Public Childcare, Child Development, and Labor Market Outcomes*

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Abstract

This study examines the impact of publicly provided daycare for children age 0-3 on subsequent child development and household outcomes over the course of seven years after daycare enrollment. The city of Rio de Janeiro in Brazil used a lottery to assign children to limited public daycare openings. Winning the lottery translated to one additional semester of daycare center attendance. Incomes for beneficiary households and labor force participation for the primary caregiver were significantly higher in the first year of daycare attendance and four years later. Labor force participation also rose for siblings and grandparents in the household; grandparents were 20 percentage points more likely to be employed four years after enrollment. Beneficiary children had improved height-for-age and weight-for-age, and both of these impacts persisted seven years after enrollment. There were also gains in the cognitive development of children four years after daycare enrolment, but they fade over time. These results suggest an array of positive impacts of publicly provided childcare, not limited to the beneficiary child, and affecting multiple members of the household.

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1 Introduction

Publicly provided daycare programs (for children ages 0 to 4) have two important goals. First, they offer enriched nutrition, education and socialization opportunities to children during the first years of their lives. Second, they provide childcare services for caregivers, allowing them to participate in the labor market. This prevents breaks in the careers of caregivers, potentially increasing their subsequent labor market attachment, and boosting household resources during the most critical years for child development.

There is, however, little evidence from low- and middle- income countries on the impact of large scale public daycare services. Much of the empirical studies to date have focused on home-based interventions for the youngest children or preschool for older children, but not on daycare centers in the early years of life, despite the fact that these form a large and growing part of the childcare sector, especially in middle-income countries.[1]

In this paper we study experimentally the impact of publicly provided daycare in a large metropolitan area in a middle-income country. Notably, we examine impacts one, four, and seven years after enrollment, mapping out the trajectory of impacts for far longer than most studies. In addition, unlike much of the literature, we document labor supply responses not only for parents but for all members of the households. This is important because in lower and middle income countries there are often multiple generations of the same family living as one household. As a result, there are many potential caregivers for the children present in the household, whose labor supply may react to the availability of publicly provided daycare.

The large scale experimental design in this study is possible because the government of Rio de Janeiro in 2007 randomly assigned 24,000 applicants age 0-3 across 10,000 available slots for free public daycare centers. Children enrolling in public daycare received 9.5 hours of care on weekdays and five meals during the day. Many children who lost the lottery enrolled the subsequent year or enrolled in private daycare, but the lottery is still a very strong predictor of enrollment in daycare. We selected a random sample of about four thousand children to measure the impacts of the program, and we administered detailed surveys to children and parents in 2008, 2012 and 2015.

We identify sizeable impacts of winning the lottery on household income both in the first and fourth years after the lottery took place. Households in which the child is a lottery winner had between 8-10 percent higher income than control households. Seven

[1] In Brazil between 2000 and 2010, the proportion of children in daycare nearly doubled from 12 percent to 21 percent. In Ecuador, it increased sevenfold, to 23 percent. Chile and Uruguay also experienced large increases (Araujo et al., 2015).

years after enrollment, the increase (about 5 percent higher than control households) was no longer statistically significant. Labor force participation for the primary caregiver had increased by more than ten percent four years after enrollment.

Strikingly, this is driven by the fact that employment increased markedly for grandparents residing with the child, who were 20 percentage points more likely to be working (relative to a 50 percent employment rate among grandparents in the control group). Siblings were also more likely to be employed. Seven years after enrollment, labor force participation was no longer significantly higher among the lottery winners, which is unsurprising as the children were all of school age. Employment rates of parents are high especially in the later periods of the study, and essentially the same between those who did and did not win the lottery. Therefore, in this sample, access to public day care substantially affects household resources, not only by increasing the potential for parental employment (the focus of most of the studies in this literature), but by improving the employment possibilities for other household members of working age. Caregiver stress also falls in the year after enrollment, and both attitudes and interactions between the caregiver and the child improve four years after enrollment.

Children who won the lottery also demonstrated significantly higher development outcomes. Four years after enrollment, they were 0.16 standard deviations (SD) taller for their age (height-for-age) and 0.20 SD heavier for their age (weight-for-age). Seven years later, these effects were 0.11 and 0.14, respectively. Such increases in height and weight are consistent with the results of nutrition-specific interventions (Bhutta et al., 2008). They illustrate the (potentially large) nutrition benefits of full-time daycare for poor children, which are sometimes understudied in papers more focused on their cognitive and socio-emotional development. Full-time daycare is not always seen or labeled as an important nutrition intervention.

We applied various tests of cognitive development and observe positive, significant gains on our index of cognitive growth (of about 0.07 SD) four years after enrollment, driven principally by gains in vocabulary. By seven years after enrollment, those impacts were still positive, but smaller and no longer statistically significant. We find no impact – positive or negative – of daycare on children's behavior. We include some exploratory analysis on the principal mechanisms driving these child development findings.

These are intent to treat estimates of the impacts of winning the lottery, as opposed to impacts of having a child attend full-time daycare. On average, children who do not win the lottery attend daycare for 1.9 years (out of a maximum possible 4 years), while those who win the lottery attend day care for an additional 0.64 years during their first four years of life (a 30% increase). To compute impacts on children and

families of attending daycare for a full year we should scale up these estimates roughly by 50 percent. With some extrapolation, we could then compare outcomes of children attending 0 (the minimum), 1, 2 (the average), 3 or 4 (the maximum) years of day care. For example, taking up 4 as opposed to 0 years of daycare could lead to gains of 50 percent in household income (consistent with having one or more additional household members in full time employment) and 0.4 SD in child cognition in the years immediately following daycare completion which are only half as large 3 years later, and longer-term improvements of 0.6 to 0.7 SD in height-for-age and weight-for-age. These are substantial impacts which should be weighed up against the high cost of public provision of formal daycare services.

These findings add to an extremely limited collection of studies on the impact of daycare for young children (age 0-3). Of the three available studies to examine center-based childcare in the first three years of life in low- and middle-income countries, one finds negative impacts on children's cognitive development but positive effects on nutrition in Colombia (Bernal et al., 2019). That paper does not examine impacts on household income or labor force participation. A second finds an improvement in children's personal-social skills and a gain in mothers' labor force participation in Nicaragua (Hojman and López Bóo, 2019). The third, offering vouchers to private daycare centers in urban Kenya, finds sizeable gains in mothers' labor force participation (Clark et al., 2019). Community-based daycare programs – often carried out in the home of a mother – have tended to find either no impact or even a negative impact for the youngest children (Behrman et al., 2004; Rosero and Oosterbeek, 2011). A previous systematic review of early child education interventions included no studies of daycare programs for children aged 0-3 (Leroy et al., 2012). For older children attending pre-school (often ages four and five), impacts on child development tend to be positive.

The evidence from high income countries on the provision of daycare is mixed, with positive long-run impacts in some cases and negative impacts in others (Black et al., 2014; Baker et al., 2019). Because impacts may vary based on the both the level of investments that children already receive at home and on the quality of daycare services, the impact in low- or middle-income countries may be distinct.

This work also contributes to the literature on the impacts of daycare availability on the labor force participation of adults in low- and middle- income countries. A recent review of more than 450 early childhood development interventions in low- and middle-income countries found that just four percent examine maternal labor force participation, and even fewer report labor force outcomes for other members of the household (Evans et al., 2020). While those relatively few studies that do examine

maternal labor force participation of daycare provision tend to find positive impacts (Cascio, 2009; Berlinski et al., 2011), our findings that impacts on grandparents and older siblings could be as or even more substantial has important implications when considering the returns to public investments in childcare. Finally, this work speaks to the literature on fade-out of effects from early childhood and education interventions (Bailey et al., 2017; Jenkins et al., 2018). The impacts on children's anthropometrics suggest that provision of regular meals through daycare at a crucial growth stage can result in enduring improvements.

The rest of this article is organized as follows. Section 2 describes the context and the services provided by public creches in Rio de Janeiro, Brazil. Section 3 details the evaluation design. Section 4 shows the main impact of the program. Section 5 includes exploratory analysis on mechanisms and robustness checks. Section 5 concludes.

2 The Context and the Intervention

2.1 The Context

This study takes place in the city of Rio de Janeiro, the second largest city in Brazil. In the year of the intervention (2007), Rio de Janeiro had a population of around 6 million people, which corresponded to 3.5 percent of Brazil's population.[2] Seven percent of Rio de Janeiro's population were children aged 0-4. Although the Brazilian constitution states that the government will guarantee access to daycare for children up to five years of age (Government of Brazil, 2016), in practice there are not enough public daycare centers (or creches) to fully meet the demand. In 2007, there were 244 public daycare centers in Rio de Janeiro, servicing just 6.8 percent of the city's 0-4 population, and 352 private daycare centers servicing 7.3 percent of the children.

In this context, there was an unsurprising excess demand for spaces in public daycare centers. The municipal government agreed to implement a lottery to distribute the available vacancies for the 2008 academic year.[3]

[2]Rio de Janeiro is a relatively high income city within Brazil, accounting for 5 percent of the national GDP. When compared to the national average, Rio de Janeiro had a higher GDP per capita in 2007: 11.477 USD as opposed to the 7.374 USD country average. The poorest 10 percent of individuals in the city had a per capita monthly income of 58 USD, substantially higher than the 34 USD in the rest of the country.

[3]The lottery was subsequently modified to give higher chances of admission to lower income students, and eventually the admissions became primarily needs based.

2.2 The Intervention

Rio de Janeiro's public daycare program provided full-time daycare during weekdays (from 7am to 4:30pm). The daycare program included a variety of center-based activities tailored to children of each of four age groups from the youngest (age 0-11) to the oldest (age 36-47 months).[4] Activities in the creches included time for physical play, instructional toys, art, music, storytelling, and rest time. Children also had access to five meals or snacks over the course of the day. Similar meals were offered to all creches according to a standardized menu developed by a nutritionist to ensure a balanced diet.[5] Government health professionals – both medical and dental – also paid frequent visits to each creche to monitor the health status of the children and intervene as needed.

3 Evaluation Design

3.1 Sampling and Randomization

The allocation of available spaces in creches in Rio de Janeiro, up to 2006, was decentralized and assigned under the responsibility of each creche's management. Government guidelines for allocation indicated general criteria suggesting prioritization of children (i) with special needs, (ii) with any chronic diseases, (iii) living in poor households, (iv) in households with members in conflict with the law, and (v) with parents that needed access to daycare to be able to work. However, as public creches are primarily located in low-income neighborhoods of the city, most children applying to the available spaces met at least one of the criteria, so that final allocation decision often fell to the discretion of creche management.

In 2007, the municipal government decided to implement a lottery to allocate the available spaces in a more structured and transparent way for the upcoming 2008 academic year. For 2008, there were 244 public day care centers spread around mostly low-income neighborhoods of the city. But because not all creches provided services for all four age groups, and children could only enroll in a creche serving their age group, the total number of creche-age group combinations for the 2008 academic year lottery was 847, with a total of 11,640 spaces available. A total of 25,511 children applied for the available spaces.

Children considered high priority (as identified by creche management) and children

[4]Specifically, the four age groups were age 0-11 months (*Bercario I*), age 12 to 23 months (*Bercario II*), age 24-35 months (*Maternal I*), and age 36-47 months (*Maternal II*).

[5]The meals included breakfast, a mid-morning snack, lunch, and two afternoon snacks. Examples of creche menus are posted online (Prefeitura da Cidade do Rio de Janeiro, 2019).

with special needs, a total of 947 and 660 respectively, were automatically granted a space in a creche without the need to participate in the lottery. Therefore, a lottery was carried out to distribute the remaining 10,033 vacancies among all the other 23,904 applicants, which all met at least one of the vulnerability criteria mentioned above.

Beneficiaries were selected by lotteries specific to each creche-age group. Lotteries were carried out in those groups for which there the demand for vacancies exceeded the number of vacancies (there were some age group - creche combinations for which there was no excess demand, and which are not used in our study). Those not selected through the lottery were placed in randomized order on a waiting list and could enter the creche if a space became available.

A sample of 4,350 children in 232 creche-age groups was selected for the impact evaluation among the creche-age groups that participated in the lottery. The number of children selected for the sample in each creche-age group varied between 5, 10, 15 or 20 children from both treatment and control groups, depending on the number of vacancies offered and the size of the waiting list. Creche-age groups with fewer than seven vacancies or fewer than seven children on the waiting list were not included.

As is standard with lotteries of this type, applicants are randomly assigned a rank on a waitlist, and then offered the available slots until they are all accepted. However, our sample only includes children at the top and bottom of the waitlist (those most and least likely to be offered slots), and excludes children in the middle. Originally there were no resources to survey all children on the waitlists, and excluding children with ranks in the middle minimizes issues caused by imperfect compliance in randomized waitlist designs, raised in Chaisemartin and Behagel (2020).

3.2 Data

In our empirical analysis we use basic administrative records from the application files to the lottery, combined with three rounds of survey data. When caregivers applied for a space at a creche, they filled out a short questionnaire with basic identifying information – e.g., name, gender, date of birth – and questions related to the vulnerability criteria, including household size, the work status of the person responsible for the child, whether the person depended on daycare to be able to work, whether the child had any chronic disease, whether the child had special needs, whether any member of the family was involved in substance abuse or had ever been imprisoned, and whether the family lived in the community. The answers to this questionnaire give us basic pre-lottery information for all applicants.

Regarding the survey data, the first round was collected between July and December

2008 (6-11 months after the lottery winners were exposed to childcare). This survey includes information on household welfare, including labor market outcomes, time allocation of the child's main caregiver, household income and assets, and stress of the mother. The survey also recorded whether children in the sample were enrolled in a public creche or – if not – any other daycare alternative. No developmental outcomes of children we assessed in this first-round survey.

The two subsequent survey rounds took place in 2012 and 2015, five and eight years after lottery winners were offered slots in creches. These rounds included follow-up data on households, and in addition, it also measured child development outcomes. By 2012, less than 1 percent of our sample still attended creches, so all impacts measured using these surveys were observed after children were no longer in daycare. The survey implemented in 2012, due to financial constraints, only interviewed part of the original sample, corresponding to beneficiaries from 64 creches, or roughly 60 percent of the sample. The 2015 survey targeted the entire sample.

The socioeconomic questionnaire administered in 2012, answered by the person responsible for the child, included information on income and assets, labor market outcomes for all household members, stress of the mother, and home environment characteristics. They also recorded a detailed history of daycare attendance by the child and included enumerator observations about the interactions of the child's caregiver and the child during the interview.

To measure child development in 2012, we collected data on cognitive function, child behavior, and anthropometrics (the height and weight of the child). Cognitive function was assessed using three batteries:[6]

- The TVIP Peabody picture vocabulary test, which measures vocabulary development (Dunn et al., 1986; Lima, 2007).
- Three measures of executive function, which relate to to working memory, mental flexibility, and self-control: (a) the Head Toes Knees Shoulder exercise (Ponitz et al., 2008), (b) the Pencil Tapping Test (Diamond and Taylor, 1996), and (c) the Stroop Test (Stroop, 1935).
- Two batteries of the Woodcock-Johnson-Munoz tests related to visual-spatial thinking and associative memory: (a) WJ Visual Integration and (b) WJ Memory for Names (Woodcock et al., 2005).

[6] All cognitive tests carried out measure factors of the Cattell-Horn-Carroll theory on the structure of human cognitive abilities (McGrew, 2005; Alfonso et al., 2005).

Child behavior is measured based on the Child Behavior Questionnaire (CBQ) (Rothbart et al., 2001), administered to the mother and aimed at providing a detailed assessment of temperament in children 3 to 7 years old. The CBQ also has five subscales which we analyze separately: frustration, attention focusing, soothability, impulsivity, and inhibitory control.

In the 2015 round, the same household questionnaire was applied to the entire sample. The child development measures of anthropometrics and child behavior were collected using the same instruments applied in 2012, but cognitive development data in the 2015 survey is assessed using the Wechsler Intelligence Scale for Children-IV (Wechsler, 2003), which measures IQ as an aggregate measure of its components. We use the short version of this measure which has four main components: verbal comprehension, perceptual reasoning, working memory, and processing speed.

Balance and attrition

Rates of attition in our survey are large, but they are similar to those in other long run longitudinal surveys in poor countries. Table 1 documents rates of attrition at each stage of the study. There are four main stages to consider: 1) registry (administrative data collected at the time of the application to the lottery), from which the original sample was drawn; 2) first survey round, in 2008; 3) second survey round, in 2012, and only targeting about 60 percent of the original universe; and 4) third survey round, in 2015, targeting 100 percent of the original universe.

Table 1 reports differences in attrition rates at different survey stages between lottery winners and losers. We regress indicators of whether an individual is in the sample at each stage on lottery indicators and strata fixed effects (where each strata is a creche by age group combination). The first row concerns attrition from the pre-lottery administrative data records until the 2008 survey. There are 4,349 observations in the regression, corresponding to the size of the original sample. By 2008, only 85.6 percent of lottery losers where still in the sample, an attrition of almost 15 percent in a little over 6 months (the time elapsed between the collection of application data and the collection of the first survey). Such attrition occurs mainly because administrative lottery records did not always have accurate contact information. Attrition rates are 2.5 percentage points lower among lottery winners, a small difference relatively to lottery losers, but nevertheless statistically different from zero.

Between June and October 2008, a sample of 3,776 households were surveyed out of the universe of 4,349 households. Of the 3,776 households successfully interviewed in 2008, due to financial constraints, only 2,124 with valid contact information were

approached for interview in 2012. These families correspond to all families residing in 6 out of the 10 education districts in the original sample. Of these 2,124 families, 1,462 were re-interviewed. Therefore, the figures in columns 2 and 3 of the table (control group means) need to be interpreted in light of the fact that only 60 percent of the original sample was targeted in the 2012 survey, and this is why only 33 percent of the original sample and 37 percent of the 2008 sample was interviewed on this date, implying apparent attrition rates of 63 percent to 67 percent. Instead, the true attrition rate is between 38 percent (= 1 - 37/60) and 43 percent (= 1 - 33/60) at this stage. Columns (2) and (3) show that attrition is again slightly lower among those who won the lottery than among those who did not.

In 2015, we re-approached 3115 households from the 2008 sample for which contact information was still functioning (although we also made an attempt to find households from original sample of size 4349) and recorded interviews with 2,050. This means that attrition from the original sample is 44% (column 4), and attrition from the 2008 survey is 50%, slightly higher among lottery losers than lottery winners. Attrition between 2012 and 2015, for the matching sample, was 25%, and again slightly larger among those who did not win the lottery (column 6). In sum, attrition rates are large but not unlike typical other long term longitudinal studies in low and middle income countries. They are only slightly different between those who did and did not win the lottery in 2008, so in Table A1 in the Appendix next investigate if, at least in terms of observables, there is differential selective attrition between those who did and did not win the lottery. We find that this is not the case suggesting that attrition may affect the sample of lottery winners and losers in a similar way.[7]

Table 2 shows that child and household characteristics are balanced across treatment arms. These characteristics are measured either in the pre-lottery registry (including a measure of household income per capita), or they are pre-determined characteristics from 2008 survey. Only two out of 19 variables display significant differences between treatment and control groups with 95 percent confidence, and those two are closely related (whether the caregiver can read and write, and whether the caregiver has at least a basic education). Furthermore, the coefficients on the differences are very small. Across all coefficients, we cannot reject the null hypothesis that all coefficients are equal to zero: the p-value of the joint test is equal to 0.128.

[7]To be specific, we regress pre-determined variables measured in the pre-lottery registry on in the 2008 survey on whether a child or a family won or not the lottery, whether they are still in the sample in the 2012 and the 2015 waves, and the interaction of these two variables.

3.3 Empirical strategy

Our basic strategy is to compare children and households who gained access to a slot in a childcare center through the lottery, to those that were placed on waiting lists. Because of randomized nature of the lottery, lottery winners and lottery losers will be similar on average on both observed and unobserved characteristics, so that differences in their subsequent outcomes will be attributable to daycare access.

In practice, winning the lottery guaranteed a space in a creche, but individuals did not always take up the offer. Losing the lottery did not prevent children from reapplying to the lottery in the following year. Therefore, winning the lottery increases the probability of daycare attendance but is not a perfect predictor of enrollment. Our main analysis focuses on intention to treat (ITT) estimates, which reflect the impacts of being offered a slot in a creche on our outcomes of interest. As discussed above, typical issues with randomized rank list designs raised by Chaisemartin and Behagel (2020) are also minimized in our study because our sampling scheme samples children with rankings on the top and bottom of the randomized list, and omits children in the middle.

Our ITT estimates are based on the following regression:

$$y_{igc} = \alpha + \beta_{\text{ITT}} L_{igc} + \Gamma \mathbf{X}_{igc} + \delta_{gc} + \epsilon_{igc} \tag{1}$$

In this equation, y_{igc} is an outcome of interest for individual i, who participated in the lottery for age group g in day care center c, L_{igc} is an indicator variable that takes value 1 if individual i is a lottery winner and 0 otherwise, $\mathbf{X}_{igc}$ are controls for the race and gender of the child, δ_{gc} is a set of strata fixed effects (for each age group-day care center pair at which each lottery took place), and ϵ_{igc} is an error term. β_{ITT} is the ITT coefficient, which measures the impact of winning the lottery on the outcome of interest. Our main results concern ITT estimates, and in the remainder of the paper we show estimates of equation 1 for household outcomes (labor market participation, income, and the home environment), and child development outcomes (anthropometrics, cognitive function, and child behavior).

Since children not offered a slot in creches in 2008 were eligible to enter the lottery in subsequent years, many of the children who initially lost the lottery eventually did enroll in public creches. Some children also enrolled in alternative daycare arrangements, such as private daycare centers or community-based daycare centers. To go beyond the intent-to-treat estimates and measure the actual effect of attending creches on our main outcomes of interest, in results presented in the Appendix and briefly discussed in the

main text, we also use an instrumental variables strategy (IV), where the lottery status serves as an instrument for creche attendance, since it correlates directly with treatment but not with any of the outcomes of interest. Our measure of creche attendance is a variable that reflects years attending daycare, ranging from zero to four, based on self-reported data collected during the various survey waves.[8]

IV estimates are based on the following two-stage approach:

$$\begin{aligned} y_{igc} &= \alpha + \beta_{\texttt{IV}}\widehat{T}_{igc} + \Gamma\mathbf{X}_{igc} + \delta_{gc} + \epsilon_{igc} \\ T_{igc} &= \gamma + \eta L_{igc} + \phi\mathbf{X}_{igc} + \delta_{gc} + \xi_{igc} \end{aligned} \tag{2}$$

Here y_{igc} is an outcome of interest for individual i, L_{igc} remains an indicator variable for lottery status and in this case serves as the instrumental variable for predicting years in *creche* T_{igc}, $\widehat{T}_{igc}$ is the predicted value of years in *creche*, $\mathbf{X}_{igc}$ is a set of baseline individual level controls, δ_{gc} is a set of fixed effects for each age group-daycare center pair, and ϵ_{igc} and ξ_{igc} are error terms. $\beta_{\texttt{IV}}$ is the IV estimate of the effect of attending daycare for an additional year on household and child outcomes.

4 Main Results

Winning the lottery significantly increased the likelihood that a child participated in daycare. According to self-reports in the 2015 survey, 97 percent of lottery winners and 78 percent of lottery losers reported having ever attended daycare.[9] In Table 3 we examine differences in average time in day care between those who did and did not win the lottery. In the first column we present estimates from a regression of the number of years in daycare on an indicator for winning the lottery, age and gender, and strata fixed effects. In the remaining columns we run a similar regression with a different dependent variable: indicators for having attended at least 1, 2, 3, and 4 years of daycare (in columns 2-5, respectively).

The first column shows that, on average, children who won the lottery spent just over half a year more in daycare than children who lost the lottery. The remaining columns of the table document that the likelihood of spending at least one, two, three or even four years in daycare are all higher for lottery winners than for lottery losers:

[8]The surveys collected detailed data on the history of daycare attendance, including which center–if any–the child attended in each semester. The variable *years in creche* takes the value 0 if a child never attended daycare, 1 if a child attended 1 or 2 semesters, 2 if a child attended 3 or 4 semesters, 3 if a child attended 5 or 6 semesters, and 4 if child attended more than 6 semesters.

[9]If data were missing for this variable in 2015, we relied on reports from the 2012 survey to complete full daycare histories for each respondent.

lottery winners were roughly twenty percentage points more likely to have spent either one or two years in daycare, and they were seven percentage points more likely to have spent at least four years in daycare (see also Figure A.1 in the Appendix). All these differences are highly statistically significant.

Having established that winning the lottery is a strong predictor of attending daycare, we now turn to estimating impacts of winning the lottery on outcomes. Because we study a wide array of outcomes, we construct summary indices of outcomes to avoid having false positives driving our results, as in Kling et al. (2007) and Anderson (2008).We consider three household level indices measuring labor market outcomes (employment and earnings of different household members), household income and assets, and the quality of the home learning environment (e.g., number of books in the home, frequency with which a child is read to). The three main child level indices we use measure anthropometrics, cognitive development, and behavior.

Table 4 shows estimates of equation 1, using as outcomes the six indices just described (one in each column). The table has three sets of rows, for outcomes measured in 2008 (only labor, and income and assets), 2012 and 2015. There are large impacts on labor and income and assets in 2008, only six months after lottery results are known and lottery winners have the opportunity to enrol their children in free full-day care. This indicates that access to full-time care enabled caregivers to participate more intensely in the labor market and to generate additional resources for the household. Impacts on labor market outcomes are still positive in 2012 and 2015, after children have left day care, suggesting that lottery winners were able to benefit from sustained gains in labor market attachment driven by their additional early experience in the labor market. We also see important impacts of winning the lottery on income and assets in 2012, although they fall sharply by 2015. There are no detectable impacts on home environments in either year.

Child outcomes are only observed in 2012 and 2015. There are large impacts of winning the lottery on anthropometrics. Children who win the lottery benefit from better nutrition than those who do not win the lottery, either because they have better access to nutritious meals in daycare centres, or because the increase in household resources enables parents to buy better food. There are also impacts on children's cognition in 2012, which are smaller by 2015. We observe no impacts on behavior.

Having established that access to daycare impacts the lives of adults and children, we now examine in more detail the components of the indices just described.

4.1 Household outcomes

Labor force participation and income

We start by examining the components of the household level indices. Table 5 reports estimated impacts of winning the lottery on the employment and income of different household members, in 2008, 2012 and 2015. The 2008 survey only asked this information of the main caregiver of the child, while in the 2012 and 2015 surveys we have available information for each household member, one of whom is then identified as the main caregiver of the child. Because the 2008 is especially interesting because it covers the period right after the lottery, but because it is also limited because it only concerns caregivers, in this table we distinguish impacts of winning the lottery on the main caregivers' outcomes, from impacts on different household members.

Winning the lottery leads to an increase in the employment of the main caregiver (a parent in about 80 percent of cases, as observed in Figure A.2) at the intensive and extensive margins, both in 2008 and 2012. This is likely driven by the impacts of learning the lottery on household members other than parents. We see the largest impacts of winning the daycare lottery on the employment and income (measured in $USD, and only available for individual household members for 2012 and 2015) for grandparents and for siblings over the age of 15 (Table 5). Note that the majority of cohabiting grandparents in our sample are still of working age. In the 2012 survey, 10% of them were 46 or younger. The 25th, 50th and 75th percentiles of their age distribution were 49, 55 and 61 respectively.

The lack of an average impact on the labor market outcomes of mothers is probably due to the fact that roughtly 70% of mothers were already working and earning, so publicly provided daycare opened the door for grandmothers and others (for whom employment rates were much lower) to enter the labor force. For grandmothers, the program led to a rise in income of 50 percent in 2012 when compared with the control group mean, with similarly sized gains among siblings. By 2015, the effects are still positive, but smaller and no longer statistically significant. The income effects on grandparents and siblings translate to social security contributions (a variable only available in 2012 and 2015), which are an indication that these gains are in formal sector employment.[10]

The effects on labor market participation of individuals translate to gains in household resources, shown in Table 6 (the number of observations varies slightly across

[10]Sample sizes differ, even within the same survey wave, when we consider the outcomes of different household members. This is because not all households have the same composition, and there are multiple households where grandparents or older siblings are not present. There is however no correlation between winning the lottery and household composition.

variables because of small differences in non-responses). Across survey years, lottery winners had 5 to 10% higher total household incomes than lottery losing households, although these impacts are only statistically different from zero in 2008 and 2012. Such increase in income, a consequence of stronger labor market attachment by household members, likely led to increases in consumption and assets. In fact, in 2012, monthly food expenditure (measured in $USD) is about 5% higher in households who won the lottery, although this is no longer true in 2015. In 2012 there is also an impact of winning the lottery of 0.13 SD on a standardized asset index, which fades out by 2015. Access to a bank account, measured only in 2012 and 2015, also shows a substantial increase of 7 percentage points in 2012, also reduced to almost 0 in 2015. We do not observe impacts on access to credit in either year. Instrumental variables estimates on household income and assets show larger impacts on those who actually benefited from the program, with similar patterns of fade-out (see Table A.2 in the Appendix).

Even though we see a decline in the impacts of the lottery over time, especially as all children move to formal (full-day) schooling, the fact that access to daycare enabled an increase in household resources for at least a few years is important. It likely led to increases in child and household welfare during those years, which were likely to be particularly important for the development children in these households (because they were so young).

Home environment

We also investigate how access to childcare affects other, non-financial aspects of the home environment. Table 7 documents a short-run negative impact of winning the lottery (in 2008) on the total time the caregiver spends with the child, which is to be expected as childcare is replacing some of the caregiver's time. By 2012 and 2015, that negative effect has dissipated. Across a range of other home environment outcomes – whether the caregiver reads or sings to the child, the number of children's books at home, attitudes towards the child, and stress of the caregiver, we observe mixed results. In the short run, caregivers experience less stress, probably because they are better able to juggle child care and other responsibilities. In the 2012 follow-up, caregivers report fewer negative attitudes and a higher likelihood of reading or singing to the child, but there are no significant impacts in other outcomes, and there are no significant impacts on any home environment outcomes by 2015.

4.2 Child development outcomes

We now turn to impacts on children. In both 2012 and 2015, we observe large, statistically significant gains in both height-for-age and weight-for-age (Table 8), suggesting a lasting impact of the program on these outcomes. Even by 2015, long after children have left daycare, our IV estimates (in Appendix Table A.5) show that one additional year in full-time daycare leads to gains in height and weight for age of 0.17 SD and 0.21 SD respectively (the program did not result in increases in overweight or obese children).

Access to public daycare improved the nutritional intake of these mostly poor children. This may have happened through two channels. The most direct channel is through the provision of nutritious meals in daycare centres, an important feature of the service they provide, as discussed above. There is also an indirect channel operating through an increase in household resources, which led to an increase in food expenditure (documented above), presumably driven by the consumption of more and higher quality food by households who got access to free daycare.

In 2012, we also observe gains in children's cognitive development which are particularly large for a test of receptive vocabulary (the TVIP), and smaller and not statistically different from zero for any of the other measures (Table 9). In 2015, we see statistically significant gains in perceptual reasoning but not in any other outcomes, nor on an aggregate measure of IQ. Impacts on reported child behavior are mostly non-existent, as seen in Table 10. This null result on child behavior could potentially be seen in a positive light. A previous and important study in Canada shows that widespread provision of public daycare led to worse child behavioral outcomes in the short run, and that those adverse behavioral outcomes persisted into young adulthood (Baker et al., 2008, 2019). The Rio de Janeiro creche program boosted physical outcomes substantially with no apparent adverse behavioral outcomes.

5 Exploratory analysis

To complement our analysis, we carry out a simple analysis of the child anthropometrics and cognitive achievement indices, in which we include varying subsets of potential mediators of the impacts of winning the lottery on these outcomes, and examine the changes in the coefficient on the lottery indicator for suggestive evidence as to the importance of these channels. We recognize the problems in this analysis, since all mediator variables are likely to be endogenous, and so include it only as suggestive (Huber, 2020).

We consider two types of mediators: income related and home environment related. Together, they reduce the size of the estimated impact of winning the lottery on child's cognition (in 2012) by nearly 50 percent, suggesting that there are potentially important channels operating through income and the home environment. Regarding anthropometric outcomes, including income-related and home environment controls has little impact on the lottery coefficient, suggesting that the observed impacts are likely a direct and exclusive result of the childcare (rather than a result of better nutrition at home). The centers provided five meals or snacks per day, and receiving that nutrition at a key development stage was likely instrumental to boosting anthropometric outcomes in an enduring way.

6 Conclusion

We evaluate the impact on child development and employment and earnings of household members of publicly provided childcare for low-income households, using data from a large urban area in a middle-income country. We find positive impacts of access to daycare on the labor force participation of adults and household income. These impacts are especially large for grandparents and older siblings, an important finding of our paper. Few studies report results on employment impacts on individuals other than parents, so early child development evaluations may fail to capture the full range of benefits of formal daycare programs (Evans et al., 2020).

Another distinctive aspect of our paper is that we report on results up through seven years after initial enrollment. The vast majority of education-related interventions measure outcomes within one year of conclusion of the treatment (McEwan, 2015). Thus, we are able to map the trajectory of treatment effects. Regarding employment and income, there are initially large but dwindling effects on these outcomes over time, as comparator households catch up. This is expected since all children eventually become too old for daycare, and are able to access full time schooling, which means that time in child care activities becomes less of a constraint for all households. Impacts on child cognition also decline over time. However, we observe enduring impacts of access to daycare on children's anthropometric outcomes, likely linked to the high quality of nutrition these children have access to in daycare centres. There are no adverse impacts on daycare provision on children or parents.

Our results suggest that daycare provision has impacts that extend far beyond children and even their parents, benefiting grandparents and siblings as well. Publicly provided daycare can improve certain outcomes for children while enabling other mem-

bers of the household to engage in the labor force and boost household income. As such, daycare is one policy tool for boosting labor market activity for women across generations.

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Figures and Tables

Table 1: Difference in the Proportion of Non-Attriters Between Lottery Winners and Losers

	2008 to registry	2012 to registry	2012 to 2008	2015 to registry	2015 to 2008	2015 relative to 2012 (matching sample)
	(1)	(2)	(3)	(4)	(5)	(6)
Lottery winner	0.025***	0.023*	0.024*	0.032**	0.028*	0.023
	(0.009)	(0.012)	(0.013)	(0.015)	(0.016)	(0.023)
Control group mean	.856	.331	.366	.456	.504	.750
N	4,349	4,349	3,776	4,349	3,776	1,486

Notes: This table shows attrition results for the different waves of our surveys. Each column reports results from a regression of an indicator of whether a given lottery participant had data for a given year (relative to registry or previous wave of survey) on an indicator of winning the lottery and strata fixed effects. Robust standard errors are in parentheses. The survey implemented in 2012, due to financial constraints, only interviewed a subsample of 64 *creches*, corresponding to approximately 40 percent of the sample. Therefore, column (6) refers to the matching sample between 2015 and that interviewed in 2012. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table 2: Covariates Balance - Lottery Winners and Losers

	Lottery loser	Lottery winner	Regression adjusted difference	N
	(1)	(2)	(3)	(4)
Male child	0.507	0.533	0.026	3,897
	(0.500)	(0.499)	(0.017)	
White child	0.324	0.346	0.023	3,887
	(0.468)	(0.476)	(0.015)	
Black child	0.122	0.105	-0.017	3,887
	(0.327)	(0.307)	(0.010)	
Mixed race child	0.524	0.523	-0.002	3,887
	(0.500)	(0.500)	(0.016)	
Other race child	0.030	0.026	-0.005	3,887
	(0.170)	(0.158)	(0.005)	
Birthweight in quilos	3.189	3.206	0.024	3,742
	(0.615)	(0.612)	(0.020)	
Birth height in centimetres	49.26	49.29	0.038	3,722
	(4.056)	(4.233)	(0.136)	
Planned Birth	0.329	0.346	0.017	3,770
	(0.470)	(0.476)	(0.015)	
First Born	0.442	0.426	-0.014	3,764
	(0.497)	(0.495)	(0.016)	
Age of the Mother at Birth	20.28	20.37	0.089	3,767
	(4.890)	(4.968)	(0.157)	
Prenatal Care	0.948	0.944	-0.003	3,765
	(0.223)	(0.230)	(0.007)	
Natural Birth Delivery	0.691	0.662	-0.028*	3,768
	(0.462)	(0.473)	(0.015)	
Premature Birth	0.121	0.131	0.008	3,762
	(0.327)	(0.337)	(0.011)	
Breastfed up to 6 Months	0.772	0.751	-0.022	3,770
	(0.420)	(0.433)	(0.014)	
HH per capita income	586.200	634.500	56.010	4,103
	(1818.900)	(2841.300)	(70.490)	
HH size	4.547	4.638	0.107	4,137
	(3.463)	(4.553)	(0.124)	
Age of caregiver	29.250	29.150	-0.142	3,776
	(9.768)	(9.157)	(0.304)	
Caregiver can read and write	0.965	0.982	0.017***	3,768
	(0.184)	(0.134)	(0.005)	
Caregiver has at least basic education	0.676	0.707	0.034**	3,404
	(0.468)	(0.455)	(0.015)	
	(0.114)	(0.122)	(0.004)	
p-value joint		.128		

Notes: This table considers covariate balance for the evaluation sample. Columns 1 and 2 show mean values for lottery losers and lottery winners; column 3 displays the results of a regression of each covariate on a dummy variable indicating whether the individual was a lottery winner and strata fixed effects; column 4 reports the number of observations. Robust standard errors are in parentheses. Data come from registry and 2008 survey. P-value for the F-test of overall significance is reported at the bottom of the table. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table 3: Impact of Lottery on Daycare Attendance

		Probability (Years in Daycare $\geq i$)			
	Years in Daycare	i=1	i=2	i=3	i=4
	(1)	(2)	(3)	(4)	(5)
Lottery Winner	0.637***	0.190***	0.207***	0.168***	0.072***
	(0.048)	(0.012)	(0.017)	(0.019)	(0.014)
Control group mean	1.895				
N	2,410	2,410	2,410	2,410	2,410
P-value ($\forall i$)			0.000		

Notes: This table displays the impact of winning the lottery on average years attending daycare (Column 1), and on the probability of (years attending daycare greater than i) (Columns 2 - 5). Column 1 shows ITT estimates from a regression that includes strata fixed effects and controls for race and gender of the child. Robust standard errors are in parentheses. Columns 2-5 consider estimates of simultaneous regressions of dummies for attending daycare for 1+, 2+, 3+ and 4+ years on lottery status, controls for race and gender of the child and strata dummies. Standard errors are in parentheses. Daycare attendance is based on self-reported survey data collected in 2012 and complemented with data from 2015 for the remainder of the sample not surveyed in 2012. The p-value at the bottom of the table is for for the F test of null hypothesis that the differences between all simultaneous regressions coefficients are equal to zero. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table 4: Average Effects by Groups of Outcomes

	Labor outcomes	Income outcomes	Child outcomes	Home environment outcomes
	(1)	(2)	(3)	(4)
All years average effects	0.088**	0.085**	0.040	-0.018
	(0.037)	(0.034)	(0.260)	(0.320)
N	1053	1002	1032	1068
2012 average effects	0.065	0.101***	0.056*	-0.017
	(0.043)	(0.035)	(0.032)	(0.021)
N	1471	1364	1397	1399
2015 average effects	0.070*	0.033	0.039	0.009
	(0.037)	(0.027)	(0.039)	(0.025)
N	1948	1965	802	1123

Notes: The estimates displayed in this table follow Kling et al. (2007) to calculate average mean standardized effect size across multiple outcomes. All years include 2008, 2012 and 2015 outcomes. Outcomes considered here are the same estimated separately throughout the paper. Labor outcomes are employment, weekly working hours, contribution to social security and monthly income. Income outcomes are asset index, household income, access to credit, expenditures and access to bank account. Child outcomes are anthropometrics, TVIP and executive function for 2012, and anthropometrics and WISC and its components for 2015. Robust standard errors are in parenthesis. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table 5: ITT Estimated Effects on Labor Market Outcomes for Caregiver and All Household Members

	Main Caregiver			All Household Members					
	Caregiver			Mother		Grandparent		Sibling	
	2008	2012	2015	2012	2015	2012	2015	2012	2015
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Monthly income		62.850**	5.962	28.120	17.210	245.100***	65.970	117.400**	42.660
		(32.010)	(35.290)	(31.860)	(36.050)	(80.510)	(85.050)	(58.370)	(39.460)
Control group mean		461	602	561	630	441	376	230	170
N		1,386	1,946	1,382	1,781	438	478	244	557
Currently employed	0.048***	0.048*	0.017	0.002	0.005	0.208***	0.077	0.162*	0.102*
	(0.016)	(0.027)	(0.023)	(0.026)	(0.023)	(0.061)	(0.064)	(0.090)	(0.056)
Control group mean	0.410	0.580	0.610	0.680	0.760	0.510	0.510	0.370	0.340
N	3,754	1,386	1,939	1,382	1,774	438	475	244	555
Weekly working hours	1.855***	2.471**	-0.028	0.110	-0.840	10.68***	3.407	4.138	1.797
	(0.702)	(1.244)	(1.032)	(1.266)	(1.092)	(3.078)	(3.048)	(4.283)	(2.260)
Control group mean	17	20	21	26	24	20	17	16	11
N	3,753	1,352	1,874	1,351	1,713	415	430	241	527
Contribution to social security		0.022	-0.008	0.006	-0.015	0.218***	0.066	0.154**	0.020
		(0.026)	(0.023)	(0.028)	(0.025)	(0.059)	(0.064)	(0.072)	(0.044)
Control group mean		0.330	0.420	0.420	0.470	0.280	0.380	0.190	0.170
N		1,385	1,923	1,381	1,761	436	471	243	551

Notes: This table considers the impact of winning the lottery on i) Average monthly income; ii) Employment; iii) Weekly working hours and iv) Contribution to Social Security. Columns 1-3 show estimates for these outcomes for the main caregiver of the child for years 2008 (data available only for Employment and Weekly working hours), 2012 and 2015. Columns 4-9 show, for 2012 and 2015, estimates for these outcomes for all family members older than 15 (who may or may not be the caregiver), namely mother, grandparent, and sibling, respectively. There may be more than one observation per child in each category in columns 4-9. All ITT estimated effects are from regressions that include strata fixed effects and controls for race and gender of the child. For all measures we include the control group mean. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table 6: ITT Estimated Effects on Household Income, Expenditures, Asset Index, Access to Bank Account and Credit

	2008	2012	2015
	(1)	(2)	(3)
Household Income	49.968***	110.982**	66.011
	(14.880)	(50.031)	(58.307)
Control group mean	613	1,102	1,361
N	3,762	1,486	2,049
Mean expenditures		27.551*	-5.132
		(16.193)	(16.340)
Control group mean		557	620
N		1,439	1,971
Asset index z-score	0.066**	0.131**	0.041
	(0.031)	(0.052)	(0.035)
N	3,762	1,486	2,049
Access to bank account		0.071***	0.019
		(0.026)	(0.022)
Control group mean		0.570	0.590
N		1,482	2,045
Access to credit		0.019	0.022
		(0.026)	(0.022)
Control group mean		0.430	0.420
N		1,481	2,042

Notes: This table considers, for 2008, 2012 and 2015, the impact of winning the lottery on the household income, mean household expenditures, asset index z-score, mean access to bank account (at least one household member with a bank account) and mean access to credit (at least one household member holding a credit card). All ITT estimated effects are from regressions that include strata fixed effects and controls for race and gender of the child. For the non-standardized measures we include the control group mean. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table 7: ITT Estimated Effects on Home Environment

	2008	2012	2015
	(1)	(2)	(3)
Total time caregiver spends with child	-12.334***	-1.024	0.782
	(1.121)	(0.968)	(0.933)
Control group mean	55	60	55
N	3,762	1,482	2,049
Ever reads or sings for the child		0.065***	0.009
		(0.025)	(0.022)
Control group mean		0.630	0.470
N		1,484	2,048
Number of children' books at home ≥ 8		0.036	0.013
		(0.024)	(0.020)
Control group mean		0.265	0.289
N		1,482	2,045
Positive attitudes towards the child		-0.023	-0.001
		(0.015)	(0.012)
Control group mean		0.558	0.530
N		1,484	2,034
Negative attitudes towards the child		-0.013**	-0.002
		(0.006)	(0.006)
Control group mean		0.048	0.021
N		1,483	1,124
Stress of the caregiver z-score	-0.079**	0.036	0.070
	(0.031)	(0.053)	(0.044)
N	3,762	1,486	2,048

Notes: This table considers, for 2008, 2012 and 2015, the impact of winning the lottery on i) Total time in weekly hours caregiver spends with the child; ii) Probability of anyone in the household ever reading or singing for the child; iii) Probability of the household having at least 8 children's books; iv) Positive and Negative attitudes towards the child, based on observational data reported by the enumerator and v) Stress of the mother z-score, based on self reported data collected through the *Perceived Stress Scale* by **?**. All ITT estimated effects are from regressions that include strata fixed effects and controls for race and gender of the child. For all measures we include at the bottom of each panel the control group mean. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table 8: ITT Estimated Effects on Anthropometrics: Height for Age (HFA) and Weight for Age (WFA)

	Height for Age		Weight for Age	
	2012	2015	2012	2015
	(1)	(2)	(3)	(4)
Lottery winner	0.163**	0.110**	0.199***	0.140**
	(0.067)	(0.055)	(0.073)	(0.070)
Control group mean	0.099	0.258	0.012	0.182
N	1,433	1,939	1,436	1,946

Notes: This table considers the impact of winning the lottery on the mean z-scores of anthropometrics measures, HFA and WFA, using data collected in years 2012 and 2015. All ITT estimated effects are from regressions that include strata fixed effects and controls for race and gender of the child. Robust standard errors are in parentheses. Height and weight were standardized using World Health Organization growth standards to calculate HFA and WFA z-scores. As the WHO only has standardized weight for children up to 114 months, age =114 was imputed to all children older than 114 months in 2015 to avoid losing observations. For HFA z-scores, no imputation was carried out as the WHO standards are available for older ages. This imputation exercise does not introduce much distortion, as the same exercise for HFA generates very similar results (slightly higher point estimates).$*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table 9: ITT Estimated Effects on Children's Cognitive Function

	2012 Cognitive measures				
	Aggregate cognitive z-score	TVIP	Executive Function	Memory for Names	Visual Integration
	(1)	(2)	(3)	(4)	(5)
2012 mean z-scores	0.067**	0.112**	0.059	0.085	0.041
	(0.032)	(0.052)	(0.051)	(0.053)	(0.052)
N	1,486	1,466	1,481	1,476	1,486
	2015 Cognitive measures				
	Aggregate IQ z-score	Verbal comprehension	Perceptual reasoning	Working memory	Processing speed
	(1)	(2)	(3)	(4)	(5)
2015 mean z-scores	0.044	-0.011	0.091**	0.045	-0.006
	(0.043)	(0.043)	(0.044)	(0.045)	(0.045)
N	1,999	1,999	1,999	1,999	1,996

Notes: This table considers the impact of winning the lottery on the mean z-score for different measures of children's cognitive function in years 2012 and 2015. The upper panel displays the aggregate cognitive z-score in column (1), the TVIP vocabulary test in column (2), the aggregate z-score of executive function tests in column (3), the z-score for the Memory for Names Test in column (4) and the z-score for the Visual Integration test in column (5). The lower panel displays the aggregate IQ z-score in column (1), and its components in columns (2)-(5), respectively verbal comprehension, perceptual reasoning, working memory and processing speed. All scores have been standardized to have mean zero and σ one within age and within the sample. All ITT estimated effects are from regressions that include strata fixed effects and controls for race and gender of the child. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table 10: ITT Estimated Effects on Child Behavior

		Child Behavior Questionnaire				
	Aggregate CBQ z-score	Frustration	Attention	Soothability	Impulsivity	Inhibition
	(1)	(2)	(3)	(4)	(5)	(6)
2012 mean z-scores	0.001	-0.004	0.006	0.025	-0.081	0.061
	(0.052)	(0.053)	(0.053)	(0.053)	(0.054)	(0.053)
N	1,483	1,483	1,483	1,483	1,483	1,483
2015 mean z-scores	0.004	0.003	-0.036	-0.025	0.012	0.053
	(0.068)	(0.068)	(0.067)	(0.067)	(0.067)	(0.066)
N	923	923	923	923	923	923

Notes: This table considers the impact of winning the lottery on the mean z-score for our measures of children's behavior based on the child behavior questionnaire in 2012 and 2015: the aggregate CBQ z-score in column (1), and its components in columns (2)-(6), respectively frustration, attention, soothability, impulsivity and inhibition. All scores have been standardized to have mean zero and σ one within age and within the sample. All ITT estimated effects are from regressions that include strata fixed effects and controls for race and gender of the child. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table 11: Mediation Analysis for Cognitive Function Outcomes

	TVIP				WISC- Perceptual Reasoning			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lottery Winner	0.094*	0.054	0.070	0.050	0.087*	0.066	0.098**	0.081*
	(0.055)	(0.053)	(0.055)	(0.053)	(0.046)	(0.045)	(0.046)	(0.045)
N	1,338				1,813			
Income-Related Mediators		x		x		x		x
Home Environment Mediators			x	x			x	x

Notes: This table presents the results for the mediation analysis for child cognitive function outcomes for 2012 and 2015. For each outcome reported, TVIP for 2012 and WISC-Perceptual reasoning for 2015, four columns are presented (keeping the sample constant): i) first column reports the ITT results; ii) second column presents the results including the income-related variables as mediators; iii) third column presents the results including home environment variables as mediators; and iv) fourth column presents the specification with all previously mentioned mediators. All specifications include strata fixed effects and controls for race and gender of the child. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

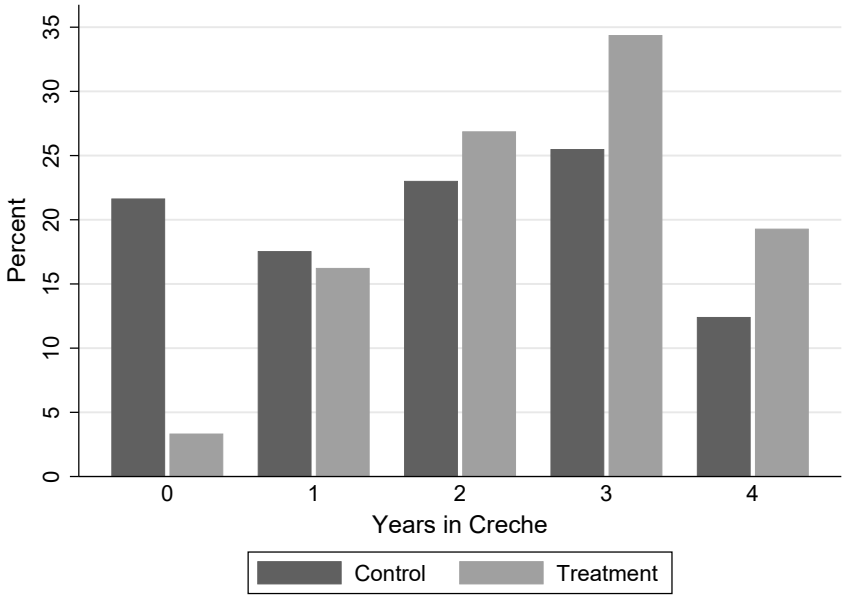
Table 12: Mediation Analysis for Anthropometric Outcomes

	2012				2015			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Weight for Age	0.188**	0.162**	0.201**	0.187**	0.136*	0.123*	0.132*	0.123
	(0.078)	(0.077)	(0.081)	(0.081)	(0.074)	(0.074)	(0.075)	(0.075)
N	1,314				1,765			
Height for Age	0.146**	0.116*	0.131*	0.112	0.090	0.080	0.103*	0.093
	(0.071)	(0.070)	(0.076)	(0.075)	(0.058)	(0.058)	(0.059)	(0.059)
N	1,310				1,757			
Income-Related Mediators		x		x		x		x
Home Environment Mediators			x	x			x	x

Notes: This table presents the results for the mediation analysis for child anthropometric outcomes for 2012 and 2015. For each outcome reported, WFA and HFA, four columns are presented for each year (keeping the sample constant): i) first column reports the ITT results; ii) second column presents the results including the income-related variables as mediators; iii) third column presents the results including home environment variables as mediators; and iv) fourth column presents the specification with all previously mentioned mediators. The upper panel reports the results for WFA, and the lower panel the results for HFA. All specifications include strata fixed effects and controls for race and gender of the child. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Appendix A

Figure A.1: Years in Creche by Lottery Status



Notes: This figure reports average years in *creches* by lottery status, based on self-reported survey data on *creche* attendance collected in 2012 and 2015

Figure A.2: Identity of the Main Caregiver



Notes: This figure displays the identity of the person reported as the main responsible for taking care of the child in 2008, 2012 and 2015.

Table A.1: Differential Selective Attrition between all rounds of data collection

	Male child	White child	Black child	Mixed race child	Other race child	Birthweight in kg	Birth height in cm	Planned Birth	First Born	Age of the Mother at Birth	Prenatal Care
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2008 to registry											
Interviewed in 2008 * Lottery winner	-0.035	-0.019	0.126**	-0.086	-0.020						
	(0.097)	(0.090)	(0.060)	(0.095)	(0.031)						
N	3897	3887	3887	3887	3887						
2012 to 2008											
Interviewed in 2012 * Lottery winner	0.014	0.014	-0.004	0.005	-0.015	-0.041	0.137	0.016	0.003	0.174	0.004
	(0.034)	(0.032)	(0.021)	(0.034)	(0.011)	(0.042)	(0.285)	(0.032)	(0.034)	(0.329)	(0.016)
N	3,774	3,764	3,764	3,764	3,764	3,742	3,722	3,770	3,764	3,767	3,765
2015 to 2008											
Interviewed in 2015 * Lottery winner	-0.010	0.042	0.002	-0.038	-0.005	0.004	0.255	-0.038	-0.032	0.025	-0.003
	(0.034)	(0.032)	(0.021)	(0.033)	(0.011)	(0.041)	(0.278)	(0.031)	(0.033)	(0.321)	(0.015)
N	3,774	3,764	3,764	3,764	3,764	3,742	3,722	3,770	3,764	3,767	3,765

	Natural Birth Delivery	Premature Birth	Breastfed up to 6 Months	HH income	HH size	Age of carer	Carer can read and write	Carer has at least basic education	Carer has at least secondary education	Carer has at least higher education	Highest grade completed of carer
	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
2008 to registry											
Interviewed in 2008 * Lottery winner				67.07	-0.212						
				(212.7)	(0.374)						
N				4,103	4,137						
2012 to 2008											
Interviewed in 2012 * Lottery winner	-0.044	0.058**	0.076***	-96.57	-0.413	-0.190	-0.008	-0.018	0.005	-0.000	-0.140
	(0.032)	(0.023)	(0.029)	(154.1)	(0.291)	(0.637)	(0.011)	(0.031)	(0.033)	(0.009)	(0.168)
N	3,768	3,762	3,770	3,562	3,592	3,776	3,768	3,404	3,404	3,404	3,346
2015 to 2008											
Interviewed in 2015 * Lottery winner	0.012	0.018	0.005	-13.30	-0.264	-0.034	-0.001	-0.034	-0.007	0.010	-0.103
	(0.031)	(0.022)	(0.028)	(150.5)	(0.284)	(0.622)	(0.011)	(0.030)	(0.032)	(0.008)	(0.164)
N	3,768	3,762	3,770	3,562	3,592	3,776	3,768	3,404	3,404	3,404	3,346

Notes: This table shows differential selective attrition results for the different waves of our surveys for 22 covariates. Each column reports results of a regression of each covariate on an indicator of whether there was individual data for a given year (relative to registry or a previous wave of survey), on an indicator of winning the lottery, and the interaction between them. All specifications include strata fixed effects. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table A.2: IV: Impact of Daycare Attendance on Income-Related Variables

	2008	2012	2015
	(1)	(2)	(3)
Mean HH Income	100.812***	184.745**	102.291
	(32.430)	(85.245)	(90.278)
N	2,287	1,486	2,049
Mean expenditures		45.504*	-8.058
		(27.298)	(25.670)
N		1,439	1,971
Asset index		0.218**	0.063
		(0.088)	(0.054)
N		1,486	2,049
Access to Bank Account		0.119***	0.029
		(0.046)	(0.034)
N		1,482	2,045
Access to Credit		0.032	0.035
		(0.043)	(0.035)
N		1,481	2,042

Notes: This table reports IV estimates of the effect of an additional year of daycare attendance (instrumented by lottery status) on household income-related variables for years 2008, 2012, and 2015, based on self-reported survey data from these years. All IV estimates are from regressions that include strata dummies and controls for race and gender of the child. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table A.3: IV: Impact of Daycare Attendance on Home Environments

	2008	2012	2015
	(1)	(2)	(3)
Total time caregiver spends with child	-19.940***	-1.693	1.212
	(2.558)	(1.571)	(1.451)
N	2,287	1,482	2,049
Ever reads or sings for the child		0.109**	0.014
		(0.043)	(0.034)
N		1,484	2,048
Positive attitudes towards the child		-0.038	-0.001
		(0.026)	(0.018)
N		1,484	2,034
Negative attitudes towards the child		-0.022**	-0.004
		(0.011)	(0.010)
N		1,483	1,124
Stress of the Mother Z-score	-0.120*	0.060	0.103
	(0.067)	(0.088)	(0.065)
N	2,287	1,486	2,048

Notes: This table reports IV estimates of the effect of an additional year of daycare attendance (instrumented by lottery status) on children's home environments for years 2008, 2012 and 2015, based on self-reported survey data from these years. All IV estimates are from regressions that include strata dummies and controls for race and gender of the child. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table A.4: IV: Impact of Daycare Attendance on Children's Cognitive Function

	Aggregate Cognitive Score	TVIP	WISC-Perceptual Reasoning
	2012	2012	2015
	(1)	(2)	(3)
Treatment	0.112**	0.191**	0.144**
	(0.054)	(0.090)	(0.070)
N	1,486	1,466	1,999

Notes: This table reports IV estimates of the effect of an additional year of daycare attendance (instrumented by lottery status) on children's cognitive function for years 2012 (aggregate cognitive z-score and TVIP), and 2015 (WISC-Perceptual reasoning index), based on self-reported survey data from these years. All IV estimates are from regressions that include strata dummies and controls for race and gender of the child. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table A.5: IV: Impact of Daycare Attendance on Anthropometrics Z-Scores

	Height for Age		Weight for Age	
	2012	2015	2012	2015
	(1)	(2)	(3)	(4)
Treatment	0.269**	0.170*	0.327***	0.217**
	(0.111)	(0.087)	(0.125)	(0.109)
N	1,433	1,938	1,436	1,946

Notes: This table reports IV estimates of the effect of an additional year of daycare attendance (instrumented by lottery status) on children's anthropometrics in 2012 and 2015, based on self-reported survey data from these years. All IV estimates are from regressions that include strata dummies and controls for race and gender of the child. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table A.6: ITT Estimated Effects on Household Income: Balanced Panel

	2008	2012	2015
	(1)	(2)	(3)
Lottery winner	70.29**	167.0***	90.81
	(29.57)	(59.60)	(82.96)
N	1,080	1,080	1,080

Notes: This table considers the impact of winning the lottery on the household income (in current reais) for years 2008, 2012, and 2015, based on self-reported survey data from these years, for the sample for which there is a balanced panel. All ITT estimated effects are from regressions that include strata fixed effects and controls for race and gender of the child. For all years the table displays the control group mean. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table A.7: ITT Estimated Effects on Children's Cognitive Function: Balanced Panel

	2012 Cognitive measures				
	Aggregate cognitive z-score	TVIP	Executive Function	Memory for Names	Visual Integration
	(1)	(2)	(3)	(4)	(5)
2012 Mean z-scores	0.022	0.032	0.008	0.090	-0.039
	(0.037)	(0.060)	(0.060)	(0.061)	(0.060)
N	1,105	1,105	1,105	1,105	1,105
	2015 Cognitive measures				
	Aggregate IQ z-score	Verbal comprehension	Perceptual reasoning	Working memory	Processing speed
	(1)	(2)	(3)	(4)	(5)
2015 Mean z-scores	0.034	-0.058	0.086	0.094	-0.029
	(0.059)	(0.062)	(0.062)	(0.060)	(0.062)
N	1,105	1,105	1,105	1,105	1,105

Notes: This table considers the impact of winning the lottery on the mean z-score for different measures of children's cognitive function in years 2012 and 2015, for the sample for which there is a balanced panel. The upper panel displays the aggregate cognitive z-score in column (1), the TVIP vocabulary test in column (2), the aggregate z-score of executive function tests in column (3), the z-score for the Memory for Names Test in column (4) and the z-score for the Visual Integration test in column (5). The lower panel displays the aggregate IQ z-score in column (1), and its components in columns (2)-(5), respectively verbal comprehension, perceptual reasoning, working memory and processing speed. All scores have been standardized to have mean zero and σ one within age and within the sample. All ITT estimated effects are from regressions that include strata fixed effects and controls for race and gender of the child. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.

Table A.8: ITT Estimated Effects on Anthropometrics: Balanced Panel

	Height for Age		Weight for Age	
	2012	2015	2012	2015
	(1)	(2)	(3)	(4)
Lottery winner	0.172**	0.148**	0.196**	0.125
	(0.079)	(0.074)	(0.086)	(0.093)
N	1,050	1,050	1,050	1,050

Notes: This table considers the impact of winning the lottery on the mean z-scores of anthropometrics measures, HFA and WFA, using data collected in years 2012 and 2015, for the sample for which there is a balanced panel. All scores have been standardized using the WHO growth standards. All ITT estimated effects are from regressions that include strata fixed effects and controls for race and gender of the child. Robust standard errors are in parentheses. $*p \leq 0.1$, $**p \leq .05$, $***p \leq .01$.