipal Finances (*FINBRA [Finanças Municipais]*)

The information available at the National Treasury Secretariat on states, municipalities, and the Federal District is obtained by receiving accounting data through the Accounting and Tax Information System of the Brazilian Public Sector (Siconfi). Through these data, although with limitations due to the non-separation between the expenses with daycare centers and preschool, the average effective public expenditure carried out by the municipalities was calculated<sup>54</sup>.

### 5. Information System on Public Budgets in Education (*Sistema de Informações sobre Orçamentos Públicos em Educação [SIOPE]*)

SIOPE is an electronic tool created for the collection, processing, dissemination, and public access to information regarding the education budgets of the Union, States, Federal District, and municipalities<sup>55</sup>. Through these data, it was calculated the average salary of the teachers by the levels of Education paid by the municipalities in Brazil. This analysis was used to compare these results with the values used in the cost estimation.

## 4.2 Nutrition

The Cost of Inaction methodology for nutrition programs will consider only the Bolsa Família program, described in section 2.2. For the analysis, we will rely on 2 main characteristics: the age of the children receiving the program, and the vulnerability of the target population. These choices are due to the literature review conducted on this type of program. Glewwe et al. (2001) show that children under 3 years old are benefited from the Philippine nutritional program, but the highest benefit is for children

<sup>54</sup>The code used to obtain the information from this data was "12.365 - Educação Infantil".

<sup>55</sup>This information is available at [https://www.fnade.gov.br/fnde\\_sistemas/siope](https://www.fnade.gov.br/fnde_sistemas/siope). Accessed on August 30, 2021.

between 0 and 2 years old that belong to the most vulnerable group. Dewey and Begum (2011) highlights that the highest demand for nutrition comes during pre-natal period and between 0 to 2 years old. In addition, in Brazil, the lowest enrollment rate in daycare is among children between 0 and 2 years old, as Table 1 and Figure 2 shows. Children between 2 and 3 years old will not be considered for two reasons: most of the studies focus on children aged between 0 and 2 years; and it would be difficult to account for the daycare impact on the child’s nutrition. Finally, the food cost is already taken into account in the early childhood education COI<sup>56</sup>.

Regarding the target population, we will use the Cadastro Único data set, a national registry of people nationwide that are close to the poverty line. All people that receive Bolsa Família and other social programs are registered at Cadastro Único, which means that people that receive the conditional cash transfer from the Bolsa Família program are considered more vulnerable, but people in Cadastro Único that do not receive this stipend can be considered vulnerable too. To this extent, we will consider both of these populations at different quality levels. Children in families that receive Bolsa Família will be the most benefited from this program, and, as an extension of the model, we will consider families belonging to Cadastro Único, but with a lower benefit. According to Cadastro Único non-identified 2017<sup>57</sup>, data set there are  $\sim 75$  million people registered that constitute  $\sim 26$  million families and, among these, 44 million people from  $\sim 14$  million families receive Bolsa Família.

Regarding the costs, we will use the value of the Bolsa Família benefit per category, presented in Section 2.2. We understand that the monthly addition of 41 Brazilian Reais ( $\sim 10$  US dollars of 2019) per child in each category of the program is complementary and that the stipend as a whole is the one responsible for preventing people from food insecurity condition. For this reason, we will consider the full stipend (basic stipend that all families in Bolsa Família program receive plus the specific additional stipend to the category in consideration) taking into account only families that have in their composition children between 0 and 2 years old. Table 3 presents the numbers for each population<sup>58</sup>.

The three different costs will be:

1. Annual average cost per child in 2019 US dollars considering the basic stipend (89 Brazilian reais) plus the specific stipend (41 Brazilian reais) to children that belong to families that already receive Bolsa Família;

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<sup>56</sup>During the COVID-19 pandemic crisis, preschools and daycare centers showed how important they are to guarantee food to children. At the beginning of the pandemic, several schools implemented a plan so that families were able to collect some basic food inputs.

<sup>57</sup>This is the most recent de-identified data available at the Ministry of Citizenship website at <https://aplicacoes.mds.gov.br/sagi/portal/index.php?grupo=212>. This data is a representative sample from the universe of people that are registered at Cadastro Único.

<sup>58</sup>As we are using non-identified data we cannot guarantee that all the families that fit into the category are actually receiving the benefit. However, according to the Bolsa Família program description, if they receive Bolsa Família and are registered as part of one of these age categories, they will receive an additional stipend. For this reason, we believe this is very close to the real number of children receiving this specific stipend.

2. Annual estimated average cost per child in 2019 US dollars considering the basic stipend (89 Brazilian reais) plus the specific stipend modified to be equivalent to the basic stipend (89 Brazilian reais) to children that belong to families that already receive Bolsa Família; and
3. Annual estimated cost per child in 2019 US dollars considering the basic stipend (89 Brazilian reais) plus the specific stipend (41 Brazilian reais) to children that are registered at Cadastro Único but do not receive the Conditional Cash Transfer from Bolsa Família Program.

Table 3: Total of families and children between 0 and 2 years old by Bolsa Família

|                   | Families  | Children between 0 and 2 years old |
|-------------------|-----------|------------------------------------|
| Bolsa Família     | 1,683,326 | 1,736,385                          |
| Not Bolsa Família | 332,423   | 342,224                            |
| Total             | 2,015,749 | 2,078,609                          |

Note:

Regarding the benefits, it is difficult to establish which is the value of the benefit should be used. No longitudinal analysis for this Brazilian program considering long-run outcomes, such as labor market income or educational achievement, was found. So we need to rely on what the international literature finds.

Aboud and Yousafzai (2015), a systematic literature review, points out a benefit of 0.086 standard deviations for nutrition interventions. Glewwe et al. (2001) conclude that the impact of a nutritional program promoting an average growth of 2 to 3 cm in the height-for-age is equivalent to additional 12 months (1.2 academic years) of schooling for the most vulnerable group and additional 6 months of schooling to the less vulnerable group. In the Guatemalan study, Maluccio et al. (2009) show an impact of 1.2 grades completed for women, and Hoddinott et al. (2008) find an increase in 46% in wages for men.

An evaluation of the conditional cash transfer Mexican program (Progresa) leads to an increase of 1.1 cm in height for age (Rivera et al., 2004). As Progresa and Bolsa Família are both conditional cash transfer programs, we will assume that children who benefited from the Brazilian program will have an increase of 1 cm in their height in the second quality level, and the other benefits will be calculated from this. We will assume a linear relation between height-for-age and learning in a way that an increase in 1 cm will lead to an increase of 6 months of schooling and this would lead to an increase of 23% in the wages. For the less target intervention, the third quality level, we will assume 3 months of increase in schooling, and an 11.5% increase in wages. The first quality level will be defined as a proportion of the second, so the increase in wages will be considered as 16.3%.

The studies also show that the nutrients that children are consuming are important, combining macro and micro nutrients. However, we do not have data to support this analysis: we would need to build the average food inputs that the children should have between 6 months to 24 months old, and also analyze the mom's consumption of nutrients until when the child has 0 to 6 months old, as the recommendation

is that children are breastfed until they are 6 months old.

### 4.3 Home visiting

The Cost of Inaction methodology for home visiting programs will be based on important contributions already made about the theme. For cost analysis, the sources will be diverse, depending on the level of quality defined. The benefits analysis, due to the limited amount of contributions already published on long-term benefits for home visiting programs in Brazil, will be established based on the international literature. Finally, the total number of children affected by the intervention (N) will be given by the Cadastro Único data set, the same used for nutrition programs.

Barnett (1993) considers that some items are fundamental when analyzing the costs of home visiting programs. Among them are: (1) the number and the duration of the visits, once that these programs vary considerably in the number of months, the frequency, and the duration of visits; (2) home visitor caseload, that is, the number of families or children assign to each home visitor and the number of visits expected per week; (3) home visitor credentials and characteristics, that is, if it is necessary that the home visitor presents a graduate degree, a high school diploma or none at all; and (4) supervision and administration, that normally account for 10% to 30% of the cost of these programs, depending, if the cost of a new program will be added to an existing agency or not. According to the study of CMN (2017b), when applied to Brazil, the average spending on item (4) is 35%, based on information from the Municipal Experience 2011/2012, a survey that aimed to identify the main expenses to maintain social assistance policy programs, such as the Family Protection and Assistance Service (Paif) and the Service Protection and Specialized Assistance to Families and Individuals (Paefi).

That being said, quality levels for this intervention are defined. We will define 4 quality levels that have characteristics related to costs similar to those found in the Happy Child program, the Better Early Childhood (BEC) program, the home visiting intervention carried out in São Paulo, Brazil (Brentani et al., 2021), and, in addition, a higher level of spending that will be from now on called RAIS level, considering the information found in RAIS<sup>59</sup> (2019) and in CMN (2017b), taking in to account what the literature on home visiting programs suggest. At each of these levels, the goal is to establish the annual expenditure per child that will later be used to calculate the COI. The values for the quality level costs were obtained from different sources:

1. Happy Child program-level costs were obtained using government sources (BRASIL, 2018a,b). Ordinance No 2,496, of September 17, 2018 updated the value of the federal financing HC program actions per beneficiary of the Program, per month. Due to the diversity of the program, which

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<sup>59</sup>RAIS is a statistical database generated from the RAIS declaration (Annual Report on Social Information) which presents annual information from the Brazilian formal labor market, such as a number of employees by age group, education and gender and average remuneration of jobs according to occupation and sector of economic activity by geographic level.

in each municipality presents different values for the home visitor and supervisor salaries, and the limited amount of data available, this will be the only source of costs considered to this level.

2. Better Early Childhood program-level costs were obtained mostly from Verch (2017). BEC is a state initiative and it is the responsibility of the municipality to complement the amount transferred by the state for the sustainability of the program. The state is responsible for costs such as: contracting the Municipal Technical Group (GTM), Monitors, and Visitors; the physical structure for teamwork; resources and support materials for the development of care modalities; training; travel; execution of events; etc. While the municipality is responsible for the expenses of the GTM team, monitors, visitors, and data entry personnel; the physical structure; materials; and transportation. Using all this information, Verch (2017) estimates the total investment per month per beneficiary assisted by this policy for the year 2016.
3. São Paulo intervention level costs were obtained from Brentani et al. (2021). The article presents the intervention cost per child, based on a sample of 200 children and a 1-year program, considering the items: home visitor salaries, personnel supervisor, and materials. Here we assume that the costs presented referred to the year in which the intervention happened, 2015.
4. RAIS level costs were obtained using information from RAIS (2019) and CMN (2017b), adapted to the intervention sample costs used by Brentani et al. (2021). From RAIS (2019) we calculated the average salary of social care workers with a graduate degree to be used as a proxy for home visitor salaries and the average salary of all the social care workers to be used as a proxy for personnel supervisor salaries. This configuration was used once that, as mentioned previously, home visiting interventions for low-income families have the greatest effect when programs employ graduate professionals (Olds, 2002). Moreover, from the intervention costs considering only personnel expenses, we added 35% which refers to the additional costs of the program, as suggested by CMN (2017b), and that include: office expenses (furniture, internet, telephone, electricity, and water); travel expenses (fuel, driver and maintenance); supplies (from office and from activities developed with children); and staff training (courses, travel, and daily rates).

Once established the costs for the 4 levels of quality for home visiting programs are, the next step is to set the connection with the estimated long-term benefits for children when they enter the labor market. The connection will be established in a very simple way, based on the existing information. It is important to notice that, for the first two quality levels, the benefits will be estimated in one way and for levels 3 and 4 they will follow another way.

In the sequence, the analysis of the long-term benefits for the quality levels 1 and 2 is presented. The intervention carried out in São Paulo has aspects that are more similar to the intervention carried out in Jamaica, once that it is a small scale intervention, with a specific target group (children from a specific

region that have not attended day-care full-time) than the interventions of the first quality levels that happen in a large scale and, therefore, are closer to the Peruvian intervention than the Jamaica one. To get an idea of the size of these programs, in January of 2021, Cuna Más beneficiaries were more than 116,000<sup>60</sup>, HC beneficiaries were more than 338,000<sup>61</sup> and, as mentioned before, BEC has served more than 50,000 families in 2020. Thus, the quality levels (1) and (2) will have their benefits obtained from the annual costs per beneficiary of the Peruvian program and their given long-term benefits presented by Araujo et al. (2021a) that adapted from the context of this document will be 4.26%. So, these values for quality levels 1 and 2 will be, respectively, 3.24% and 3.57%<sup>62</sup>.

The Jamaica intervention, originally published by Grantham-McGregor et al. (1991) is one of the main home visiting programs ever made to developing countries, as mentioned before. The impact of home visiting on an overall measure of child development after 24 months in this program was 0.88 standard deviations, according to Araujo et al. (2021a), and these short-term effects on child development led to a 25 percent increase in labor income in the long run Gertler et al. (2014).

Thus, to calculate the monetary value of home visiting program effects for the long run, given that the paper of Brentani et al. (2021) also made use of the Reach Up and Learn curriculum, the methodology to be used will be based on Araujo et al. (2021a), that calculates the long-term benefits from a program that also was built directly based on the Jamaican experience, but for a Peruvian intervention (Cuna Más program). The appendix Table 27 summarize the information about program design, costs and evaluation for the interventions carried out in Jamaica, Brazil, and Peru. Using the information from the table, in a simple account, we would estimate that the expected increase in labor income would be 12.5 percent in Brazil<sup>63</sup>, considering the intervention carried out in São Paulo (quality level 3).

For the last level of quality (4), the assumption presented is that the long-term benefits are the same as those observed in level 3. This exercise is carried out to show that, even assuming a relatively higher cost of the intervention, it remains quite viable and interesting to policy makers, as the results that will be presented later will show.

Although all the interventions analyzed in the appendix Table 27 are based on the original Reach Up and Learn program, they differ in a lot of aspects, including target populations and the scale of the intervention. Also, as mentioned by Araujo et al. (2021a), the expected increase in labor income should be seen as suggestive only, once the child development measure was not the same in the different

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<sup>60</sup>Cuna Más Data. Available at: <http://sdv.midis.gob.pe/Infomidis/#/>. Accessed July 30th, 2021.

<sup>61</sup>VIS Data 3. Available at: <https://bityli.com/iwtU0>. Accessed July 30th, 2021.

<sup>62</sup>The established calculation was  $[(228.43 \times 0.0426) / 300]$  for quality level 1 and  $[(251.46 \times 0.0426) / 300]$  for quality level 2, where 300 is the annual cost per child of the Cuna Más program, 228.43 is the annual cost per child of the Happy Child program and 251.46 is the annual cost per child of the Better Early Childhood program.

<sup>63</sup>The established calculation was  $[(0.44 \times 0.25) / 0.88]$ , where the impact of home visiting on an overall measure of child development after 24 months in Jamaica was 0.88 standard deviations, in Brazil the impact after 12 months of intervention was 0.22 standard deviations and transforming the intervention in two years to be comparable to the Jamaican one the value found is 0.44 standard deviations and 25% was the increase in labor income resulted from the short-term effects on child development in Jamaica.

countries (the Griffiths Mental Development Scales in Jamaica, the ASQ-3 in Peru and the PRIDI in Brazil). Also, these estimates assume that the impact of the program on child development in Brazil is a proportion of the impact of a similar program in Jamaica and that then the future impact on wages will also be proportional, but, in practice, the way from changes in development to changes in wages may be less straightforward, for example, it could be nonlinear, or it could depend on other factors that vary by country, such as availability and quality of education services.

For last, we have that, for home visiting programs, the total number of children affected by the intervention ( $N$ ) will be the total number of children from 0 to 1 year, considering only families that receive the Bolsa Família benefit, according to the Cadastro Único data set, the same used for nutrition programs. The choice to use this age range happened so that the long-term benefits could be compared since the Jamaican intervention lasted 2 years. And the condition that families receive Bolsa Família comes from the international literature that points out that participants classified as belonging to higher risk groups obtain better results than participants at lower risk in home visiting interventions (Olds, 2002, 2006; Kitzman, 2004) and because receive this benefit is a requirement for the child to participate in the Criança Feliz program. According to Cadastro Único, the number of children in this configuration for 2017 was 1,736,385.

Tables 28 and 29 presents details about the cost quality levels, the short-run benefits and the long-run benefits used in the methodology of the home visiting section.

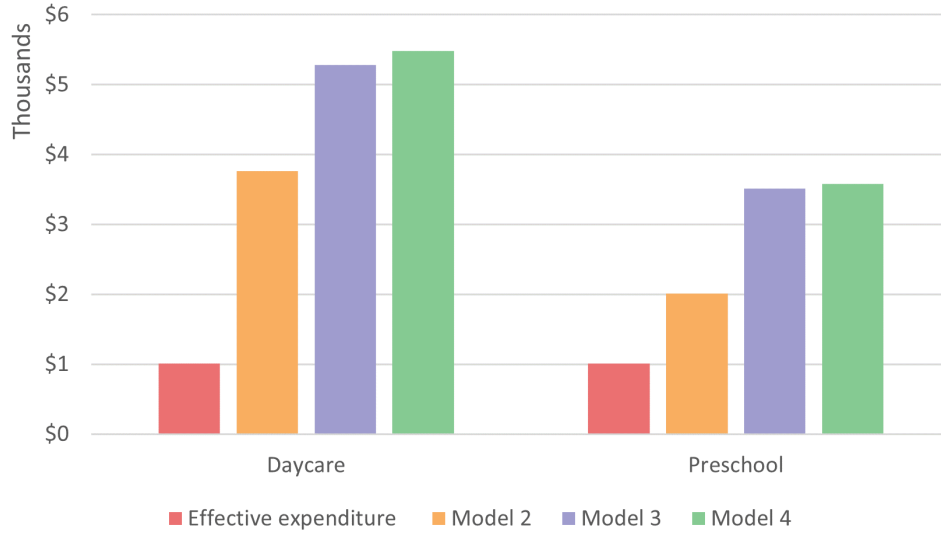
## 5 Results

### 5.1 Early Childhood Education

#### 5.1.1 Effective expenditure by the government and estimated costs

First of all, the figure 11 shows the annual average effective expenditure by the government in contrast to the estimated annual costs per child for daycare centers and preschool. It is possible to note that the estimated costs in model 4 are more than five times larger in comparison to effective expenditure by the government for daycare centers and three times and a half larger for preschool.

Figure 11: Effective expenditure and estimated cost per child in a year (\$)



However, this result should be considered with caution once the Municipal Finances declared through different databases are often inconsistent. There are differences in the values declared between Municipal Finances through Brazilian Public Sector Accounting and Tax Information System (Siconfi) and Information System on Public Budgets in Education (SIOPE). It was observed just for one municipality difference as R\$ 40 million in the expenditure on Early Childhood Education (ECE). These differences could be due to the transfers of resources destined for Education as quoted in the overview section, such as the one carried out by National Education Development Fund (FNDE), National School Feeding Program (PNAE), and others. This observation means that the real effective expenditure by the government could be greater than presented above with the transfers and to be conclusive about it, it is recommended to invest in the unification of the databases between the different information systems (Sinconfi and SIOPE) by the Brazilian government.

To be specific, the greater increase between the models is shown between models 2 and 3. Model 3 added up to model 2 (Minimum Maintenance Cost) the construction cost referring to the cost of a Minimum Structural Quality to be offered for all children. The estimated cost added to model 2 was about R\$55 million in total and according to the page of the National Education Development Fund (FNDE) the Proinfância program works on two main axes: i) construction of daycare centers and preschools, and ii) acquisition of furniture and equipment suitable for the functioning of the physical school in ECE, such as tables, chairs, cribs, refrigerators, stoves, and drinking fountains, transferred to the municipalities about R\$170 million in 2016; R\$35 million in 2017; R\$31 million in 2018; and R\$33 million in 2019<sup>64</sup>.

<sup>64</sup> Available at <https://www.gov.br/mec/pt-br/programas-e-acoes/programa-nacional-de-reestruturacao-e-aquisicao-de-equipamentos-para-a-rede-escolar-publica-de-educacao-infantil-proinfancia>. Accessed on August 29, 2021.

This information means that if Brazil were at the level of model 2 in terms of quality, enhancing the level doesn't seem to be financially impossible.

Finally, it is important to highlight that the difference in the estimated costs between models 3 and 4 is an increase in the costs of 4 percentage points (pp) and 2 pp in relation to model 3 for daycare and preschool respectively. Model 4 adds the cost of continuous formation and the payment of salaries as if all the teachers have at least the university formation as settled on the National Education Plan. It is important to highlight that it is the teacher the main person to interact with the children and offer learning opportunities to them. Hence, we are assuming that by giving the teachers training and the minimum structure needed, these learning opportunities will be offered to all children. As a comparative, the study quoted in the literature review Barros et al. (2011) found that this cost for Rio de Janeiro was 6%<sup>65</sup>. Despite the present estimation being below the costs found by Barros et al. (2011), it is close. It is worthy to recover that, according to the authors the investment in it has the lowest cost and a considerable impact on children's development.

After all, is this estimation of the cost too high?

To think about it, one way is to compare the estimated costs with the international cost of the Early Childhood Education program. Heckman et al. (2021) in their study about the dynastic benefits of Perry Preschool Project (PPP), a high-quality ECE program in the United States in which the curriculum was designed to spur the development of cognitive and non-cognitive skills focused on vulnerable children uses the total program cost per child of 21,151 (2017 US dollars) which considers both operating and capital (classroom and facilities). Second the authors, the participants received two years of 2.5-hour preschool sessions during weekdays starting at age three and they also received weekly teacher home visits during the two-year treatment period. How the estimated costs of two years do not exceed 11,000 (2019 US dollars) for daycare and 7,200 (2019 US dollars) for preschool of at least 4 hours a day during the weekdays, it seems that the cost of high-quality is not high.

Additionally, another way to think about how large is the cost is to delve into the estimated costs. Based on the calculation, the cost of staff with the social charge is the greater cost to maintain the offer of ECE, reaching in some cases 80% of the costs. Recovering from the methodology, the salaries used aim to reach the goals of the National Education Plan. However, one question to be done is if these values are too high compared to reality. With the intention to answer this question, it was used the SIOPE's data<sup>66</sup> about the teachers' remuneration for all municipalities. The results with the values of the salaries used on the models and found through the data could be seen in the table 4 as follows.

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<sup>65</sup>The cost to increase the dimension of "Program activities and structure".

<sup>66</sup>SIOPE is an electronic tool created for the collection, processing, dissemination and public access to information regarding the education budgets of the Union, states, Federal District, and municipalities, without prejudice to the powers of the Legislative Powers and the Courts of Auditors. This information is available at [https://www.fnnde.gov.br/fnde\\_sistemas/siope](https://www.fnnde.gov.br/fnde_sistemas/siope). Accessed on August 30, 2021.

Table 4: Teacher Remuneration used in the study compared to the remuneration used in Brazil (BRL)

|                       | Models 2 and 3 | Model 4  | with FUNDEB <sup>1</sup> | without FUNDEB <sup>1</sup> |
|-----------------------|----------------|----------|--------------------------|-----------------------------|
| High School           | 2,557.74       | -        | 3,962.75                 | 2,385.84                    |
| University            | 4,477.50       | 4,477.50 | 4,459.34                 | 2,739.99                    |
| Specialization        | 4,925.25       | 4,925.25 | 4,516.55                 | 2,666.90                    |
| Minimum master degree | 5,820.75       | 5,820.75 | 5,082.70                 | 4,409.56                    |

Note: <sup>1</sup>Fund for the Maintenance and Development of Basic Education and the Valorization of Education Professionals (FUNDEB) is a fund made up of resources from taxes and transfers from the States, Federal District, and Municipalities linked to Education.

Nonetheless, one more time, the results should be seen with caution once the data includes teachers from Elementary School; that despite they could have the same level of education, in Brazil, usually earn more than ECE's teachers. Unfortunately, it was not possible to identify the differences between the two categories. However, the numbers show that the values proposed in the estimation seem to be feasible in reality. For last, even if these values were not possible today, with the approval of the new FUNDEB that proposes to increase the resources for Education and increase the proportion that can be spent on personnel<sup>67</sup>, these values seem feasible in the future. To be specific to ECE, with the new FUNDEB settled with Constitutional Amendment 108 of 2020 the investment from the Federal will increase from 10% to 23% until 2026 of the total amount of the fund, and 10.5% it will be designated to increase the expenditure per child in the municipalities and states<sup>68</sup>.

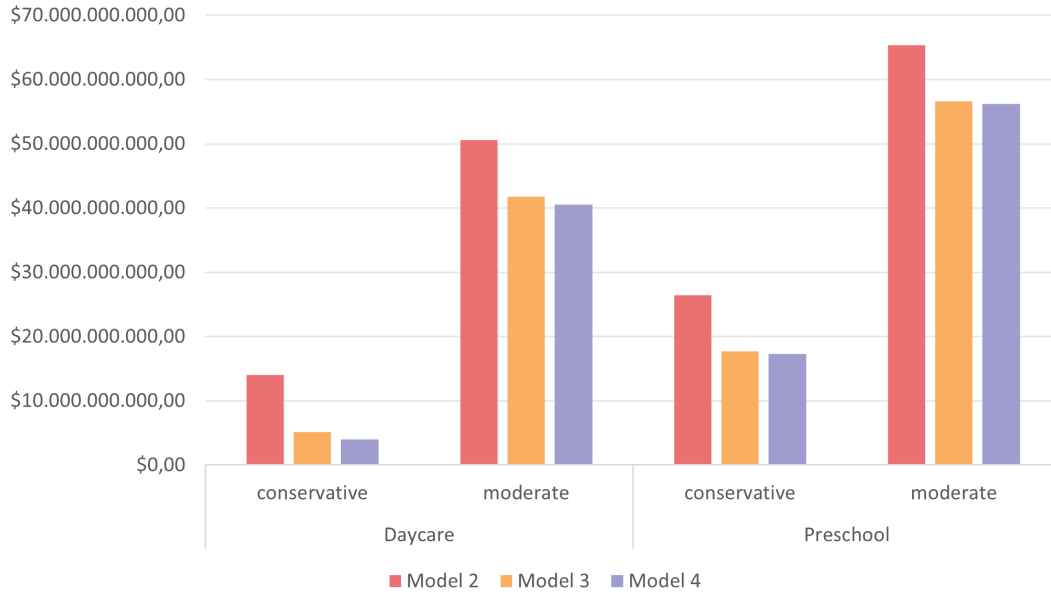
### 5.1.2 Cost of Inaction for Early Childhood Education

The results of the Cost of Inaction (COI) for Early Childhood Education (ECE) can be found in figure 12 below. These results were based on the covered rate ( $N$ ) of 50% for daycare and 100% for the preschool program as settled in the National Education Plan (PNE). If we consider that a lower quality level returns fewer benefits, the estimate of Model 2 with a conservative estimation could be the minimum limit of the expected Cost of Inaction. In the same way, the estimation of Model 4 with a moderate estimation could be the maximum limit. Hence, it is found a range of the expected cost for not offering ECE alongside quality.

<sup>67</sup>70% of the resources must be for the remuneration of Basic Education professionals.

<sup>68</sup>See Instituto Unibanco (2021).

Figure 12: Cost of Inaction in providing quality Early Childhood Education (US\$)



Nonetheless, what do these numbers mean? The table 5 shows that the range of the Cost of Inaction as a percentage of Gross Domestic Product (GDP) for daycare is between 0.75% and 2.16% and for the preschool is between 1.41% and 2.99%. Note from the table that it was showed the values for the effective expenditure. If the effective expenditure with ECE generates the same benefits that quality ECE guarantees, the social gains would be relatively high as a percentage of GDP. In addition, table 6 brings the results for the Benefit-Cost ratio showing that one dollar spent on daycare and preschool programs along with quality returns at least 1.6 and 3.2 dollars, respectively.

Table 5: Cost of inaction in providing quality Early Childhood Education as a percentage of Gross Domestic Product (GDP)

|                       | Daycare      |          | Preschool    |          |
|-----------------------|--------------|----------|--------------|----------|
|                       | conservative | moderate | conservative | moderate |
| Effective expenditure | 1.60%        | 3.55%    | 1.72%        | 3.79%    |
| Model 2               | 0.75%        | 2.69%    | 1.41%        | 3.48%    |
| Model 3               | 0.28%        | 2.22%    | 0.94%        | 3.02%    |
| Model 4               | 0.21%        | 2.16%    | 0.92%        | 2.99%    |

Table 6: Benefit-Cost Ratio in offering quality Early Childhood Education

|                       | Daycare      |          | Preschool    |          |
|-----------------------|--------------|----------|--------------|----------|
|                       | conservative | moderate | conservative | moderate |
| Effective expenditure | 6.1          | 12.4     | 6.5          | 13.1     |
| Model 2               | 1.6          | 3.3      | 3.2          | 6.5      |
| Model 3               | 1.2          | 2.4      | 1.9          | 3.8      |
| Model 4               | 1.1          | 2.3      | 1.8          | 3.7      |

In other words, aggregating the estimated COI from daycare and preschool the results mean ten times the average annual investment in Early Childhood Education by the government shown in the figure 9 in the overview section. Moreover, it is important to mention the Cost of Inaction model just considers the benefits on productivity. However, it is settled through the literature that Early Childhood Education is associated with other benefits such as crime reduction, improvement of mothers' mental health, and children's health. Just to show how large the effect considering the externalities could be, Barros et al. (2021) calculates the cost for a young not conclude the Basic Education for Brazil. The authors estimate that 17% of the students wouldn't conclude their studies per year, and the total annual loss for the country is R\$ 220 billion, which is equivalent to 3.3% of the annual GDP. Part of it, 53% is associated with the impact on productivity; however the other part is associated with longevity and quality of life, and reduced violence. This means that the results shown in this study are conservative.

Finally, it is important to mention that the results presented until now are based on the coverage rate settled by the National Education Plan (PNE). However, as expected, the results are not different considering the 2019 coverage rate which the COI as the percentage of the GDP varies from 0.55% to 1.6% for daycare and from 1.33% to 2.82% for preschool. However, these results are assuming the total coverage rate, i. e. how much Brazil lost in not offering ECE alongside quality. Still, If the interest is to know how much Brazil loss to not offering the enrollment rate in ECE alongside quality settled by the National Education Plan in relation to the 2019 coverage rate, the loss could reach 0.5 pp for daycare and 0.18 pp for preschool. In other words, for daycare, the loss means 23% of the estimated COI as the percentage of GDP considering the PNE coverage rate and for preschool means 6%.

As shown, the Cost of Inaction of ECE programs for Brazil is positive. This means that not guaranteeing quality alongside access to this program could be a loss for Brazil. However, as shown in the previews sections the problem in Brazil is not only about quality but also equity as there are differences in access between the major regions, race, income, and localization. When it comes to race, income, and localization the present study tried to introduce these variables considering the calculation of the estimated cost. An instance of it, it was the increase in the salary of teachers in rural localization as they demand more effort to do that because of the distance of the city and others.

Nonetheless, it is known that offering ECE in the different major regions demands different costs and different efforts. Accordingly, to consider the differences between the major regions and to analyze the benefits to offer ECE alongside quality for each place, it was estimated the Cost of Inaction by major regions and it will be presented in the next subsection.

### 5.1.3 Cost of Inaction of the quality Early Childhood Education by Major Regions

First of all, it is possible to see differences in the estimated cost for each major region in contrast with the effective expenditure.

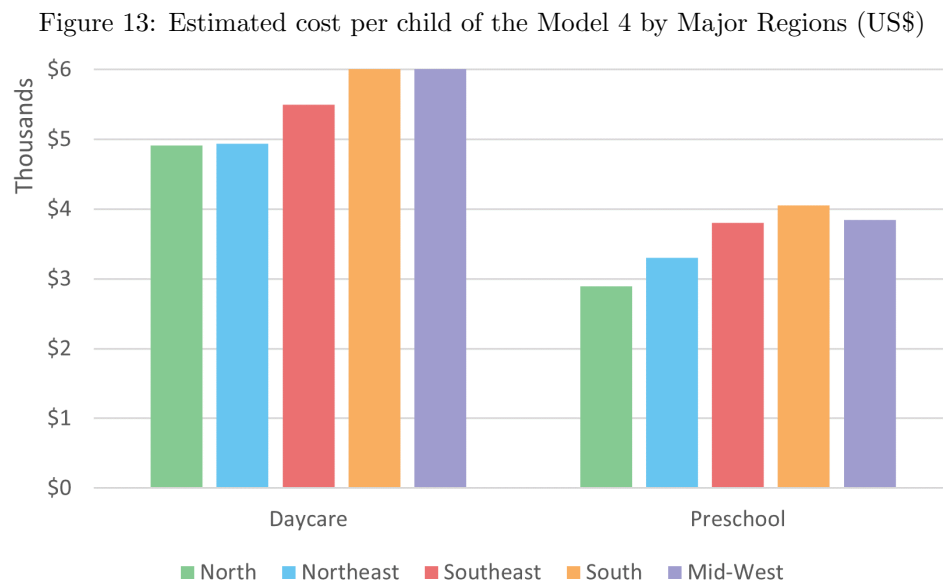
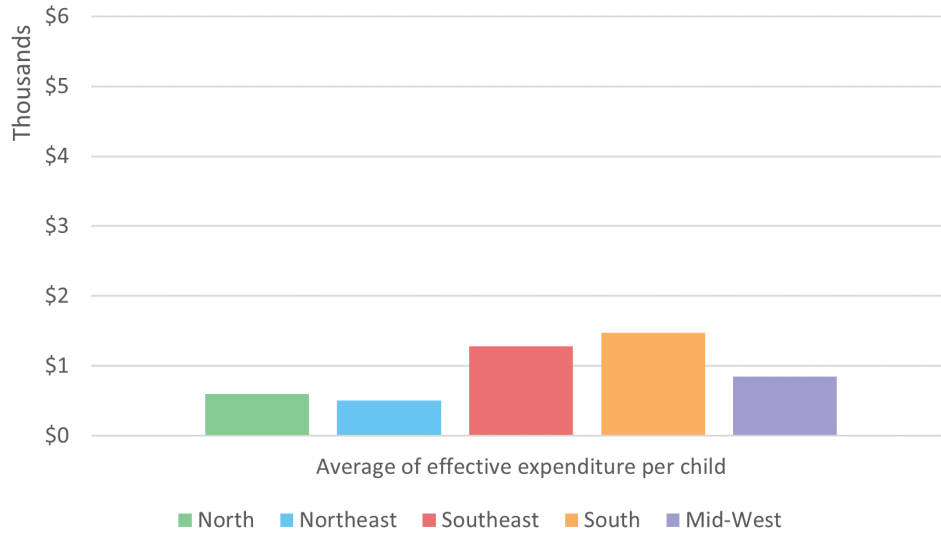


Figure 14: Effective expenditure per child by Major Regions (US\$)



As the figures above show, the costs vary by major region. In addition to that, it was considered the distribution of the total number of children for the major regions by the PNADC's data and replicated this distribution for the total number of children considered by the United Nations Population Division. The distribution considered in the present analysis is found in the table 7. In addition, to calculate the GDP per capita projections by Major Regions was considered the relation of the GDP per capita for the Major Regions by the GDP per capita for Brazil<sup>69</sup>. With it, it was found that the GDP per capita in relation to GDP per capita in Brazil for Major Regions is: 0.7 for North; 0.53 for Northeast; 1.23 for Southeast; 1.19 for South; and 1.40 for Mid-West.

Table 7: Distribution of children by Major Regions

|           | Daycare | Preschool |
|-----------|---------|-----------|
| North     | 10.8%   | 11.6%     |
| Northeast | 27.0%   | 26.6%     |
| Southeast | 40.6%   | 40.2%     |
| South     | 13.4%   | 13.1%     |
| Mid-West  | 8.2%    | 8.5%      |

Note: Own elaboration using PNADC's data.

With all this information quoted before, in Figure 15 it is possible to note the results of the Cost of

<sup>69</sup>To calculate this specific relation and replicate it for the GDP per capita forecast by International Monetary Fund, it was used the data from Ipeadata. The GDP per capita was obtained through the division of the 2017 GDP to the population (2010) for Brazil and the Major Regions. After it, it was considered the GDP per capita of the Major Region in relation to GDP per capita of Brazil.

Inaction considered the Model 4 with a moderate impact (15.62%) for the major regions.

Figure 15: Cost of Inaction for Quality Early Childhood Education by Major Regions based on Model 4



Despite the interesting findings of this estimation, there are limitations on that as we are considering the  $i$ ,  $s$ , and  $e$ , equal for all major regions. Still, it is possible to see at a glance that considering the number of children in the phase of Early Childhood, the cost estimated, and the GDP per capita for the major regions the benefit to offer ECE could vary through the local. Note that in the Northeast region, despite concentrating a larger number of children from 0 to 5 years old and the estimated cost is almost the same in relation to the North region, the COI is lesser for this region. This finding could be due to the lesser productivity that this major region presents.

## 5.2 Nutrition

Figure 16 shows the three costs outlined in section 4.2. The first column represents the value that we can consider the closest to what actually is implemented, as we are using the government data and we have the value of the conditional cash transfer. The second column represents the extrapolation of this program with a higher amount of conditional cash transfer to children of this age, as the literature shows that the intervention has a bigger impact in this period of life. This would correspond to the ideal intervention, as this corresponds to the target population pointed out in the literature as the most benefited from this type of intervention. Finally, the third column is a less focused extension of the model. This one is destined for people that have a higher household per capita income when compared to Bolsa Família recipients. However, these people are also in a vulnerable condition and would benefit from this program.

Figure 16: Average annual nutrition costs per child in 2019 US dollars

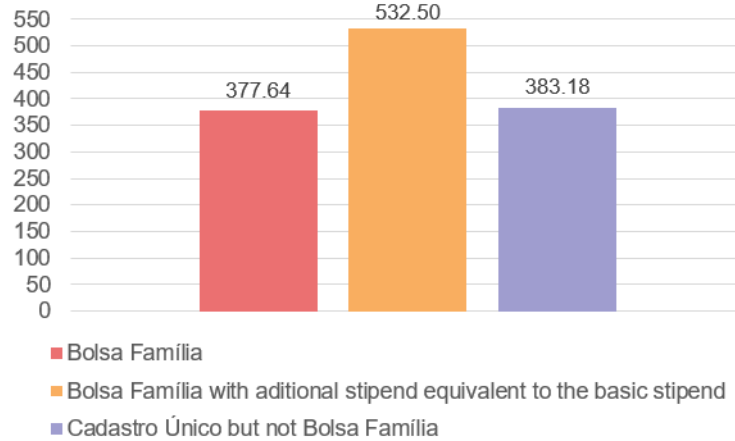


Figure 17 presents the Cost of Inaction to the nutrition program and Figure 18 shows the Cost of Inaction as a percentage of the GDP. As expected, the third model has a lower cost of inaction, as it is less focused. This is an important thing to notice as the design of the Bolsa Família Program is being discussed now. Evidence points out that a more focused program might benefit more children, and this must be considered in the design of the program. If we allocate more resources to people that belong to a more vulnerable context, then the cost of not doing so is much higher, as the second bar shows. The first bar reinforces the importance of the existence of the program.

Figure 17: Cost of Inaction of Nutrition programs (\$)

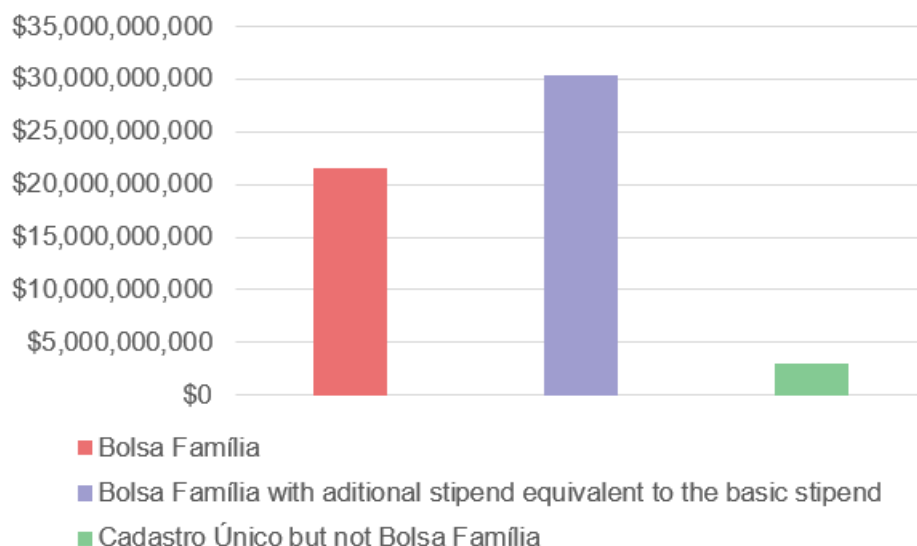
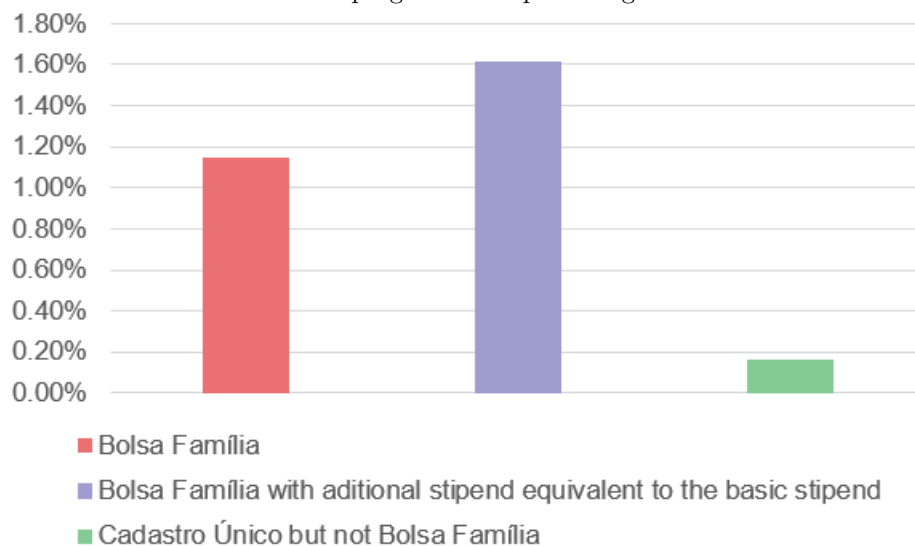


Figure 18: Cost of Inaction of Nutrition programs as a percentage of Gross Domestic Product (GDP)

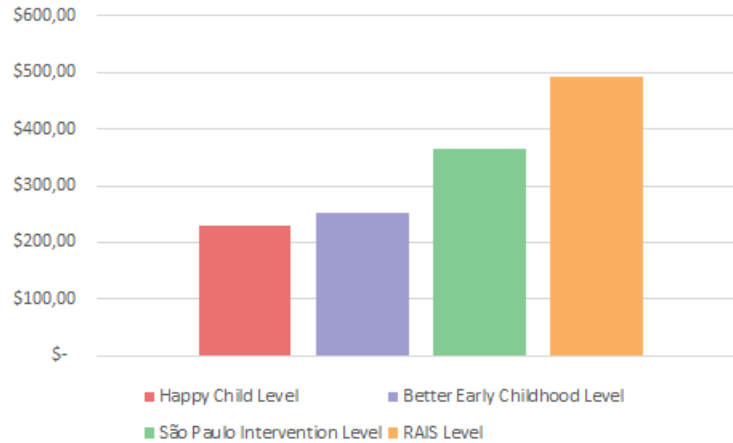


We must add that there are several limitations to this analysis. The fact that there is no long-term or longitudinal analysis to estimate the impact of this nutritional program as a direct effect on wages makes it difficult to establish what should be the benefit. Also, it is hard to estimate the accurate change in the height-for-age for children who benefited from this program, so we used a result from a Mexican program that is similar to Bolsa Família. However, despite all the limitations, this represents the best estimate of the intervention and gives a sense on what are the losses of not investing more in this area.

### 5.3 Home visiting

All the quality level costs defined in Section 4.3 were corrected by the Broad National Consumer Price Index (IPCA) for values of 2019, and Figure 19 shows the estimated costs for each quality level.

Figure 19: Average annual home visiting programs costs per child in 2019 US dollars



The values indicate that the quality level costs increase from level 1 to 4. Column 1 result was expected, once the Happy Child program is the most recent one, the biggest and the cheapest of all the interventions. Also, as mentioned by CMN (2017a) the program has some problems related to underfunding. Following, the next level presented is the Better Early Childhood column. This intervention is also a large one, however, is restricted to one state of Brazil and due to its bigger time of existence is already consolidated. Coming next, the column costs of the São Paulo intervention are presented and are relatively higher than the previous ones, due to the fact that this initiative was very focal and restricted to a specific public. Finally, the RAIS level costs column has the highest amount of investment required. This happens once this level of quality considers at least graduate professionals as home visitors for the intervention.

In the sequence, Figure 20 presents the Benefit:Cost ratio, Figure 21 presents the Cost of Inaction, and Figure 22 presents the Cost of Inaction as a percentage of Gross Domestic Product (GDP) for the home visiting programs.

Figure 20: Benefit:Cost ratio for Home visiting programs

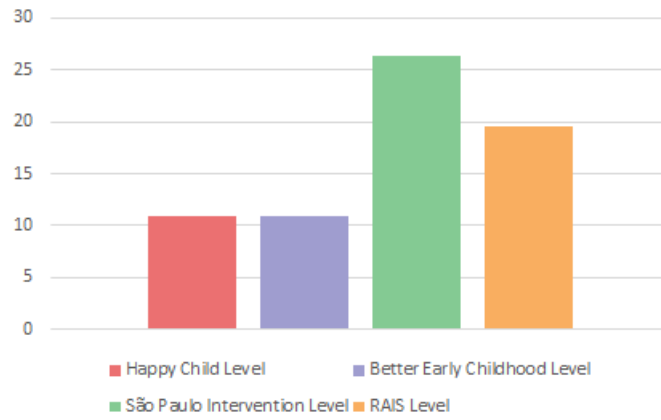


Figure 21: Cost of Inaction of Home Visiting programs

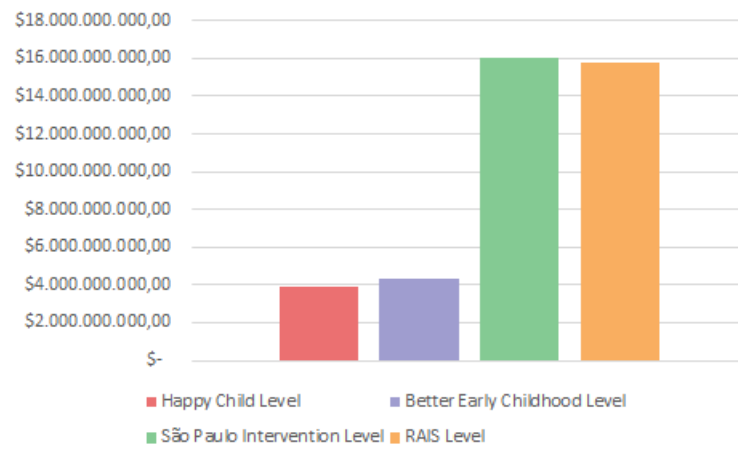
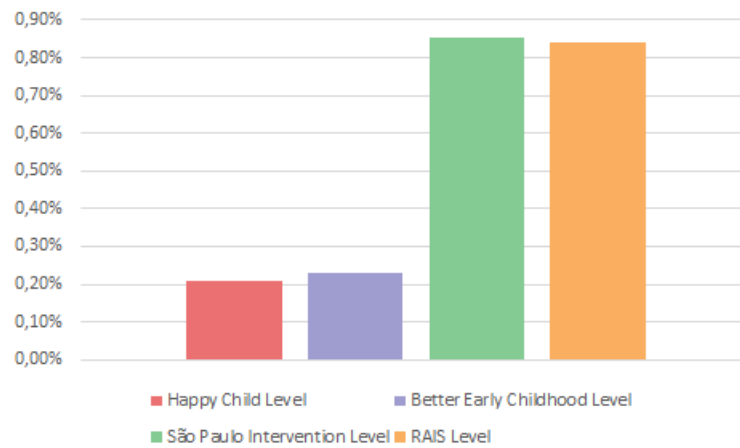


Figure 22: Cost of Inaction of Home Visiting programs as a percentage of Gross Domestic Product (GDP)



The Benefit:Cost ratio Figure suggests that for any intervention quality level the benefits outweigh the costs. The general aspect common to these graphics is that the first two levels of quality are much similar as are the last two. Although quite diverse, in general terms, the results found suggest that regardless of whether the interventions require higher or lower costs and present small or large long-term benefits, home visiting programs are worth it.

## 6 Conclusion

It is known that investing in Early Childhood is unquestionable. So, how much is the social loss for a country that does not do this investment? Trying to answer this question the present project aimed to analyze the Cost of Inaction of the Early Childhood programs for Brazil in three main fields: i) Education; ii) Health; and iii) Social care.

With regards to Early Childhood Education (ECE) it was shown that Brazil has made significant advances in terms of access more than doubling the enrollment rate to daycare centers that attend children from 0 to 3 years old and almost universalizing preschool which attends children from 4 to 5 years old. However, this access is unequal by major regions, age group, income, race, and localization. In addition to that, the diagnostic analysis from some studies has been showing that possibly the inequality to ECE is bigger when it comes to the quality of the institutions that offer the service. Considering this overview, the present study did not focus in calculate the Cost of Inaction (COI) to offer this program in Brazil, because the offer has already been done. But, the focus was to estimate the Cost of Inaction to offer ECE alongside quality and equity.

With it, it was estimated three costs associated with ECE's quality, and in essence, they enhance the level of quality from the minimum maintenance cost, to minimum structural quality cost; and followed by the learning opportunities cost. However, as the study aims to investigate the social cost, these estimated costs were weighted with the private costs. It is worthy to mention that despite the estimated cost showed to be five times larger in comparison to effective expenditure by the government for daycare and three times and a half for preschool the results should be considered with caution once the Municipal Finances are declared through different data are often inconsistent and the real expenditure in ECE by the government could be greater than presented on this study. To be conclusive about it and to evaluate the real expenditure of ECE in Brazil and how much it has been effective, it is recommended to invest in the unification of the databases between the different information systems (Siconfi and SIOPE) by the Brazilian government. The importance of it at this moment seems to be greater than ever before as in 2020 it was approved the new FUNDEB (a fund) that aims to enhance the public investment in education, including in ECE.

About the Cost of Inaction as a percentage of Gross Domestic Product (GDP) for daycare programs

the values estimated were between 0.75% and 2.16% and for the preschool program was between 1.41% and 2.99%. In other words, aggregating these values for daycare and preschool, these results mean from eight to ten times the average annual investment in ECE by the Brazilian government. In addition, it was shown that one dollar spend on daycare and preschool programs returns at least 1.6 and 3.2 dollars, respectively. This means that not guaranteeing access alongside quality to this program could be a loss for Brazil. It is important to mention that these estimates are conservative once the impact considered is just on productivity. However, it is known that investing in ECE has externalities such as improving the quality of life and health of the children and mothers.

Last, with the intention to consider the differences between the major regions was estimated the COI for each of them. It was noted that in the Northeast region, despite concentrating a larger number of children from 0 to 5 years old and the estimated cost is almost the same in relation to the North region, the COI is lesser for this region comparatively. The Northeast region presented the lesser COI estimation and the Mid-West region presented the highest COI estimation reaching 2.86% for daycare and 3.86% for preschool.

Finally, it is worthy to highlight that programs in Early Childhood should be complementary. As shown in the overview section, the access to ECE is smaller in the North and Northeast regions and it is where most of the rural schools are located. One strategy to overcome the difficulties by the government to access vulnerable children who live in places that are not covered by the Education System is through other programs, such as Home Visit. Even when there is educational cover through the system, the complementary of the programs can enhance the results, mainly for disadvantaged children that need more attention from the government. An example of this is balanced nutrition being offered at ECE centers. So, to be effective it is important to have transparency on the finances and coordinate the fields to the same goal, to transform the country into a country that gives the same opportunities to all.

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## Appendix A - Literature Review

Table 8: Daycare literature review

| Source                          | Research Question                                                                             | Quantified Outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Barros and Mendonça (1999)      | An assessment of the costs and benefits of preschool education in Brazil                      | There is no effect of having attended daycare on income, school performance, school performance, and employability.                                                                                                                                                                                                                                                                                                                                                               |
| Curi and Menezes-Filho (2006)   | The Effects of Preschool on Wages, Schooling and School Proficiency                           | There is no evidence that starting daycare studies increases the probability of finishing 4 and 8 years of schooling; however, having started studies at the daycare increased 13 percentage points (pp) in the probability of finishing 11 years of education and 19 pp in the probability of finishing university. In addition, starting daycare studies means an increase in attained schooling of 1.1 years. However, no effect on the future income of individuals is found. |
| Felício and Vasconcellos (2007) | The effect of early childhood education on school performance measured in standardized exams  | Attending daycare center has a positive and significant effect of 8.6% (or about 0.33 standard deviation) on SAEB test performance. In addition, attending ECE raises the average proficiency of elementary schools by about 9.6% or about 0.38 standard deviation.                                                                                                                                                                                                               |
| Pinto et. al. (2017)            | The impact of Daycare Attendance on Math Test Scores for a Cohort of Fourth Graders in Brazil | Positive net impact of daycare attendance, but of small magnitude. The results show that the effect of daycare is not always positive, but goes from -0,28 sd for mothers that have no education until about 0,42 sd for mothers with college or more.                                                                                                                                                                                                                            |
| Barros et. Al (2011)            | An assessment of the impact of daycare quality on child development                           | The results found by this analysis suggest that children attending daycare centers (DCs) considered to be of high quality are, on average, 1.2 months older in developmental age than children attending DCs considered to be of low quality, a marginally significant estimate ( p-value at 11%).                                                                                                                                                                                |
| Fonseca G. C. (2015)            | Investigating the durability of the early childhood education's effects                       | The fading-out for math proficiency would be equivalent to a decay rate between 1% and 12% per completed grade. This means that something between 89% and 21% of the original effect can still be detected.                                                                                                                                                                                                                                                                       |
| Ribeiro G. M. (2017)            | Income Inequalities: Education in question                                                    | The increase of 1 year of schooling increases 11.6% of income.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Cetra O. G (2020)               | Quality of education and wages in Brazilian municipalities                                    | The increase of 1 standard deviation in the SAEB has an growth of 4.6% in income. (1.7% local effect and 2.9% regional effect). Improving quality and quantity increase 6.3% in income.                                                                                                                                                                                                                                                                                           |
| Barros et. al. (2021)           | Consequences of Violation of the Right to Education                                           | The updated value for 2018 of the impact of an additional year of schooling on the log of GDP per capita is 0.142 and on the log of labor remuneration is 0.108.                                                                                                                                                                                                                                                                                                                  |

Table 9: Preschool literature review

| Source                          | Research Question                                                                                               | Quantified Outcomes                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Barros and Mendonça (1999)      | An assessment of the costs and benefits of preschool education in Brazil                                        | An extra year in preschool is related to an increase in attained schooling of 0.4 years and a direct increase in future income of 2% (most conservative estimate). One year of schooling is related to an 11% increase in future income. So, an extra year in preschool means an increase of about 6% in future income, not including gains from nutritional improvements and reduced repetition.                              |
| Curi and Menezes-Filho (2006)   | The Effects of Preschool on Wages, Schooling and School Proficiency                                             | Children who started school in preschool have 4 percentage points (pp) more likely to finish 4 years of schooling; 18 pp in the probability of finishing 8 years of education; 24 pp in the probability of finishing 11 years of education and 5.5 pp in the probability of finishing university. In addition, starting preschool studies means an increase of 1.6 years of schooling and an increase of 16% in future income. |
| Felício and Vasconcellos (2007) | The effect of early childhood education on school performance measured in standardized exams                    | Attending preschool has a positive and significant effect of 6.3% (or about 0.25 standard deviation) on SAEB test performance. In addition, attending ECE raises the average proficiency of elementary schools by about 9.6% or about 0.38 standard deviation.                                                                                                                                                                 |
| Pinto et. al. (2017)            | The impact of Daycare Attendance on Math Test Scores for a Cohort of Fourth Graders in Brazil                   | Positive impact of kindergarten on test scores. The magnitude of the effect is around 0.22 of the standard deviation of math test scores. The results have a lower dispersion among the level of mother's education, going from -0.004 sd for mothers without education until about 0.25 sd for mother with college or more.                                                                                                   |
| Campos et. al (2011)            | The contribution of quality early childhood education and its impacts on the beginning of fundamental education | The results show that attending a good quality preschool means 12% more in learning than not attending preschool, according to the Provinha Brasil scale. Furthermore, it is found that 1.3% of the total variance of grades is due to variability in the quality of preschool.                                                                                                                                                |
| Fonseca G. C. (2015)            | Investigating the durability of the early childhood education's effects                                         | The fading-out for math proficiency would be equivalent to a decay rate between 1% and 12% per completed grade. This means that something between 89% and 21% of the original effect can still be detected.                                                                                                                                                                                                                    |
| Ribeiro G. M. (2017)            | Income Inequalities: Education in question                                                                      | The increase of 1 year of schooling increases 11.6% of income.                                                                                                                                                                                                                                                                                                                                                                 |
| Cetra O. G (2020)               | Quality of education and wages in Brazilian municipalities                                                      | The increase of 1 standard deviation in the SAEB has an growth of 4.6% in income. (1.7% local effect and 2.9% regional effect). Improving quality and quantity increase 6.3% in income.                                                                                                                                                                                                                                        |
| Barros et. al. (2021)           | Consequences of Violation of the Right to Education                                                             | The updated value for 2018 of the impact of an additional year of schooling on the log of GDP per capita is 0.142 and on the log of labor remuneration is 0.108.                                                                                                                                                                                                                                                               |

## Appendix B - Steps of calculation the educational cost per child

Table 10: Steps of calculation the educational cost per child - Part 1

|    |                                                                                       |       | Teaching stages / modalities / segments   |                                         |                                          |                                          |                                           |                                         |                                          |                                          |                                 |                                 |
|----|---------------------------------------------------------------------------------------|-------|-------------------------------------------|-----------------------------------------|------------------------------------------|------------------------------------------|-------------------------------------------|-----------------------------------------|------------------------------------------|------------------------------------------|---------------------------------|---------------------------------|
|    | calculation memory                                                                    | total | daycare<br>< 1 year<br>urban<br>part time | daycare 1<br>year<br>urban<br>part time | daycare 2<br>years<br>urban<br>part time | daycare 3<br>years<br>urban<br>part time | daycare<br>< 1 year<br>urban full<br>time | daycare 1<br>year<br>urban full<br>time | daycare 2<br>years<br>urban full<br>time | daycare 3<br>years<br>urban full<br>time | Preschool<br>urban<br>part time | Preschool<br>urban full<br>time |
| 1  | Number of enrollments a                                                               | 136   | 9                                         | 8                                       | 20                                       | 29                                       |                                           |                                         |                                          |                                          | 70                              |                                 |
|    | [total stage]**                                                                       |       |                                           |                                         |                                          |                                          |                                           |                                         |                                          |                                          |                                 |                                 |
|    | Number of enrollments in the night shift***                                           | 0     |                                           |                                         |                                          |                                          |                                           |                                         |                                          |                                          |                                 |                                 |
| 2  | PQR: Percentage of full-time enrollment ****                                          | b     | 80%                                       | 80%                                     | 80%                                      | 80%                                      | 80%                                       | 80%                                     | 80%                                      | 80%                                      | 25%                             | 25%                             |
| 3  | Number of enrollments [shift: partial or full] c = a * b                              | 1217  | 1.8                                       | 1.6                                     | 4                                        | 5.8                                      | 7.2                                       | 6.4                                     | 16                                       | 23.2                                     | 52.5                            | 17.5                            |
| 4  | PQR: class size *****                                                                 | d     | 6                                         | 7                                       | 8                                        | 15                                       | 6                                         | 7                                       | 8                                        | 15                                       | 20                              | 20                              |
| 5  | Calculation of daytime 'number of classes' e = (c-a')/d**                             | 10.58 | 0.30                                      | 0.23                                    | 0.50                                     | 0.39                                     | 1.20                                      | 0.91                                    | 2.00                                     | 1.55                                     | 2.63                            | 0.88                            |
|    | Calculation of the 'number of night classes' e'=a'/d**                                |       |                                           |                                         |                                          |                                          |                                           |                                         |                                          |                                          |                                 |                                 |
| 6a | PQR: Number of school days f                                                          |       | 5                                         | 5                                       | 5                                        | 5                                        | 5                                         | 5                                       | 5                                        | 5                                        | 5                               | 5                               |
| 6b | PQR: Daily teaching hours (day shift) g                                               |       | 4                                         | 4                                       | 4                                        | 4                                        | 10                                        | 10                                      | 10                                       | 10                                       | 4                               | 10                              |
|    | PQR: Daily teaching hours (night shift) h                                             |       |                                           |                                         |                                          |                                          |                                           |                                         |                                          |                                          |                                 |                                 |
| 7  | Calculation of 'total teaching hours' i = (e * f * g) + (e' * f * h)                  | 408   | 6                                         | 5                                       | 10                                       | 8                                        | 60                                        | 46                                      | 100                                      | 77                                       | 53                              | 44                              |
| 8  | PQR: parameters referring to the 'teaching work-day' weekly working hours (in hours): | j     | 40                                        | 40                                      | 40                                       | 40                                       | 40                                        | 40                                      | 40                                       | 40                                       | 40                              | 40                              |
|    | Day without student interaction (%)                                                   |       |                                           |                                         |                                          |                                          |                                           |                                         |                                          |                                          |                                 |                                 |
|    | Journey with student interaction (%) k                                                |       | 0.666                                     | 0.666                                   | 0.666                                    | 0.666                                    | 0.666                                     | 0.666                                   | 0.666                                    | 0.666                                    | 0.666                           | 0.666                           |
| 9  | Calculation of demand for teachers ***** L = i/(j * k)                                | 15.30 | 0.23                                      | 0.17                                    | 0.38                                     | 0.29                                     | 2.25                                      | 1.72                                    | 3.75                                     | 2.90                                     | 1.97                            | 1.64                            |

Notes: (\*\*) Only public school enrollments (federal, state and municipal) are considered. Enrollments for complementary activities and/or specialized educational services (AEE) are not considered. (\*\*\*) Night groups are those whose activities start at 5 pm. Enrollments in Early Childhood Education (Nursery and Pre-school) in evening classes were not considered. (\*\*\*\*) In order to calculate the number of full-time enrollments, EJA and Vocational Education enrollments are not considered. (\*\*\*\*\*)

The rounding of this calculation step was set to two decimal places (Ex. 1.225  $\cong$  1.23 or 1.224  $\cong$  1.22).

Color legend: Red: PQR values (user changeable parameters)

Table 11: Steps of calculation the educational cost per child - Part 2

| Step | Description                                                                                                          |       |                           |                                                   |                                                |                                            |                       |     |                                       |                             |  |
|------|----------------------------------------------------------------------------------------------------------------------|-------|---------------------------|---------------------------------------------------|------------------------------------------------|--------------------------------------------|-----------------------|-----|---------------------------------------|-----------------------------|--|
| 9    | Calculation of demand for teachers                                                                                   | 15.30 |                           |                                                   |                                                |                                            |                       |     |                                       |                             |  |
| 10   | Insertion of the 'percentage of teachers by level of education'.<br>Diagnostic values surveyed by the School Census. |       |                           |                                                   |                                                |                                            |                       |     |                                       |                             |  |
| 11   | PQR: Values of 'teaching remuneration' by level of training;                                                         |       |                           |                                                   |                                                |                                            |                       |     |                                       |                             |  |
| 12   | PQR: Parameter insertion referring to 'Additional for teachers working in rural schools';                            | 15%   |                           |                                                   |                                                |                                            |                       |     |                                       |                             |  |
|      |                                                                                                                      | Level | Training level            | Step 11<br>Remuneration<br>monthly gross<br>(BRL) | Step 9<br>Total number of<br>teachers (demand) | Step 10<br>Number of teachers<br>existing* | % teachers<br>level** | per | Step 13<br>Total expense<br>monthly** | Total annual<br>expense**** |  |
|      |                                                                                                                      | P1    | High school               | R\$ 2886.24                                       | 15.30                                          | 2                                          | 5.56%                 |     | R\$ 2453.37                           | R\$ 32,629.77               |  |
|      |                                                                                                                      | P2    | University educa-<br>tion | R\$ 4927.33                                       | 15.30                                          | 10                                         | 27.78%                |     | R\$ 20,941.69                         | R\$ 278,524.42              |  |
|      |                                                                                                                      | P3    | Specialization            | R\$ 5420.06                                       | 15.30                                          | 24                                         | 66.67%                |     | R\$ 55,286.02                         | R\$ 735,304.07              |  |
|      |                                                                                                                      | P4    | Master's degree           | R\$ 6405.52                                       | 15.30                                          | 0                                          | 0.00%                 |     | R\$ -                                 | R\$ -                       |  |
|      |                                                                                                                      | P5    | Doctorate degree          | R\$ 7390.99                                       | 15.30                                          | 0                                          | 0.00%                 |     | R\$ -                                 | R\$ -                       |  |
| 13   | Calculation of total ex-<br>penditure on 'teacher pay'                                                               | Total |                           |                                                   |                                                | 36                                         | 100.00%               |     | R\$ 78,681.07                         | R\$ 1,046,458.26            |  |

Notes: (\*) The calculation of the number of teachers considered professionals in the roles of 'Teacher' and 'Titular Professor' - tutoring coordinator (module or subject) - EaD, exercised in public schools working in classes whose type of service is not a complementary activity or Specialized Educational Service (AEE). (\*\*) At the "High School" level, teachers with the following backgrounds were added: 'Complete Elementary School', 'Incomplete Elementary School', 'High School' and 'High School in the normal modality'. (\*\*\*) Total monthly expenditure on remuneration of teachers at each level of training: [total number of teachers demanded] x [% of teachers at the level of training] x [gross monthly pay] (\*\*\*\*) The annual expense was calculated from the monthly remuneration multiplied by 13.3. The multiplier 13.3 represents: (monthly wage x 12) + [13% salary] + [1/3 vacation]

Table 12: Steps of calculation the educational cost per child - Part 3

| Step                                  | Description                                                                                                      |              |       |                               |                    |  |                    |                         |                                        |  |  |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------|-------|-------------------------------|--------------------|--|--------------------|-------------------------|----------------------------------------|--|--|
| 14                                    | PQR: Insertion of parameters related to the composition (criteria of allocation) of the 'staff staff' of schools |              |       |                               |                    |  |                    |                         |                                        |  |  |
| 15                                    | PQR: Calculation of demand by employees (quantitative by function)                                               |              |       |                               |                    |  |                    |                         |                                        |  |  |
| 16                                    | PQR: Insertion of parameters referring to the value of 'compensation' by function;                               |              |       |                               |                    |  |                    |                         |                                        |  |  |
| 17                                    | Calculation of 'employee compensation' expense                                                                   |              |       |                               |                    |  |                    |                         |                                        |  |  |
|                                       | 136 enrollments — offer: daycare center and preschool                                                            |              |       |                               |                    |  |                    |                         |                                        |  |  |
| Function                              | Level of training                                                                                                | Localization |       | Step 14                       |                    |  |                    | Urban school enrollment | Step 15                                |  |  |
|                                       |                                                                                                                  | urban        | rural | Allocation criteria by school |                    |  |                    |                         | Calculation of the number of employees |  |  |
|                                       |                                                                                                                  |              |       | Professional by enrollment    | Minimum per school |  | Maximum per school |                         |                                        |  |  |
| Principal                             | University education                                                                                             | yes          | yes   |                               | 1                  |  | 1                  | 136                     | 1                                      |  |  |
| Vice-principal                        | University education                                                                                             | yes          |       | 600                           |                    |  | 3                  |                         | 1                                      |  |  |
| Pedagogical coordination              | University education                                                                                             | yes          |       | 350                           | 1                  |  |                    |                         | 1                                      |  |  |
| Library (upper level)                 | University education                                                                                             | yes          | yes   |                               | 1                  |  | 1                  |                         | 1                                      |  |  |
| Library (technical level)             | High school                                                                                                      | yes          |       |                               | 1                  |  | 1                  |                         | 1                                      |  |  |
| school secretary                      | High school                                                                                                      | yes          |       | 350                           | 1                  |  |                    |                         | 1                                      |  |  |
| Didactic multimedia                   | High school                                                                                                      | yes          |       | 250                           | 1                  |  |                    |                         | 1                                      |  |  |
| Infrastructure                        | High school                                                                                                      | yes          |       | 150                           | 1                  |  |                    |                         | 1                                      |  |  |
| food                                  | High school                                                                                                      | yes          | yes   | 125                           | 1                  |  |                    |                         | 2                                      |  |  |
| Total MDE (excluding "food" function) |                                                                                                                  |              |       |                               |                    |  |                    | 10                      |                                        |  |  |

Table 13: Steps of calculation the educational cost per child - Part 3 continued

| TOTAL                                 |                                                                                          |                |       |                                       |                    |                    |                                          |                         |                                                |                              |
|---------------------------------------|------------------------------------------------------------------------------------------|----------------|-------|---------------------------------------|--------------------|--------------------|------------------------------------------|-------------------------|------------------------------------------------|------------------------------|
| Function                              | Level of training                                                                        | Localization   |       | Step 14 Allocation criteria by school |                    |                    | Step 16 Remuneration monthly gross (R\$) | Urban school enrollment | Step 15 Calculation of the number of employees | Step 17 Total annual expense |
|                                       |                                                                                          | urban          | rural | Professional by enrollment            | Minimum per school | Maximum per school |                                          |                         |                                                |                              |
| Principal                             | University education                                                                     | yes            | yes   |                                       | 1                  | 1                  | 5912.79                                  |                         | 1                                              | R\$ 78,640.11                |
| Vice-principal                        | University education                                                                     | yes            |       | 600                                   |                    | 3                  | 5666.42                                  |                         | 1                                              | R\$ 75,363.39                |
| Pedagogical coordination              | University education                                                                     | yes            |       | 350                                   | 1                  |                    | 5666.42                                  | 136                     | 1                                              | R\$ 75,363.39                |
| Library (upper level)                 | University education                                                                     | yes            | yes   |                                       | 1                  | 1                  | 4927.33                                  |                         | 1                                              | R\$ 65,533.49                |
| Library (technical level)             | High school                                                                              | yes            |       |                                       | 1                  | 1                  | 2886.24                                  |                         | 1                                              | R\$ 38,386.99                |
| school secretary                      | High school                                                                              | yes            |       | 350                                   | 1                  |                    | 2886.24                                  |                         | 1                                              | R\$ 38,386.99                |
| Didactic multimedia                   | High school                                                                              | yes            |       | 250                                   | 1                  |                    | 2886.24                                  |                         | 1                                              | R\$ 38,386.99                |
| Infrastructure                        | High school                                                                              | yes            |       | 150                                   | 1                  |                    | 2886.24                                  |                         | 1                                              | R\$ 38,386.99                |
| food                                  | High school                                                                              | yes            | yes   | 125                                   | 1                  |                    | 2886.24                                  |                         | 2                                              | R\$ 76,773.98                |
| Total MDE (excluding "food" function) |                                                                                          |                |       |                                       |                    |                    |                                          |                         | 10                                             | R\$ 5772.48                  |
|                                       |                                                                                          |                |       |                                       |                    |                    |                                          |                         |                                                | R\$ 39,490.40                |
|                                       |                                                                                          |                |       |                                       |                    |                    |                                          |                         |                                                | 525,222.32                   |
| 18                                    | Insertion of parameters referring to 'social charges' on the payroll                     | 20%            |       |                                       |                    |                    |                                          |                         |                                                |                              |
| 19                                    | Calculation of expenditure on 'social charges' on the remuneration of teachers and staff | R\$ 314,336.12 |       |                                       |                    |                    |                                          |                         |                                                |                              |

Table 14: Steps of calculation the educational cost per child - Part 4

| Step | Description                                                                                                                                    |                  |                  |
|------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|
| 20   | Calculation of the 'Sub-total expenses with MDE' [personnel expenses]                                                                          | R\$ 2,929,170.28 |                  |
|      | Expenses with teaching materials and pedagogical actions in schools                                                                            | 5%               |                  |
| 21   | Continuing training of education professionals                                                                                                 | 1%               |                  |
|      | Operation and maintenance of school infrastructure, equipment and furniture                                                                    | 5%               |                  |
|      | Expenses with the administrative area of the network (Department of Education, administrative units and support agencies) and school transport | 7.50%            |                  |
|      | Total                                                                                                                                          | 18.5%            | 18.5%            |
| 22   | Total 'Other expenses'. Formula: [(step 20 / (1 - % total step 21)) - step 20]                                                                 | R\$ 664,903.68   | R\$ 664,903.68   |
| 23   | Calculation of 'Total expenses with MDE'. Formula: 'staff expenses' + 'other expenses' (step 21)]                                              | R\$ 3,594,073.96 | R\$ 3,594,073.96 |
| 24   | Calculation of the aggregated 'annual student cost' for the location. Formula: [step 23 / location registration number]                        | R\$ 5863.09      | R\$ 5863.09      |

Table 15: Steps of calculation the cost - Part 5

| Step                                                                      | Description                                                 | Table 19: Steps of calculation the cost - Part 3 |                    |                  |                         |                         |                         |                         |                           |                           |                           |                           |
|---------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------|--------------------|------------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| 25                                                                        | Calculation of cost drivers for steps/modalities and shifts |                                                  |                    |                  |                         |                         |                         |                         |                           |                           |                           |                           |
|                                                                           |                                                             | N                                                | Grand total        |                  | Daycare urban part time |                         | Daycare urban full time |                         | Preschool urban part time |                           | Preschool urban full time |                           |
| a. Number of enrollment                                                   |                                                             |                                                  | %                  | N                | %                       | N                       | %                       | N                       | %                         | N                         | %                         |                           |
| b. Number of teachers                                                     |                                                             |                                                  |                    |                  |                         |                         |                         |                         |                           |                           |                           |                           |
|                                                                           |                                                             |                                                  | 136                | 100%             | 13.2                    | 9.7%                    | 52.8                    | 38.8%                   | 52.5                      | 38.6%                     | 17.5                      | 12.9%                     |
|                                                                           |                                                             |                                                  | 15.30              | 100%             | 1.06                    | 6.9%                    | 10.62                   | 69.4%                   | 1.97                      | 12.9%                     | 1.64                      | 10.7%                     |
| 26                                                                        | Calculation of total expenses                               |                                                  |                    |                  |                         |                         |                         |                         |                           |                           |                           |                           |
|                                                                           |                                                             | Apportionment criterion                          | Calculation Memory | Grand total      |                         | Daycare urban part time |                         | Daycare urban full time |                           | Preschool urban part time |                           | Preschool urban full time |
|                                                                           |                                                             |                                                  |                    | R\$              |                         | R\$                     |                         | R\$                     |                           | R\$                       |                           |                           |
| Staff                                                                     |                                                             | a = (b+c)+d                                      |                    | R\$ 2,929,170.28 |                         | R\$ 249,622.11          |                         | R\$ 1,521,699.85        |                           | R\$ 807,732.57            |                           | R\$ 350,115.74            |
| Teachers                                                                  |                                                             | professors                                       | b                  | R\$ 1,046,458.26 |                         | R\$ 72,668.25           |                         | R\$ 726,682.51          |                           | R\$ 134,785.91            |                           | R\$ 112,321.59            |
| Non-teaching professionals                                                |                                                             | enrollment                                       | c                  | R\$ 1,394,516.97 |                         | R\$ 135,350.18          |                         | R\$ 541,400.71          |                           | R\$ 538,324.57            |                           | R\$ 179,441.52            |
| Social charges                                                            |                                                             | d = (b+c) * 20%                                  |                    | R\$ 488,195.05   |                         | R\$ 41,603.69           |                         | R\$ 253,616.64          |                           | R\$ 134,622.10            |                           | R\$ 58,352.62             |
|                                                                           |                                                             |                                                  |                    |                  |                         | 8.52%                   |                         | 51.95%                  |                           | 28%                       |                           | 12%                       |
| Expenses with teaching materials and pedagogical actions in schools       |                                                             | e = [(a/(1-(%total of step 21)) - a]             |                    | R\$ 664,903.68   |                         | R\$ 56,662.69           |                         | R\$ 345,416.53          |                           | R\$ 183,350.34            |                           | R\$ 79,474.12             |
| Continuing training of education professionals                            |                                                             |                                                  |                    |                  |                         |                         |                         |                         |                           |                           |                           |                           |
| Operation and maintenance of school infrastructure (...)                  |                                                             |                                                  |                    |                  |                         |                         |                         |                         |                           |                           |                           |                           |
| Expenses with the administrative area of the network and school transport |                                                             |                                                  |                    |                  |                         |                         |                         |                         |                           |                           |                           |                           |
| Total MDE                                                                 |                                                             | f = (a+e)                                        |                    | R\$ 3,594,073.96 |                         | R\$ 306,284.80          |                         | R\$ 1,867,116.39        |                           | R\$ 991,082.91            |                           | R\$ 429,589.86            |
|                                                                           |                                                             |                                                  |                    |                  |                         |                         |                         | R\$ 32,930.32           |                           |                           |                           |                           |
| 27                                                                        | Calculation of MDE Cost per student                         |                                                  |                    |                  |                         |                         |                         |                         |                           |                           |                           |                           |
|                                                                           |                                                             |                                                  |                    | Grand total      |                         | Daycare urban part time |                         | Daycare urban full time |                           | Preschool urban part time |                           | Preschool urban full time |
| Cost child yearly                                                         |                                                             | g=(f/a)                                          |                    | R\$ 26,427.01    |                         | R\$ 23,203.39           |                         | R\$ 35,362.05           |                           | R\$ 18,877.77             |                           | R\$ 24,547.99             |
| Cost child monthly                                                        |                                                             | h=(f/a)/12                                       |                    | R\$ 2,202.25     |                         | R\$ 1,933.62            |                         | R\$ 2,946.84            |                           | R\$ 1,573.15              |                           | R\$ 2,045.67              |

## Appendix C - Parameters

Table 16: Teacher Credit Hours

| Aspects                            | Daycare | Preschool |
|------------------------------------|---------|-----------|
| <b>School days per week</b>        |         |           |
| Number of days                     | 5       | 5         |
| <b>Daily Teaching Journey</b>      |         |           |
| Partial daytime                    | 4       | 4         |
| Full-time                          | 10      | 10        |
| <b>Full-Time</b>                   |         |           |
| Percentage of full-time enrollment | 70%     | 13.5%     |

Table 17: Working Journey

|                                            |        |
|--------------------------------------------|--------|
| Weekly working hours (in hours):           | 40     |
| Journey WITHOUT interaction with students: | 33.40% |
| Journey WITH interaction with students:    | 66.60% |

Table 18: Class Size

| Localization  | Aspect                       | Daycare      |            |             |             | Preschool |
|---------------|------------------------------|--------------|------------|-------------|-------------|-----------|
|               |                              | < 1 year old | 1 year old | 2 years old | 3 years old |           |
| Urban schools | Students per class (maximum) | 6            | 7          | 8           | 15          | 20        |
|               | Teachers per class (minimum) | 1            | 1          | 1           | 1           | 1         |
| Rural schools | Students per class (maximum) | 6            | 7          | 8           | 10          | 15        |
|               | Teachers per class (minimum) | 1            | 1          | 1           | 1           | 1         |

Table 19: Teacher Remuneration

| Teacher Remuneration by Level - Model 2 |                   |                                  |
|-----------------------------------------|-------------------|----------------------------------|
| LEVEL / CLASS                           | Level of training | Gross monthly remuneration (BRL) |
| P1                                      | High School       | 2557.74                          |
| P2                                      | Graduation        | 4477.50                          |
| P3                                      | Especialization   | 4925.25                          |
| P4                                      | Master            | 5820.75                          |
| P5                                      | Phd               | 6716.25                          |

| Teacher Remuneration by Level - Model 3 |                   |                                  |
|-----------------------------------------|-------------------|----------------------------------|
| LEVEL / CLASS                           | Level of training | Gross monthly remuneration (BRL) |
| P1                                      | High School       | 2557.74                          |
| P2                                      | Graduation        | 4477.50                          |
| P3                                      | Especialization   | 4925.25                          |
| P4                                      | Master            | 5820.75                          |
| P5                                      | Phd               | 6716.25                          |

| Teacher Remuneration by Level - Model 4 |                   |                                  |
|-----------------------------------------|-------------------|----------------------------------|
| LEVEL / CLASS                           | Level of training | Gross monthly remuneration (BRL) |
| P2                                      | Graduation        | 4477.50                          |
| P3                                      | Especialization   | 4925.25                          |
| P4                                      | Master            | 5820.75                          |
| P5                                      | Phd               | 6716.25                          |

Table 20: Staff and Wage

| Function                  | Education Level | Urban | Rural | Professional by enrollment | Minimum per school | Maximum per school | Gross monthly remuneration (BRL) |
|---------------------------|-----------------|-------|-------|----------------------------|--------------------|--------------------|----------------------------------|
| Principal                 | Upper           | Yes   | Yes   |                            | 1                  | 1                  | 5373.00                          |
| Vice principal            | Upper           | Yes   |       | 600                        |                    | 3                  | 5147.45                          |
| Pedagogical coordination  | Upper           | Yes   |       | 350                        | 1                  |                    | 5147.45                          |
| Library (upper level)     | Upper           | Yes   | Yes   |                            | 1                  | 1                  | 4477.50                          |
| Library (technical level) | Upper           | Yes   |       |                            | 1                  | 1                  | 2557.74                          |
| School secretary          | High School     | Yes   |       | 350                        | 1                  |                    | 2557.74                          |
| Didactic multimedia       | High School     | Yes   |       | 250                        | 1                  |                    | 2557.74                          |
| Infrastructure            | High School     | Yes   | Yes   | 150                        | 1                  |                    | 2557.74                          |
| Feeding                   | High School     | Yes   | Yes   | 125                        | 1                  |                    | 2557.74                          |

Table 21: Other Expenses

| Other expenses of school units and the education network - Model 1                                                                             |               |
|------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Item                                                                                                                                           | %             |
| Expenses with teaching materials and pedagogical actions in schools                                                                            | 5.00%         |
| Operation and maintenance of school infrastructure, equipment and furniture                                                                    | 5.00%         |
| Expenses with the administrative area of the network (Department of Education, administrative units and support agencies) and school transport | 7.50%         |
| <b>Total</b>                                                                                                                                   | <b>17.50%</b> |
| Other expenses of school units and the education network - Model 3                                                                             |               |
| Item                                                                                                                                           | %             |
| Expenses with teaching materials and pedagogical actions in schools                                                                            | 5.00%         |
| Continuing training of education professionals                                                                                                 | 1.00%         |
| Operation and maintenance of school infrastructure, equipment and furniture                                                                    | 5.00%         |
| Expenses with the administrative area of the network (Department of Education, administrative units and support agencies) and school transport | 7.50%         |
| <b>Total</b>                                                                                                                                   | <b>18.50%</b> |

Table 22: Other Parameters

| Aspect                               | %      |
|--------------------------------------|--------|
| Social charges                       | 20.00% |
| Additional for rural school teachers | 15.00% |

Table 23: Infrastructure

| School Dependency                                              | Urban | Rural | Daycare Centers | Preschool | Dimension m2 | Unit of measurement | Price por m2 (BRL) | Reference month/year |
|----------------------------------------------------------------|-------|-------|-----------------|-----------|--------------|---------------------|--------------------|----------------------|
| Library                                                        | X     |       | X               | X         | 67.71        | m2 (CUB R-1)        | 1932.66            | out/19               |
| Reading room                                                   |       | X     | X               | X         | 24           | m2 (CUB R-1)        | 1932.66            | out/19               |
| Computer lab                                                   | X     | X     |                 |           | 50.3         | m2 (CUB R-1)        | 1932.66            | out/19               |
| Science lab                                                    | X     | X     |                 |           | 67.94        | m2 (CUB R-1)        | 1932.66            | out/19               |
| Playground                                                     | X     | X     | X               | X         | 48           | m2 (CUB R-1)        | 1932.66            | out/19               |
| Sports Court                                                   | X     | X     |                 |           | 745.03       | m2 (CUB R-1)        | 1932.66            | out/19               |
| Indoor Court                                                   | X     | X     |                 |           | 300          | m2 (CUB R-1)        | 1932.66            | out/19               |
| Courtyard                                                      | X     | X     | X               | X         | 85.86        | m2 (CUB R-1)        | 1932.66            | out/19               |
| Indoor Courtyard                                               | X     | X     | X               | X         | 45           | m2 (CUB R-1)        | 1932.66            | out/19               |
| Management room                                                | X     |       | X               | X         | 11.53        | m2 (CUB R-1)        | 1932.66            | out/19               |
| Secretary                                                      | X     | X     | X               | X         | 26.5         | m2 (CUB R-1)        | 1932.66            | out/19               |
| Teachers room                                                  | X     | X     | X               | X         | 25.25        | m2 (CUB R-1)        | 1932.66            | out/19               |
| Kitchen                                                        | X     | X     | X               | X         | 30.7         | m2 (CUB R-1)        | 1932.66            | out/19               |
| Pantry                                                         | X     | X     | X               | X         | 9.48         | m2 (CUB R-1)        | 1932.66            | out/19               |
| Warehouse                                                      | X     | X     | X               | X         | 8.33         | m2 (CUB R-1)        | 1932.66            | out/19               |
| Internet                                                       |       | X     | X               | X         | 1            | m2 (CUB R-1)        | 1932.66            | out/19               |
| Broaband Internet                                              | X     |       | X               | X         | 1            | m2 (CUB R-1)        | 1932.66            | out/19               |
| Bathroom inside the building                                   | X     | X     | X               | X         | 10           | m2 (CUB R-1)        | 1932.66            | out/19               |
| Bathroom suitable for children's education inside the building | X     | X     | X               | X         | 10           | m2 (CUB R-1)        | 1932.66            | out/19               |
| Energy supply                                                  | X     | X     | X               | X         | 3            | m2 (CUB R-1)        | 1932.66            | out/19               |
| Water supply                                                   | X     | X     | X               | X         | 1.5          | m2 (CUB R-1)        | 1932.66            | out/19               |
| Drinking Water                                                 | X     | X     | X               | X         | 1.5          | m2 (CUB R-1)        | 1932.66            | out/19               |
| Sewage collection                                              | X     | X     | X               | X         | 3            | m2 (CUB R-1)        | 1932.66            | out/19               |
| Facilities adapted for people with disabilities                | X     | X     | X               | X         | 10           | m2 (CUB R-1)        | 1932.66            | out/19               |
| Bathrooms adapted for people with disabilities                 | X     | X     | X               | X         | 10           | m2 (CUB R-1)        | 1932.66            | out/19               |

Table 24: Feeding

| Student journey | Number of Daily Meals | Number of School Days | Value Per Meal |
|-----------------|-----------------------|-----------------------|----------------|
| Partial         | 1                     | 200                   | R\$2.14        |
| Full time       | 2                     | 200                   | R\$2.14        |

Table 25: Expenses with construction of classroom or new school

| Building type                                          | Demand for classroom | Dimension m2 | Unit of measurement | Price per m2 (BRL) |
|--------------------------------------------------------|----------------------|--------------|---------------------|--------------------|
| Number of classrooms to be built in existing buildings | less or equal 32     | 50.33        | m2 (CUB R-1)        | 1932.66            |
| Construction of a school building with 32 classrooms   | greater than 32      | 7026.96      | m2 (CUB R-1)        | 1932.66            |

## Appendix D - Home Visiting

Table 26: Brazilian literature review for home visiting programs

| Author                                                        | Study                                                                                                                                           | Outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Domain            |
|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Latin American Reference Center for Preschool Education, 2010 | Evaluation of the Primeira Infância Melhor Program                                                                                              | The document aimed to evaluate the results in the integral development of the children followed by the Program. The gains achieved by the children benefit from the program were higher than the children in the control group: 16% in the socio-emotional dimension, 23% in the motor dimension, 8% in the cognitive dimension, 10% in language.                                                                                                                                                                      | Child Development |
| Janus & Duku, 2012                                            | Evaluation of the Primeira Infância Melhor Program concerning school readiness for children between four and six years old in Rio Grande do Sul | Using EDI instrument to measure PIM effects, the result is that the children in the study developed according to expectations for their age in a similar way to children in the Canadian sample, in all domains, except for language and general knowledge. Also, children who participated in the PIM had slightly higher scores than children in the control group.                                                                                                                                                  | Child Development |
| Fundação Getúlio Vargas, 2014                                 | Evaluation for improved cost-effectiveness, qualification, and expansion of the Primeira Infância Melhor Program                                | The survey was conducted through a questionnaire with 1,600 respondents served by PIM. As a general result, there is a great acceptance, satisfaction, and confidence among the caregivers with the program, more than 80%. However, only 60% of them had the same Visitor during their participation in the PIM.                                                                                                                                                                                                      | Quality           |
| Leer et al., 2016                                             | A Snapshot on the Quality of Seven Home Visit Parenting Programs in Latin America and the Caribbean                                             | Using University of the West Indies instrument that allows obtaining an approach of the quality in visiting programs it was possible to observe that PIM Visitors have a great understanding of the characteristics and needs of families and are able to adapt the activities to the interests of the children as well as prepare with sufficient time the content of the visits, but they could work more on promoting caregiver participation.                                                                      | Quality           |
| Garcia et al., 2017                                           | Primary Care in Family-Based Health: An Empirical Evaluation of the Primeira Infância Melhor Program in Rio Grande do Sul - Brazil              | The authors investigate the effect of PIM on mortality caused by diarrhea in children under one year. The analysis, using differences-in-differences, revealed that the municipalities that had exposure equal to or greater than seven years to PIM reduced by 0.68 deaths from external causes per 1,000 children; exposure between four and six years, the effect is 0.45; and in fewer years of exposure to PIM (0 to 3 years), the effect on deaths caused by diarrhea per thousand children is -0.10.            | Health            |
| Wink Junior et al., 2021                                      | Early childhood home-based programs and school violence: evidence from Brazil                                                                   | The authors measure benefits related to the reduction of school violence after the implementation of the PIM program. Using differences-in-differences and a Probit-type regression, the estimates suggest that implementing the PIM program reduced the likelihood of verbal or physical abuse in the potentially treated school by more than five percentage points, and a similar effect was found for robbery or theft. In the case of attack or threat, this magnitude was over ten percentage points.            | Violence          |
| Brentani et al., 2021                                         | A home visit-based early childhood stimulation program in Brazil—a randomized controlled trial                                                  | A randomized controlled trial to test the relative effectiveness of child development agents (CDAs) and community health workers (CHWs) as two possible delivery platforms for early childhood development (ECD) focused home visiting intervention in São Paulo, Brazil was conducted using the Reach Up and Learn curriculum, initially developed in Jamaica, to the Brazilian context. In the per-protocol (PP) analysis, the CDA program resulted in a 0.22 standard deviation increase in children's development. | Child Development |

Table 27: Reach Up and Learn - Information about program design, costs and evaluation in Jamaica, Brazil and Peru

| Intervention                               | Jamaica                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Brazil                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Peru                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Brief Description                          | The original Reach Up and Learn program was implemented in Kingston, Jamaica, during the mid-1980s. A research team developed a set of play materials and activities to improve developmental outcomes for malnourished children, through psychosocial stimulation and play. It was delivered by paraprofessional community health workers, who, during weekly home visits to sixty-four children, modelled play activities and responsive adult-child interactions. | Two possible delivery platforms for early childhood development (ECD) focused in home visiting intervention in São Paulo, Brazil were conducted. The Reach Up and Learn curriculum was adapted to the Brazilian context. Children aged 9–15 months who did not attend crèches at enrolment were included in the trial and were randomly assigned to control or to receive biweekly home visits either through community health workers in the areas covered by the Brazilian Family Health Strategy (FHS) or by child development agents in the areas not covered by the FHS. | The Cuna Más program in Peru, was modelled on Colombia's program, which in turn was also based on the Jamaica program. It was truly an intervention at scale, implemented by the Ministry of Social Inclusion and Development. Cuna Más aimed to reach all children 0-3 years of age in rural localities with high rates of poverty and chronic malnutrition, and was geographically targeted to areas where the nationwide conditional cash transfer program was operating |
| Targeting Criteria                         | Stunted children in urban slums in Kingston                                                                                                                                                                                                                                                                                                                                                                                                                          | Children were selected from a list of children born at the University Hospital of Sao Paulo, the largest public general hospital in the Sao Paulo Western region, which covers about 80% of deliveries from low socioeconomic status families in the Butantã Jaguaré area                                                                                                                                                                                                                                                                                                     | All children 1-24 months in rural villages (up to 2,000 inhabitants or 400 dwellings) with poverty rates of 50% or higher and stunting rates of 30% or higher                                                                                                                                                                                                                                                                                                               |
| Intended Dosage                            | One hour, weekly                                                                                                                                                                                                                                                                                                                                                                                                                                                     | One hour, biweekly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | One hour, weekly                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Maximum Duration (months)                  | 24                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 36                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Months at Program Entry                    | 9-24                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 9-15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1-24                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Home Visitors Profile                      | Community health workers                                                                                                                                                                                                                                                                                                                                                                                                                                             | Community health workers (CHW) and child development agents (CDA)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Literacy required                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Supervisors Profile                        | Researchers themselves                                                                                                                                                                                                                                                                                                                                                                                                                                               | At least 14 years of formal education                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Some tertiary education required. In practice, all had at least some post-secondary schooling                                                                                                                                                                                                                                                                                                                                                                               |
| Home Visitors Remuneration (USD per month) | NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 892                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Supervisors Remuneration (USD per month)   | NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1113                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 830-900                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Families-to-HV                             | 20-21                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| HVs-to-Supervisor                          | 3/2                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | up to 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Costs (USD per child per year)             | NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 365                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 300                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Research Design                            | RCT, child-level randomization                                                                                                                                                                                                                                                                                                                                                                                                                                       | RCT, neighborhood-level randomization                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CRCT, municipality-level randomization                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Treatment Arms                             | T1 = Visits<br>T2 = Nutritional supplementation<br>T3 = Both                                                                                                                                                                                                                                                                                                                                                                                                         | T1 = CDA visits<br>T2 = CHW visits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | T1 = Visits<br>T2 = Visits + biweekly group meetings<br>T2 was not implemented, all T2 communities received T1                                                                                                                                                                                                                                                                                                                                                              |
| Population Representativeness              | Not designed to be representative of target population                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Measures                                   | Griffiths Mental Development Scales, HOME, Height and Weight                                                                                                                                                                                                                                                                                                                                                                                                         | PRIDI, CREDI, Height and Weight, Edinburgh PDS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ages and Stages Questionnaire 3, FCI, Height and Weight                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Sample Size (Home Visiting Treatments)     | Small Scale Intervention:<br>129 children (32 in T1 + 32 in T3)<br><br>127 children analyzed (30 in T1 + 32 in T3)                                                                                                                                                                                                                                                                                                                                                   | Medium Scale Intervention:<br>826 children (249 in T1 + 164 T2)<br><br>720 children analyzed (211 in T1 + 145 T2)                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Long Scale Intervention:<br>5,339 children (3,530 in T1 + T2)<br><br>4,685 children analyzed (3,192 in T1 + T2)                                                                                                                                                                                                                                                                                                                                                             |
| Impact (in Standard Deviations, SD)        | Intent-to-treat<br>0.88 SD in Developmental Quotient (DQ) <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                               | Per-protocol <sup>2</sup> (T1)<br>0.22 SD in PRIDI <sup>3</sup> language and cognition<br><br>For children not attending crèche at endline, PRIDI language and cognition results were:<br>0.45 SD in Intent-to-treat<br>0.78 SD in Per-protocol                                                                                                                                                                                                                                                                                                                               | Intent-to-treat (T1 + T2)<br>0.08 SD in cognition<br>0.10 SD in language<br>0.10 SD in total score <sup>4</sup><br><br>Treatment-on-the-treated (T1 + T2)<br>0.14 SD in cognition<br>0.16 SD in language<br>0.15 SD in total score <sup>4</sup>                                                                                                                                                                                                                             |
| Long Term Benefits                         | Twenty years after the intervention was conducted, the earnings of the stimulation group were 25% higher than those of the control group and caught up the earnings of the nonstunted comparison group                                                                                                                                                                                                                                                               | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

Notes: <sup>(1)</sup> The DQ score includes the locomotor (gross motor), hand and eye coordination (fine motor), hearing and speech (language), and performance (cognition) subscales. <sup>(2)</sup> Per-protocol analysis is based on a comparison of all children in the control group with children in each intervention arm receiving at least 10 home visits. <sup>(3)</sup> The PRIDI is a direct observation tool developed specifically for Latin America and covers the motor, cognitive, socio-emotional and language domains for children ages 2–5 (Verdisco et al., 2016). <sup>(4)</sup> Total score is an aggregate measure of cognition (problem solving), language, fine motor, gross motor and personal-social development.

Source: own authors, based on Araujo et al. (2021b) and Brentani et al. (2021).

Table 28: Cost details of the home visiting programs levels

## Level 1

| HC program         | Month cost per child (BRL) | Annual per child (USD) |
|--------------------|----------------------------|------------------------|
| Federal Investment | R\$ 75,00                  | \$ 228,43              |

## Level 2

| BEC program          | Cost (2016) | Cost (2019) | Cost (USD) | Details                                                                                                                                                                                                                        |
|----------------------|-------------|-------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State Investment     | R\$ 439,92  | R\$ 491,55  | \$ 124,76  | Contracting Municipal Technical Group (GTM), Monitors, and Visitors; the physical structure for team work; resources and support materials for the development of Care Modalities; training; travel; execution of events; etc. |
| Municipal Investment | R\$ 446,76  | R\$ 499,19  | \$ 126,70  | Expenses with the GTM team, Monitors, Visitors and Data Entry personnel, the physical structure, materials and transportation                                                                                                  |
| Total                | R\$ 886,68  | R\$ 990,74  | \$ 251,46  | Per child                                                                                                                                                                                                                      |

## Level 3

| Item                  | Cost (2015)    | Cost (2019)    | Cost (USD)   | Details                               |
|-----------------------|----------------|----------------|--------------|---------------------------------------|
| Home visitor salaries | R\$ 176.495,00 | R\$ 210.989,11 | \$ 53.550,54 | 200 children - 5 home visitors        |
| Personnel supervisor  | R\$ 44.020,00  | R\$ 52.623,25  | \$ 13.356,16 | 1 supervisor for 5 home visitors      |
| Materials             | R\$ 19.570,00  | R\$ 23.394,75  | \$ 5.937,75  | 200 children - 5 home visitors        |
| Total                 | R\$ 240.085,00 | R\$ 287.007,12 | \$ 72.844,45 | For an intervention with 200 children |
| Total                 | R\$ 1.200,43   | R\$ 1.435,04   | \$ 364,22    | Per child                             |

## Level 4

| Item                  | Month cost per child (BRL) | Cost (2019)    | Cost (USD)   | Details                               |
|-----------------------|----------------------------|----------------|--------------|---------------------------------------|
| Home visitor salaries | R\$ 3.970,44               | R\$ 238.226,40 | \$ 60.463,55 | 200 children - 5 home visitors        |
| Personnel supervisor  | R\$ 4.041,26               | R\$ 48.495,12  | \$ 12.308,41 | 1 supervisor for 5 home visitors      |
| Additional Costs      | R\$ 501,76                 | R\$ 100.352,53 | \$ 25.470,19 | 35% according to CNM (2017)           |
| Total                 | R\$ 8.513,46               | R\$ 387.074,05 | \$ 98.242,15 | For an intervention with 200 children |
| Total                 | R\$ 42,57                  | R\$ 1.935,37   | \$ 491,21    | Per child                             |

Table 29: Costs, short-run benefits and long-run benefits

|                    | Annual cost per child | Short-run benefits | Long-run benefits |
|--------------------|-----------------------|--------------------|-------------------|
| Jamaica            | -                     | 0,88 SD            | 25,00%            |
| Brazil (RAIS)      | \$ 491,21             | -                  | 12,50%            |
| Brazil (São Paulo) | \$ 364,22             | 0,44 SD            | 12,50%            |
| Peru               | \$ 300,00             | 0,15 SD            | 4,26%             |
| Brazil (BEC)       | \$ 251,46             | -                  | 3,57%             |
| Brazil (HC)        | \$ 228,43             | -                  | 3,24%             |

Source: own authors, based on Araujo et al., 2021.

## Appendix E - Databases sources

Table 30: Databases sources

| Data                                                       | Source                              | Procedure                                                                                                                                                                                      | Link                                                                                                                                                |
|------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Total Population by Age                                    | United Nations Population Division. | Go to the website and click to download the first file ("Annual Population by Age - Both Sexes (XLSX, 33.99 MB)"). The file name is WPP2019_INT_F03_1_POPULATION_BY_AGE_ANNUAL_BOTH_SEXES.csv. | <a href="https://population.un.org/wpp/Download/Standard/Interpolated/">https://population.un.org/wpp/Download/Standard/Interpolated/</a>           |
| Current GDP (Deflator For the Outcome "COI as a % of GDP") | World Bank national accounts data.  | Go to website and click to download the file that contains data from 1960.                                                                                                                     | <a href="https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?view=chart">https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?view=chart</a>         |
| GDP per capita forecast.                                   | International Monetary Fund         | Click "Entire Dataset" below the sign "Download WEO Data: October 2019 Edition". Then, select the file "by countries" to download. The file name is WEOOct2019all.csv.                         | <a href="https://www.imf.org/external/pubs/ft/weo/2019/02/weodata/index.asp">https://www.imf.org/external/pubs/ft/weo/2019/02/weodata/index.asp</a> |
| Employment rates                                           | ILO modelled estimates.             | Go to the website and click to download the file "Employment-to-population ratio by sex and age – ILO modelled estimates, Nov. 2019 (%) — Annual".                                             | <a href="https://ilostat.ilo.org/data/">https://ilostat.ilo.org/data/</a>                                                                           |
| Survival Rates                                             | United Nations Population Division. | Click to download the file "Abridged Life Table - Both Sexes (XLSX, 28.79 MB)".                                                                                                                | <a href="https://population.un.org/wpp/Download/Standard/Mortality/">https://population.un.org/wpp/Download/Standard/Mortality/</a>                 |

