

# Effects of Early Childhood Development Interventions on Parental Behaviour: Evidence from a Home-Visiting Programme in Peru

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## Abstract

Home-visiting interventions aim at improving child outcomes by shifting caregivers' parenting skills so they can offer better stimulation opportunities and enriched interactions to their children. Despite this explicit interest in parenting practices, there is little evidence from the developing world regarding the effects of the home-visiting model on the provision of stimulation by parents. There is also a lack of evidence from programmes working at scale, and little attention to the mechanisms through which these interventions affect parental behaviour. This analysis seeks to contribute to the literature on ECD interventions in two ways. First, it provides causal evidence about the effects of a scaled-up home-visiting programme on parental behaviour. And, second, it explores the constraints that limit parents' behavioural change. I use the cluster-randomised design of the home-visiting component of programme *Cuna Mas* in Peru to collect data from 20 control and 20 treatment rural districts on parenting practices and caregivers' expectations regarding the importance of parent-child interactions for child development. Results reveal that: (i) treatment effects on the quality of the home environment are positive, statistically significant ( $p < 0.01$ ) and have a size ( $d = 0.5$ ) comparable to that found for other interventions of much more smaller scale and efficacy trials conducted in the developing world; (ii) the intervention has caused an increase in the variety of play activities offered to the child by the caregiver in addition to those occurring during home visits ( $d = 0.3$ ;  $p < 0.01$ ); and (iii) constraints limiting the effect of this intervention appear to be related to household wealth but not to caregivers' educational attainment. In fact, low levels of wealth can render the intervention ineffective in changing caregivers' behaviours and expectations. This evidence is consistent with caregivers having to input time to engage in play activities with their children, and with family resources being negatively related to the opportunity cost of childcare time and positively related to its expected return.

**JEL codes:** I38, O15, D10.

**Keywords:** early childhood development, home visiting interventions, parenting practices, Peru.

# 1. Introduction and motivation

Developmental gaps between children from disadvantaged backgrounds and those belonging to more affluent families emerge early and persist over time (Heckman, 2006, 2007; Paxson and Schady, 2007; Schady et al., 2014; Walker et al., 2007). Evidence suggests that such differences are difficult to overcome later in life, and limit these children's future economic opportunities and wellbeing. Numerous studies have found a strong causal relationship between developmental indicators during childhood and later-life outcomes such as schooling, employment status, wages, and participation in crime (Almond and Currie, 2011; Cunha et al., 2006). Persistent setbacks in developmental outcomes among children from disadvantaged groups thus explain one of the channels through which poverty is inter-generationally transmitted and inequality is sustained.

The lack of adequate early stimulation at home has recently captured attention as a major constraint preventing children in socioeconomically disadvantaged families from reaching better developmental outcomes (Heckman, 2006; Walker et al., 2007). It is well established that parent-child interactions are crucial in shaping child development during their first years of life (Huberman and Mendelsohn, 2012) and evidence suggests that parental engagement in educational play activities with their children is a crucial input for child development (Fiorini and Keane, 2012).

Early childhood development (ECD) interventions aim at improving one or more dimensions of child development<sup>1</sup> by enhancing the inputs received by the child during her first years of life. This can be attempted directly (for example, by providing food supplementation or offering an enriched play environment at a day care centre) or indirectly (for example, by offering caregivers the skills and materials for them to provide an enriched environment to their children).

The home-visiting model constitutes a prominent example of an ECD intervention that combines a direct and an indirect effect. It offers direct stimulation and materials during home visits carried out by a trained paraprofessional or community member, usually once per week and for a period of 1-2 years. Importantly, home visits also seek to improve caregivers' parenting skills for them to be able to offer better stimulation opportunities and enriched interactions to their children. This type of interventions are therefore classified among those focused on parent-child interactions (PCI) (Huberman and Mendelsohn, 2012).

The literature offers strong evidence to support that ECD interventions can deliver improvements in child outcomes (Nores and Barnett, 2010). Four systematic reviews of ECD interventions in the developing world also provide strong evidence to support that the home-visiting model can cause this type of improvements (Walker (2011), Engle et al. (2011), Baker-Henningham and Lopez-Boo (2010), Engle et al. (2007)). There is, however, much less evidence from developing countries regarding the effects of these interventions on the quality of the home environment and, in particular, on parental behaviour conducive to the provision of better stimulation opportunities to the child. In addition, and to the best of my knowledge, no evaluation so far has assessed the impacts of a scaled-up home-visiting programme and there have been no attempts so far to use evaluation results to try to understand the mechanisms behind caregivers' behavioural change.

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<sup>1</sup> The early childhood development literature distinguishes at least three developmental outcomes or skills: motor, cognitive and socio-emotional (Boyden and Dercon, 2012; Grantham-McGregor et al., 2007).

In light of the above, this analysis seeks to contribute to the literature on ECD in two ways. First, it provides causal evidence about the effects of a scaled-up home-visiting intervention on parental behaviour. And, second, it explores the constraints that limit parents' behavioural change. For this, the paper is organized around three research questions: (i) can a home-visiting ECD intervention working at scale deliver an improvement in the quality of the home environment?; (ii) can a home-visiting ECD intervention working at scale change parental behaviour so as to increase the amount of stimulation offered to the child; and (iii) what constraints faced by caregivers limit the effect of this intervention on caregiver engagement in educational play activities with the child?

The rest of the paper is organized as follows. Section 2 provides an overview of the available evidence regarding the effect of home-visiting ECD interventions on parental behaviour and introduces some key concepts. This should serve to justify and locate my research questions within the relevant literature. Section 3 describes the intervention considered for this study and explains the research design. The effects of the intervention on the quality of the home environment and parental behaviour are presented in Section 4. Section 5 addresses the issue of constraints by exploring the heterogeneity of treatment effects on caregivers' behaviour and expectations regarding the importance of parent-child interaction for child development. Finally, concluding remarks are presented in Section 6.

## **2. Home-visiting ECD interventions, the home environment and parental behaviour: evidence from the developing world**

A review of the ECD literature on home-visiting interventions in the developing world reveals three features that this research seeks to address: (i) scant evidence about the effect of these interventions on parental behaviour, together with the fact that its measurement can be problematic because instruments will typically pick-up the effect of the home visit which does not imply a change in parental behaviour; (ii) lack of evidence from programmes or interventions working at scale; and (iii) little attention to the mechanisms through which these interventions affect parental behaviour and a strong emphasis on "parenting skills", which carries the implicit assumption that caregivers' lack of knowledge about certain activities that can be performed with their children is the only relevant binding constraint.

The literature on ECD interventions provides strong evidence to support the claim that the home-visiting model can deliver positive results in terms of child outcomes in the developing world. Four systematic reviews ((Walker (2011), Engle et al. (2011), Baker-Henningham and Lopez-Boo (2010), Engle et al. (2007)) identify 16 different studies that have evaluated the effects of home visits on early child development outcomes (ages between 0 and 3) and all of them report benefits in at least one domain of childhood development. In addition, results from the recent evaluation of a home-visiting intervention in Colombia also reveal positive results on child outcomes (Attanasio et al., 2012; Attanasio et al., 2013).

Home-visiting interventions have the explicit objective of improving caregivers' parenting practices by demonstrating to them how to engage in play activities with their children and how to be more sensitive and responsive during daily interactions. This should ensure an improvement in the quality of the home environment additional to that directly offered during the home visit, and which might event extend beyond the duration of the intervention.

In the developing world, the provision of better stimulation opportunities at home constitutes an important component of home-visiting interventions in response to the significant cognitive skill setbacks found among children belonging to disadvantaged families (Grantham-McGregor et al., 2007). In fact, the literature identifies the lack of adequate early stimulation at home as one of the main risk factors preventing poor children from reaching better developmental outcomes (Heckman, 2006; Walker et al., 2007).

Despite this explicit interest in parenting practices and stimulation opportunities, there is much less evidence regarding the effects of the home-visiting model on the home environment or the provision of stimulation by parents. In only 9 out of the 17 studies mentioned above, the evaluation comprised measurement of the effects on the quality of the home environment. Moreover, while aggregate positive results were found in 7 of these 9 studies, only 3 report positive effects in terms of stimulation opportunities offered to the child by the caregiver<sup>2</sup>.

Instruments commonly employed to account for the effect of ECD interventions on the home environment include culturally adapted versions of items from the Home Observation for Measurement of the Environment (HOME) inventory (Caldwell and Bradley, 1984) or the Family Care Indicators (FCI) early childhood development module (UNICEF, 2011). Based on the structure of these instruments and the information usually collected in the studies referred above, we can conceive the *quality of the home environment* as a concept that involves at least one of the following two aspects: (i) the amount of stimulation opportunities offered to the child (which can include child's engagement in particular activities, her access to play material and the organization of the child's personal space); and (ii) the degree of caregivers' sensitivity and responsiveness (which refer to caregivers' ability to understand her child's needs and cues and her ability to respond to these needs and cues, respectively). Caregiver sensitivity and responsiveness are usually evaluated in terms of the verbal and affective interactions between the caregiver and the child (Totsika and Sylva, 2004).

This way of understanding the *quality of the home environment* is closely related to the concept of *parenting practices*. In fact, Hoff et al. (2002) refer to the HOME inventory when discussing how are parenting practices defined and measured. These authors acknowledge there is little consensus on how to conceptualize "parenting practices" and decided to focus on caregiver-child interactions when discussing the relation between these practices and socioeconomic status. They organized their analysis considering three aspects: (i) verbal interaction; (ii) direct control practices (how controlling, restrictive and punitive parents are with their children); and (iii) managerial control (which refer to the experiences and physical environments parents provide to their children).

The concept of behavioural change I propose for this analysis implies a shift in parenting practices that leads to an improvement in the quality of the home environment additional to that offered during home visits, which is sustained, at least, for the duration of the intervention. Based on this, and despite being closely related, it is better to keep the concepts of home environments and parenting practices (or parental behaviour) separate when studying the effects of a home-visiting intervention, especially if follow-up data is collected while the intervention is still ongoing (as in this study) or at the same time as it is being

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<sup>2</sup> These three studies are: Attanasio et al. (2013) (significant effect in the variety of play activities and play material offered to the child), Powell et al. (2004) (significant effect on mothers' childrearing practices), and Walker et al. (2004) (significant effect on maternal involvement with the child).

phased out. This is because the intervention offers a direct improvement in the quality of the home environment through home visits that involve the caregiver, but this does not necessarily imply that the caregiver is providing an additional and sustained improvement.

From the above it follows that an increase in the amount of stimulation offered to the child at home that is provoked by an ongoing home-visiting intervention does not necessarily imply there has been a behavioural change among caregivers. The HOME inventory and the FCI collect information about the stimulation opportunities offered to the child by observation (confirming the presence of play material) and by direct report of the primary caregiver (regarding her or other adults' involvement in particular activities with the child). During the intervention or while it is being phased out, changes can be observed or reported in these two aspects only because of what has happened during the home visits. The timing of the follow-up survey, the source of the play material, and the frequency and people involved in the interactions are, therefore, important elements that have to be considered when analysing the effects of home-visiting interventions on parental behaviour. It is not clear from the 3 studies referred above if these elements were considered when measuring the effects of the intervention<sup>3</sup>.

It should also be noted that none of the 9 studies that analysed the effects of the home-visiting model on the home environment used results from an intervention working at scale. Most of the studies can be classified as “efficacy trials” that worked with a limited number of children and families (samples sizes below 150) and delivered treatment under ideal or highly controlled conditions (e.g. working with a small group of trained professionals or paraprofessionals as home-visitors). The intervention more akin to a scaled-up programme is that evaluated in Attanasio et al. (2013)<sup>4</sup>.

Generating evidence from scaled-up interventions is important for policy because it provides a more realistic appraisal of what can be accomplished with a large target population. This is especially relevant in the developing world because targeted groups (e.g. families living below a poverty line) are usually large and the home-visiting model is highly dependent on the personal skills of home-visitors, which means that the quality of delivery can be particularly sensitive to scale.

Finally, and despite the obvious emphasis that home-visiting and other PCI-focused interventions have on parental behaviour, little is explicitly said in the studies referred above about the mechanisms through which they affect parenting practices. Most studies that address the issue of “mechanisms” focus on the channels linking the intervention with child development<sup>5</sup>. This emphasis is surely relevant in terms of policy outcomes, but it tends to

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<sup>3</sup> In two of the three studies, follow-up data was collected at the same time the intervention was being phased out (Attanasio et al., 2013; Powell et al., 2004). In one study, information regarding the home environment was collected midway through the intervention (Walker et al., 2004). None of the studies explicitly acknowledge if the provision of play material and caregivers' engagement in play activities was additional to that occurring during home visits.

<sup>4</sup> The intervention was linked to the administrative capacity and community networks of the Colombian conditional transfer programme (*Familias en Accion*) and home-visits were carried out by community members for whom special training and material were prepared. This intervention also targeted a large sample of children (1,429).

<sup>5</sup> In Baker-Henningham and Lopez Boo (2010), for example, the authors highlighted: (i) how early stimulation can ameliorate the negative effects associated to living in disadvantaged circumstances; (ii) the benefits on mothers' parenting behaviour; (iii) the benefits to maternal mental health; and (iv) improvements in children's

overlook a process which is far from mechanical and which determines, at least in part, the success of these interventions.

Despite the literature's lack of explicit attention to the mechanisms behind caregivers' behavioural change, a closer look at its emphases concerning the characteristics of successful interventions can provide some clues regarding the implicit assumptions being made about the process. What we find in this regard is a strong emphasis on the transference of "skills" to parents.

For example, in one very influential Lancet review on ECD, the authors conclude that parenting interventions have larger effects when they include systematic curricula and training opportunities for parents, as well as "active strategies to show and promote caregiving behaviours – e.g. practice, role play, or coaching to improve parent-child interactions" (Engle et al., 2011; p. 1343). Other authors also stress the importance of designing programmes to be participatory and interactive (with parents), of ensuring a positive relationship between the families and those in charge of the delivery, and of taking advantage of context to facilitate communication (Huberman and Mendelsohn, 2012).

In Attanasio et al. (2013), the authors employ the concept of "childrearing beliefs"<sup>6</sup> and mention these as one of the elements shifting as a consequence of home visits. They, however, also stress the role of parenting skills or ability: "(home visits) overall aim is to promote child development by improving parents' child-rearing beliefs and their ability to provide an enriching environment for their children" (Attanasio et al. (2013); p. 36).

Parenting skills or ability, understood in this case as knowledge of particular play activities to engage with children and of how to implement them, are surely necessary for parents to be able to offer more stimulation opportunities to their children. However, a strong emphasis on this sole component implicitly assumes that the lack of these skills is the only binding constraint preventing parents in poor families from having a more active role in influencing their children's early environment. This is a strong assumption to make if resources, in general, are scarce, as is the case among the populations these programmes are meant to serve.

In this regard, Huberman and Mendelsohn (2012) note that PCI-focused programmes have produced larger benefits with relatively better educated families. These authors cite Bronfenbrenner (1974) on the role of living conditions, who notes that "in many homes, the conditions of life are so harsh that, so long as they persist, the parent has neither the will nor the capacity to participate in educational activities with the child" (Bronfenbrenner, 1974; p. 36). Of course, "disadvantaged", "at risk" or "harsh conditions" can describe a rather wide range of circumstances when referring to household resources. Further analysis of the constraints limiting caregivers' behavioural change is therefore required, and this analysis involves an exploration of the possible mechanisms explaining this phenomenon.

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ability to take advantage of other educational opportunities (increased school readiness). Nothing was explicitly said, however, about how changes in mothers' parenting behaviour are produced.

<sup>6</sup> They refer to the work of Bornstein and Putnick (2012) and distinguish between parents who believe that children develop at their own pace with little parental involvement, and those who consider that parents have an active role fostering their children's cognitive and social skills.

### 3. The intervention and research design

#### 3.1 *Cuna Mas* home-visiting programme

The rural component of the *Cuna Mas* programme in Peru (called *Servicio de Acompañamiento a Familias*) is based on the Jamaica Home Visiting Model developed by Sally Grantham-McGregor and Christine Powell (Huberman and Mendelsohn, 2012). It comprises the provision of 1-hour home visits every week for a period of one and a half years, that can be complemented with group sessions held fortnightly.

Home visits are carried out by specially trained community members or “*facilitadoras*”. Each “*facilitadora*” is in charge of approximately 10 families. They follow a structured curriculum (PNCM, 2013) to: (i) show caregivers how to interact in a more sensitive and responsive way with their children during basic care routines; (ii) demonstrate to caregivers how to engage in age-appropriate play activities with their children; and (iii) show caregivers book sharing techniques. The intervention also comprises the delivery of children’s books, illustrations, and simple toys such as puzzles.

The intervention was focalized at the district level. Districts selected are those: (i) where monetary poverty incidence is above 50%; (ii) that fall within the scope of intervention of the conditional cash transfer programme *Juntos*; (iii) that exhibit a rate of chronic malnutrition for children aged 0-5 above 30%; and (iv) where more than 50% of the population lives in a rural community. These criteria yielded a total of 531 districts comprising 31,828 rural communities. Children between 0 and 3 years of age living in these communities represent the target population of the intervention, which will be progressively expanded to ensure full coverage by year 2016. The first scaling-up effort of the programme occurred between May and June 2013, and it is currently serving approximately 30,000 families across 14 regions. The data for this study was collected between February and March 2014.

#### 3.2 Evaluation design

The intervention was scaled-up planning for an evaluation with experimental design. In particular, 60 districts were randomly allocated to each of the following groups: home visits (treatment 1), home visits and group sessions (treatment 2) and no intervention (control)<sup>7</sup>. The two largest rural communities in terms of target population were selected within each district and, from each community, a total of 15 children-caregiver dyads were randomly selected to participate in a baseline survey collected between April and May 2013 (MIDIS, 2013). Follow-up data collection for the evaluation of *Cuna Mas*’s effects on child development is programmed for early 2015.

This study is based on the cluster-randomised design described above, and has the objective of estimating the effectiveness of the intervention in changing the quality of the home environment and caregivers’ behaviour. Following power calculations, it was decided to randomly select 20 districts from the control and treatment 2 groups already created<sup>8</sup>. Within

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<sup>7</sup> The map presented in Appendix 1 shows the distribution of districts. Districts assigned to the control group will receive the service starting in year 2015.

<sup>8</sup> The Programme was interested in working with the treatment 2 group to ensure that the absence of effect in particular aspects of parenting practices will derive in recommendations that could be applied to the whole intervention. In any case, by the first quarter of 2014, the number of group sessions provided was very low (only 4) and this form of delivery was discarded.

each district, in turn, a sufficient number of caregivers from the baseline sample had to be randomly selected to ensure an average of 15 caregivers surveyed per district. This yielded a total planned sample of 600 caregivers, 300 in the control group and 300 in the treatment group. This sample size and distribution ensured a minimum detectable size of 0.26 standard deviations for a statistical power of 80%. This was judged as a conservative minimum effect size considering the values found in the studies referred above (where effect sizes ranged between 0.32 and 0.65).

Before the random selection of 20 districts from the control and treatment groups already created, some regions and treatment districts were excluded. The exclusion of regions (3 out of 11) was to prevent an excessive geographical dispersion of the sample and implied losing 14 districts in the control group and 8 districts in the treatment group.

The Programme had the specific requirement that the sample should include those caregivers who had started to receive treatment, and this had to be combined with the condition of having an average of 15 caregivers surveyed per district. These conditions determined the exclusion of 30 treatment districts which had fewer than 15 baseline caregivers who had started to receive the intervention by the time fieldwork was implemented. An intention to treat analysis would have prevented these exclusions. Unfortunately, this was not possible due to the implementation requirement in place.

After these exclusions, 20 districts were randomly selected from the remaining control and treatment groups. In each selected district, in turn, 15 caregivers were randomly selected for interview while the rest, if any, were allocated to a replacement list (Table 1.1 in Appendix 1 presents the final list of districts and regions involved in this study).

In principle, the exclusions described above could have introduced bias in the results. There is, however, no evidence of this since there are no significant differences in terms of baseline household, child and caregiver characteristics<sup>9</sup> and, more importantly, in terms of outcome measures, between: (i) control and treatment districts available after the exclusion of regions; (ii) included and excluded districts within the treatment group after consideration of there being a minimum of 15 baseline caregivers who had started to receive treatment; (iii) included districts within the treatment group and districts in the control group; and (iv) excluded districts within the treatment group and districts in the control group (see Appendix 2). The fact that these groups share the same pre-treatment outcome measures provides stronger evidence to support the absence of bias. This is because the presence of unobservable confounders affecting treatment estimates would likely manifest by producing unbalanced pre-treatment behaviours.

It is also worth saying that the main reason why caregivers had not started receiving treatment was that the programme had not been launched yet in their communities. In fact, by the time fieldwork was implemented, 45 out of the 120 treatment communities had not started receiving the intervention. It is worth noting that communities were in this situation mainly because of administrative delays in regional offices, a reason which is, in principle, unrelated to the behaviours I aim to analyse. In addition, the exclusion rule was also influenced by the requirements of power calculations and this meant that the criteria for not being part of the treatment sample at the caregiver level amounted to inhabiting a district where the intervention

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<sup>9</sup> Except for the likelihood of caregiver engagement in work-related activities outside the household, for which it is possible to observe a difference of around 10 percentage points.



has not yet started in, at least, one of its two communities. In most of the cases, excluded districts had only one community that had not started to receive the intervention. This reduced the likelihood of exclusion being driven by a characteristic shared by all district members.

Departure from a pure random design means that the absence of unobservable confounders is not assured, at least at the design stage. It is, however, a reasonable assumption based on the arguably exogenous nature of the phenomenon driving exclusion (living in a district where the intervention has not yet started in, at least, one of its communities) and on the fact that districts included in the treatment group share the same pre-treatment characteristics and outcome measures as those excluded, and as those belonging to the control group.

Finally, an analysis of baseline information for the control and treatment caregivers actually surveyed in the districts that were finally selected is presented in the next section, and confirms that both groups shared balanced behaviours and characteristics prior to the intervention.

Administrative records available for the treatment sample contain information on the number of visits provided and the date of the first and last visit delivered up until December 2013. These records reveal that caregivers in the treatment sample had received an average of 25 visits up until December 2013, a figure consistent with the fact that nearly 6 months had passed since the programme was scaled up (between May and June 2013). A dropout rate can be approximated considering those caregivers whose last visit occurred before December 2013. According to this criterion, 3% of caregivers were no longer receiving treatment by that date.

### 3.3 Survey instruments

A questionnaire was prepared to measure the quality of the home environment as well as caregiver expectations regarding the importance of early parent-child interactions for child development (see Appendix 3).

Items included in this questionnaire allow one to characterize the quality of the home environment on the basis of four aspects: (i) interaction and play activities (variety of caregiver-child interactions during basic care and variety of play activities offered to the child); (ii) responsiveness and control practices (communicative and affective caregiver-child interactions and how the caregiver disciplines the child); (iii) play material and home conditioning (variety of play materials present at home and the conditions of the child's play area); and (iv) personal care and hygiene (overall child and caregiver appearance in terms of hygiene). Figure 3.1 in Appendix 3 provides more detail on these specific components and indicates whether the information was collected through caregivers' report or enumerators' observation during the interview. This information was used to build a quality of the home environment index (with values ranging 0-1) given by the simple average of the scaled scores obtained in each of the four components described above<sup>10</sup>.

It should be noted that the abovementioned components comprise the two basic aspects of the concept of *quality of home environment* discussed in section 2. In addition, the information

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<sup>10</sup> Figure 2.1 in Appendix 2 also indicates the raw scores that can be obtained in each component. Note that maximum raw scores are not the same across components. Scaling with respect to the maximum score in each component ensures they have equal weights in the aggregate index.

organized under these four components encompasses all the aspects considered by the six subscales of the HOME infant-toddler questionnaire as well as most of the information collected by the FCI early childhood development module. In fact, specific items used to measure caregivers' responsiveness and control practices and the variety of play material are adapted versions of the items contained in the *Emotional and verbal responsivity*, *Avoidance of restriction and punishment*, and *Provision of appropriate play materials* subscales of the HOME inventory. Items used to measure the variety of play activities are also based on the FCI.

In terms of characterizing the quality of the home environment, the questionnaire employed for this study includes two novel elements with respect to the HOME inventory and the FCI: (i) specific items aimed at capturing the variety of caregiver-child interactions during feeding and basic care routines; and (ii) a modified version of the play activity table used in the FCI that allows one to identify both the frequency of the interaction and the person interacting with the child. As will be discussed later, both elements are important to account for the effects of the intervention on the stimulation opportunities offered to the child in addition to those provided during the home visit.

Caregiver expectations regarding the importance of parent-child interactions for child development was captured through an eight-item scale (see items 550 and 551 in the survey questionnaire presented in Appendix 2). During the interview, caregivers were asked about the ideal educational attainment and occupation they would like their child to achieve and then were asked to what extent they agree or disagree with eight statements about the relation between early parent-child interaction and these goals.

The questionnaire was piloted in three rural districts with similar socioeconomic characteristics to those involved in the evaluation. Interviews were conducted in the language commonly used by caregivers (around 35% spoke Quechua). Informed consent was obtained from all participants without revealing that the study was related to *Cuna Mas*. In fact, this information (as well as treatment status) was also concealed from enumerators to prevent them from making reference to the programme during the interview.

### **3.4 Balance between treatment and control groups at baseline**

Examination of control and treatment groups' observable characteristics prior to treatment can provide evidence to support the claim that there are no confounders influencing the results obtained after comparing outcome measures between these two groups. As already noted, evidence is even stronger if these groups share the same pre-treatment outcome measures as the presence of unobservable confounders affecting treatment estimates would likely manifest by producing unbalanced pre-treatment behaviours.

Table 1 summarizes mean values in the control and treatment group for pre-treatment outcome measures related to the quality of the home environment and several household, caregiver and child characteristics relevant for caregivers' child-rearing practices. Measures were built using baseline data collected between April and May 2013. A quality of the home environment index was built organizing baseline data under the four components described above. The specific information entering each component, however, is not necessarily the same because the baseline survey was not as rich in terms of measuring caregiver behaviour (for example, it did not collect information on the variety of caregiver-child interactions during basic care). The household wealth index was built combining information on dwelling

characteristics, access to basic services and availability of durable goods, as described in Escobal et al. (2003).

**Table 1: Outcome variables and household, caregiver and child characteristics at baseline**

	Control	Treatment	Difference
<i><b>Outcome variables</b></i>			
Quality of home environment index (0-1)	0.599	0.604	0.005 (0.02)
Interaction and play activities (0-1)	0.425	0.434	0.009 (0.028)
Responsiveness and control practices (0-1)	0.708	0.717	0.009 (0.024)
Play material and home conditioning (0-1)	0.348	0.363	0.015 (0.03)
Personal care and hygiene (0-1)	0.914	0.902	-0.012 (0.026)
<i><b>Household, caregiver and child characteristics</b></i>			
Household wealth index (0-1)	0.481	0.460	-0.021 (0.036)
Household members	5.425	5.395	-0.030 (0.175)
Caregiver's age	29.334	28.221	-1.113 (0.732)
Caregiver's educational attainment (years)	6.214	6.827	0.612 (0.593)
Caregiver is married (yes = 1)	0.306	0.221	-0.085 (0.057)
Caregiver worked outside household last week (yes = 1)	0.619	0.769	0.150* (0.078)
Number of children under caregiver's care	1.034	1.044	0.010 (0.014)
Caregiver's first language is Spanish (yes = 1)	0.650	0.629	-0.021 (0.131)
Caregiver is the mother (yes = 1)	0.975	0.973	-0.002 (0.015)
Child's age (months)	12.863	13.129	0.267 (0.595)
Child is male (yes = 1)	0.531	0.476	-0.055 (0.044)
Number of observations	320	294	

Robust standard errors in parentheses.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

In general, we can say control and treatment characteristics were balanced prior to the intervention. Note there are no significant differences in any of the outcome variables or household, caregiver and child characteristics considered, except for the likelihood of the caregiver being engaged in work-related activities outside the household. This is apparently larger in the treatment group if we allow for a 10% significance level.

It should also be noted from Table 1 that the final sample comprises 614 observations, 320 (52%) belonging to the control group and 294 (48%) belonging to the treatment group. As planned, data was collected from 20 control districts and 20 treatment districts with an average of 15.4 observations per district. Accordingly, all standard errors are corrected to consider that the data is arranged in 40 clusters.

## 4. Treatment effects on the quality of the home environment and parental behaviour

### 4.1 Estimation of treatment effects

Treatment effects were calculated using OLS estimates of parameters  $\beta$  and  $\beta^C$  in equations (1) and (2) given below.

$$y_i = \alpha + \beta T_i + \mu_i \quad (1)$$

$$y_i = \alpha^C + \beta^C T_i + x_i' \gamma + \varepsilon_i \quad (2)$$

In these equations,  $y_i$  is the outcome measure under analysis,  $T_i$  is the treatment status of the caregiver ( $T_i = 1$  if she belongs to the treatment group,  $T_i = 0$  if she belongs to the control group), and  $x_i$  is a vector containing pre-treatment characteristics and outcome measures.

Balanced pre-treatment characteristics and outcome measures should translate into similar estimates for  $\beta$  and  $\beta^C$ . Estimates provided by equation (2), however, are usually preferred because they can produce more precise estimates of the causal effect of interest (Angrist and Pischke, 2009). Note that the fact that covariates are not correlated with the treatment implies that their exclusion will not bias the estimate of  $\beta$ . However, this does not imply they have no explanatory power for  $y_i$  and, therefore, their inclusion can reduce the residual variance.

At this point is worth recalling that the empirical goal of this analysis is to estimate the effectiveness of the intervention in changing the quality of the home environment and caregivers' behaviour. Combined with the fact that the difference between the actual and the original treatment status of caregivers was mainly caused by delays in the implementation of the programme, this means that the parameter of interest is the "effect of the treatment on the treated". That is, the effect of the intervention itself and not the effect of being assigned to treatment (Duflo et al., 2007).

As argued in the previous section, absence of unobservable confounders affecting the estimates of the "effect of the treatment on the treated" is a reasonable assumption. This is based on the evidence presented so far and on the fact that the rule determining exclusion from the treatment group can be regarded as exogenous (in the sense of not being correlated with the error terms in equations (1) and (2)).

## 4.2 Effects on the quality of the home environment

Table 2 presents treatment effects on the quality of the home environment index and the scaled scores of each component (complete regression results are reported in Appendix 4). Effects are reported in terms of the simple difference between control and treatment group means and as the difference controlled for pre-treatment outcome values and household, caregiver and child characteristics considered in Table 1. Results for the aggregate index are reported considering the average over all components (which implies losing observations from caregivers not responding all items or for whom all characteristics could not be observed during the interview<sup>11</sup>) and the average calculated over those components with complete information.

**Table 2: Treatment effects on the quality of the home environment**

	Obs.	Mean control group	Mean treatment group	Difference	Controlled difference	d
<b>Aggregate index (0-1)</b>						
All components	486 (C=238; T=248)	0.610	0.671	0.062*** (0.019)	0.059*** (0.013)	0.534
Components with complete information	614 (C=320; T=294)	0.597	0.657	0.06*** (0.017)	0.057*** (0.014)	0.466
<b>Index components (0-1)</b>						
1. Interaction and play activities	614 (C=320; T=294)	0.363	0.438	0.074*** (0.019)	0.068*** (0.013)	0.382
2. Responsiveness and control practices	548 (C=283; T=265)	0.644	0.707	0.063*** (0.021)	0.062*** (0.021)	0.424
3. Play material and home conditioning	537 (C=264; T=273)	0.490	0.592	0.101*** (0.03)	0.098*** (0.023)	0.511
4. Personal care and hygiene	558 (C=290; T=268)	0.939	0.945	0.006 (0.016)	0.01 (0.011)	0.101

Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Controlled difference is the estimated effect including pre-treatment controls.

Effect size (d) calculated as the standardized controlled difference.

Overall, evidence shows that the treatment has a positive and significant effect on the quality of the home environment. Its effect size (standardized treatment effect between 0.53 and 0.47) can be regarded as moderate (Cohen, 1992) and lies between the values found in the literature for effective interventions based on the home-visiting model: d = 0.65 in Jamaica (Powell et al., 2004); d = 0.53-0.54 in Colombia (Attanasio et al., 2013); d = 0.49 in Jamaica (Grantham-McGregor et al., 1991); d = 0.37 in Jamaica (Walker et al., 2004); d = 0.32 in India (Bentley et al., 2010).

<sup>11</sup> Most missing observations are due to the fact that some characteristics of the environment could not be observed because the caregiver was not willing to show the play material or particular areas of the house to the enumerator. Rejection was low (around 10%) but its effect gets compounded when building an aggregate score.

It should be noted that the abovementioned interventions had between 1 and 2 years of duration. This is significantly above the average exposure of the *Cuna Mas* treatment group at the time this data was collected (around 6 months or an average of 25 visits). It is reasonable to assume, however, that longer or more intense exposures are more related to larger treatment effects in terms of child outcomes than in terms of caregiver behaviour<sup>12</sup>.

Table 2 also reveals that the improvement in the quality of the home environment is explained by positive treatment effects on every component except in “personal care and hygiene”. It should be noted that the score obtained in this component in the control group is already high (0.94 out of 1) leaving little space for an improvement.

### 4.3 Effects on caregiver behaviour

Achieving behavioural change is important because it implies an enriched environment is being offered to the child in a continuous way and not only during home visits. A change in caregivers’ behaviour also increases the likelihood of this improvement being sustained even after the intervention is phased out.

As already noted, an increase in stimulation opportunities offered to the child (either in terms of play activities or play materials) does not imply there has been a change in parental behaviour if results stem from follow up data that has been collected while home visits are still being carried out. This is the case of this particular evaluation. In addition, it is also prudent to refrain from considering increases in access to play material when talking about changes in caregiver behaviour if the intervention has directly provided materials and it is not possible to account for their origin from survey data.

To measure the effect of the intervention on caregiver behaviour we will focus on caregiver-child interactions happening in addition to the home visit. The instruments used for this analysis allows one to do this by looking at two subcomponents of the quality of the home environment index: (i) the number of types (or variety) of interactions during basic care and play; and (ii) the number of types (or variety) of play activities offered to the child. The first one is built considering interactions (e.g. verbal communication that happen during feeding, bathing and clothes change routines), which take place independently of the home visit. As shown in the first row of Table 3, there is a positive and significant effect in this outcome variable.

The second outcome variable is of particular interest for this analysis because it is related to activities with a direct and explicit stimulation purpose. This indicator is built considering the number of types of activities (out of 7 possible types) carried out by the caregiver with the child at least twice per week. Conditioning on a minimum frequency of 2 implies that the variety is measured excluding those types of activities carried out only once per week. This is important because it ensures we are measuring increases in the variety of play activities that are additional to those occurring because of the weekly home visit<sup>13</sup>. Results obtained for this

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<sup>12</sup> In Powell and Grantham-McGregor (1989) the evaluation design allowed one to compare the effects of having biweekly vs. monthly visits for a period of 2 years. Larger effects on child outcomes were found for biweekly visits. Unfortunately, no measurements of caregiver behaviour were taken.

<sup>13</sup> This is a conservative estimate. Excluding those activities carried out with frequency 1 is not the same as subtracting 1 from the frequency of those activities that were performed during the home visit. Excluding activities carried out only once per week, however, ensures that the effect picked-up by the indicator corresponds only to those activities carried out in addition to the ones that took place during the home visit.

indicator confirm that the treatment has produced an increase in the variety of play activities offered to the child by the caregiver, over and above the stimulation provided during the home visit (see the second row in Table 3).

**Table 3: Treatment effects on caregivers' interaction with child and on the variety of play activities offered by the caregiver**

	Mean control group	Mean treatment group	Difference	Controlled difference	d
Number of types of interactions during basic care (0-12)	5.069	5.813	0.744*** (0.235)	0.747*** (0.208)	0.301
Number of types of play activities carried out at least twice last week by the caregiver (0-7)	1.838	2.500	0.663*** (0.214)	0.537*** (0.135)	0.310

Number of observations is 614 (C = 320, T = 294).

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Effect size (d) calculated as the standardized controlled difference.

Another benefit of collecting information about for the frequency and person involved in play activities is that one can shed light on how behavioural change is occurring. When we asked about child engagement in particular play activities and its weekly frequency we also recorded who was the person usually sharing the activity with the child and if there was somebody else involved. This allows one to decompose the total effect on the variety of play activities carried out with a minimum frequency of  $f$  ( $\Delta V(f)$ ) in the following way:

$$\begin{aligned} \Delta V(f) = & \Delta V(f|without\ caregiver\ involvement) \\ & + \Delta V(f|with\ caregiver\ involvement) \end{aligned} \quad (3)$$

Note that caregiver involvement implies that the caregiver was either identified first as the person usually sharing the activity with the child or was identified as the one accompanying the interaction between the first person and the child. This implies that the effect on the variety of play activities carried out with the child with caregiver involvement can be further decomposed following:

$$\begin{aligned} \Delta V(f|with\ caregiver\ involvement) \\ = & \Delta V(f|caregiver\ identified\ first) \\ & + \Delta V(f|caregiver\ identified\ as\ accompanying) \end{aligned} \quad (4)$$

Table 4 presents the results of these two decompositions. As explained below, they reveal that increased stimulation offered to the child (additional to that occurring during the home visit) is occurring through greater caregiver involvement in play activities rather than through the introduction of more or new types of play activities.

**Table 4: Effects on the variety of play activities offered to the child (number of types of play activities)**

Person involved	Minimum frequency	
	1	2
(a) Anyone ( $\Delta V(f)$ ) [(b) + (c)]	0.73*** (0.113)	0.274** (0.116)
(b) Without caregiver involvement	-0.272* (0.150)	-0.508*** (0.137)
(c) With caregiver involvement [(d) + (e)]	1.001*** (0.15)	0.782*** (0.137)
(d) Caregiver identified first as the person usually sharing the activity	0.666*** (0.159)	0.537*** (0.135)
(e) Caregiver identified as the person accompanying the interaction between the first person and the child	0.340*** (0.079)	0.249*** (0.061)

Number of observations is 614 (C = 320, T = 294).

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The first row in Table 4 shows there is only a small (but significant) effect of around 0.27 on the number of types of activities offered to the child that we can be sure are additional to those that take place during the home visit (i.e. with a minimum frequency of 2). Moreover, if we compare columns 1 and 2 for indicator (a) we would realise that most of the effect on the variety of play activities is concentrated on frequency 1, something that could cast doubt on the effectiveness of the intervention beyond the home visit.

This result, however, masks the fact that there is greater caregiver involvement in play activities, something that could not have been identified in absence of information regarding the people involved in these activities. In fact, the effect of the intervention on the variety of play activities carried out with a minimum frequency of 2 raises from 0.27 to 0.78 when we condition it to have caregivers' involvement (see indicator (c) in Table 4). According to equation (3), for this to be possible, the variety of play activities offered without caregiver participation must be falling by  $0.27 - 0.78 = -0.51$ , as confirmed by the results reported for indicator (b)<sup>14</sup>.

One can think of the nature of the environment to which the child is exposed during play as something that depends, at least, on the type of activity being carried out and the people involved with the child during the activity. In this regard, the results mentioned above imply that the nature of the environment to which the child is exposed during play, in addition to the home visit, is being transformed mainly through the engagement of their caregivers (i.e. a shift in the people involved) and less because of the introduction of new types of activities.

It is also worth noting that the indicator proposed to measure the variety of play activities offered to the child by the caregiver when accounting for changes in caregiver behaviour (reported in Table 3 above) corresponds to that conditioned on the caregiver being identified

<sup>14</sup> This result should not be taken to imply that a substitution effect is in place. Greater caregiver involvement does not necessarily mean that other household members are no longer taking part of the activity.



first as the person usually sharing the activity with the child (indicator (d) in Table 4). This is to ensure that the caregiver has a leading role in the activity carried out with the child.

The effect on the number of types of play activities is equal to the sum of the effects on the proportion of caregivers who engage in each of the activities considered. This allows one to analyse if there are certain activities that account for the majority of the overall effect on the variety of play offered to the child.

Table 5 allows this analysis by showing the effect on the proportion of caregivers who engage in each of the 7 types of play activities considered. Three types of activities explain most of the effect on the variety of play offered to the child by the caregiver: telling stories to the child (10 percentage point increase), singing songs to or with the child (12 percentage point increase), and playing with the child and her toys (16 percentage point increase). No significant effect has been found in activities such as reading or looking at books, drawing or painting, and taking the child outside the house. The proportion of caregivers who carry out this last activity, however, is already relatively large in the control group (around 60%).

**Table 5: Treatment effects on each type of play activity (proportion of caregivers)**

Play activities		Mean control group	Mean treatment group	Controlled difference
<i>Play activities</i>				
1	Read books, look at pictures from a book with (NAME)	0.200	0.252	0.032 (0.031)
2	Told stories to (NAME)	0.100	0.208	0.102*** (0.03)
3	Sang songs to or with (NAME), including lullabies	0.303	0.439	0.122** (0.048)
4	Took (NAME) outside the house	0.606	0.605	-0.007 (0.045)
5	Played with (NAME) with his/her toys	0.166	0.350	0.161*** (0.04)
6	Drew, painted or scribbled with (NAME)	0.169	0.245	0.054 (0.035)
7	Played with (NAME) to name objects, colours or numbers	0.294	0.401	0.073* (0.038)
			<b>Sum</b>	<b>0.537</b>
			<b>d</b>	<b>0.310</b>

Number of observations is 614 (C = 320, T = 294).

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 5. Constraints determining treatment effects on parental behaviour

Results so far show that a home visiting ECD intervention working a scale can provoke a change in caregiver behaviour conducive to the provision of more stimulation opportunities for the child. In particular, it is possible to identify an increase in caregiver engagement in educational play activities with the child in addition to that occurring during the home visits. This effect is positive and statistically significant, amounting on average to around half an activity, and has a size of 0.3 standard deviations.

In Section 2, I highlighted the literature's lack of attention to the mechanisms behind caregivers' behavioural change and how its strong emphasis on "parenting skills" implicitly assumes that caregivers' lack of knowledge about certain activities that can be performed with their children and of the ability to engage in them is the major binding constraint. I argued this assumption can be rather strong especially if we are working with poor families who, by definition, face scarcity in many dimensions.

In this section I propose an analysis of the potential constraints limiting the effect on caregiver participation in play activities with their children. The discussion is organised in two parts. The first presents empirical evidence about the presence of heterogeneous treatment effects by caregivers' educational attainment and household wealth. Analysing if the size of treatment effects is affected by caregivers' education is relevant because this variable reflects parental skill and this, in turn, can determine the effectiveness with which new information and knowledge regarding play activities is acquired by caregivers. This, of course, is consistent with the hypothesis that the lack of "parenting skills" is the major binding constraint.

The wealth index provides a broader view of the degree of scarcity faced by the household and can capture if deprivation, in general, is affecting caregivers' engagement in play activities with their children. This can be relevant if such engagement requires parents to input resources of their own besides their skills.

The second part of the analysis discusses results obtained when measuring caregivers' expectation about the importance of parent-child interactions for child development, and presents treatment effects on this variable. Measurement of these expectations is one of the novel features of this exercise and can provide important empirical evidence for the analysis of the constraints and mechanisms behind the intervention.

### 5.1 Heterogeneity of treatment effects: the role of caregiver education and household wealth

Three different techniques are employed to determine whether the effects of the intervention differ depending on how well educated is the caregiver or how rich is her household. The first consists in estimating different treatment effects for different groups within the education and wealth distributions. If we divide these distributions into  $K$  groups, this can be easily accomplished using the following specification:

$$y_i = \alpha_1 + \beta_1 T_i + \beta_2 T_i G_{i2} + \dots + \beta_k T_i G_{ik} + \alpha_2 G_{i2} + \dots + \alpha_k G_{ik} + x_i' \gamma + \varepsilon_i \quad (5)$$

Where  $T_i$  denotes individual  $i$  treatment status,  $G_{ik}$  indicates membership to group  $k$ , and  $x_i'$  is a vector of pre-treatment controls. The treatment effect for the first group is given by  $\hat{\beta}_1$ , while the treatment effect for group  $k$  is given by  $\hat{\beta}_1 + \hat{\beta}_k$ . This specification has the advantage of allowing one to directly assess the significance of the difference of treatment effects with respect to the first group by simply looking at the significance of coefficients  $\hat{\beta}_1, \hat{\beta}_2, \dots, \hat{\beta}_k$ .

The second technique allows education and wealth to affect treatment effects in a continuous way. This is tested by introducing an interaction between treatment status and caregivers' educational attainment or household wealth. Formally:

$$\begin{aligned} y_i &= \alpha_1 + \lambda_1 T_i + \lambda_2 T_i z_i + x_i' \gamma + \varepsilon_i & (6) \\ y_i &= \alpha_1 + \lambda_1 T_i + \lambda_2 T_i z_i + \lambda_3 T_i z_i^2 + x_i' \gamma + \varepsilon_i & (7) \end{aligned}$$

Where  $z_i$  refers to caregivers' educational attainment or household wealth, depending on the source of heterogeneity under analysis. In specifications (6) and (7), the estimated effect of the treatment is given by  $\hat{\lambda}_1 + \hat{\lambda}_2 z_i$  and  $\hat{\lambda}_1 + \hat{\lambda}_2 z_i + \hat{\lambda}_3 z_i^2$ , respectively. Specification (7) allows for a non-linear effect on the treatment's impact ( $\hat{\lambda}_2 + 2\hat{\lambda}_3 z_i$ ).

Finally, a non-parametric fit of the relationship between the variety of play activities offered by the caregiver and her educational attainment or household wealth provides an even more flexible way of evaluating the presence of heterogeneity in treatment effects. For this, we need to assess the difference between the non-parametric fit built using data from the control and treatment groups. Systematic changes in this difference will be indicative of heterogeneity in treatment effects. If we suspect treatment effects exhibit a positive or negative gradient according to a certain variable, the behaviour of this difference can serve to evaluate the robustness of such gradient.

Tables 6 and 7 and Figure 1 present the results obtained from the three techniques explained above. Estimations following specification (5) were obtained after dividing the education and wealth distributions in four groups (quartiles). Results are presented in Table 6. Table 7 reports estimates from specifications (6) and (7). Panel A in Figure 1 shows the behaviour of treatment effects according to caregiver education and household wealth, estimated from the non-linear specification given in (7)<sup>15</sup>. Finally, Panel B in Figure 1 presents a non-parametric fit by treatment status of the relationship between play activities and caregiver education and household wealth.

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<sup>15</sup> Upper and lower bounds for the x-axis variables were set at the mean values in the first and fourth quartiles of the education and wealth distributions.

**Table 6: Treatment effects by household wealth and caregiver education quartiles on the variety of play activities offered by the caregiver**

<b>(a) Caregiver education</b>				
	First quartile (Q1)	Second quartile (Q2)	Third quartile (Q3)	Fourth quartile (Q4)
Treatment effect	0.439** (0.174)	0.621** (0.272)	0.591* (0.335)	0.632** (0.241)
Difference w.r.t Q1		0.182 (0.326)	0.152 (0.386)	0.193 (0.273)
<b>(b) Household wealth</b>				
	First quartile (Q1)	Second quartile (Q2)	Third quartile (Q3)	Fourth quartile (Q4)
Treatment effect	0.207 (0.186)	0.461* (0.268)	1.131*** (0.240)	0.239 (0.239)
Difference w.r.t Q1		0.254 (0.316)	0.924*** (0.288)	0.031 (0.305)

Number of observations is 614 (C = 320, T = 294).

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Treatment effects and differences estimated using an interaction between treatment status and membership to each wealth or caregiver education quartile. All regressions included pre-treatment controls.

**Table 7: Interactions between treatment status, caregivers' educational attainment and household wealth**

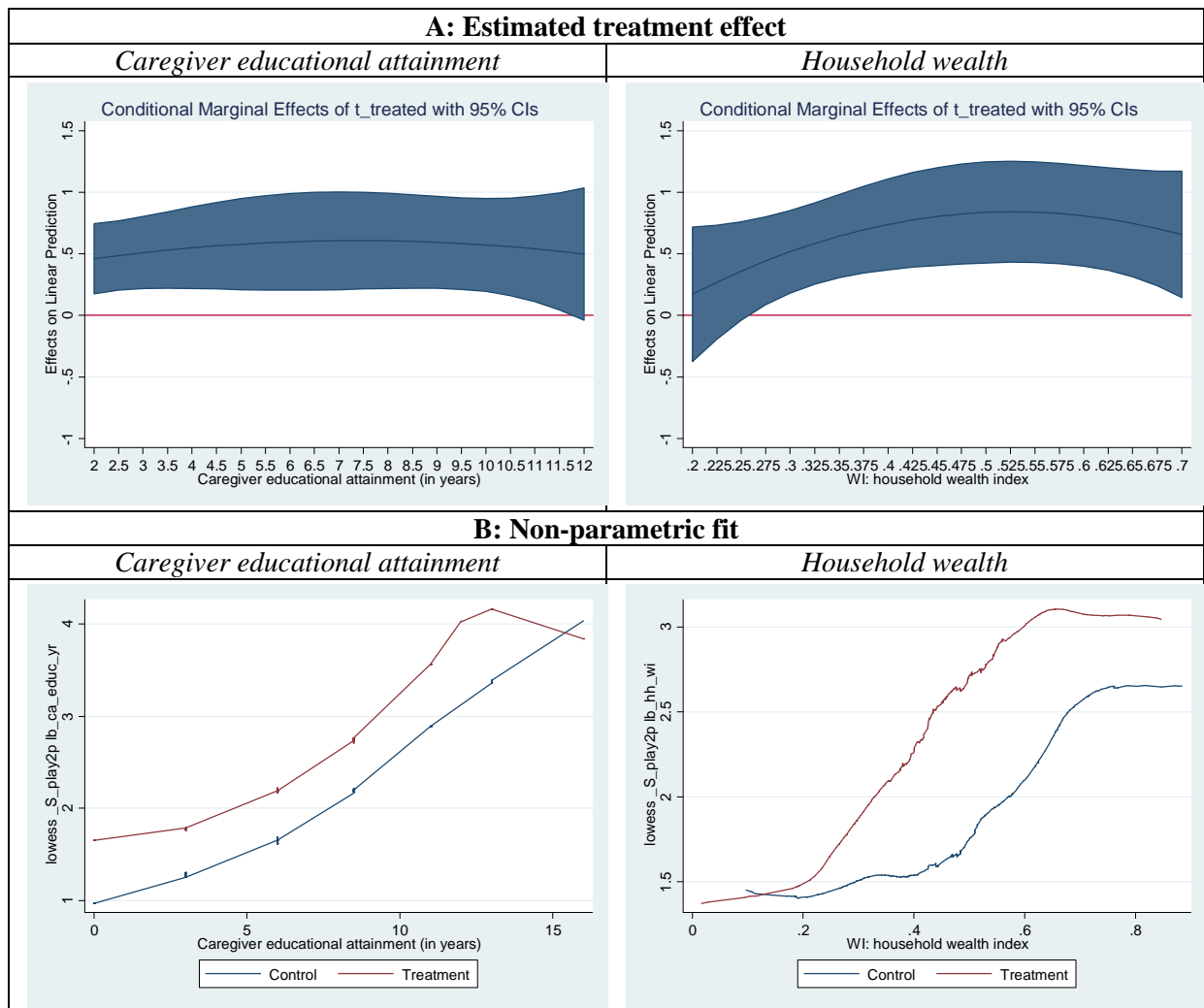
	<b>z(i) = caregiver's educational attainment</b>		<b>z(i) = household wealth</b>	
	<i>Linear effect</i>	<i>Non-linear effect</i>	<i>Linear effect</i>	<i>Non-linear effect</i>
Treatment	0.411* (0.213)	0.331 (0.252)	0.251 (0.329)	-1.210 (0.843)
Treatment*z(i)	0.019 (0.031)	0.0765 (0.110)	0.611 (0.691)	7.650* (3.956)
Treatment*z(i)^2	--	-0.005 (0.009)	--	-7.553* (4.115)
z(i)	0.097*** (0.022)	-0.069 (0.059)	0.781* (0.406)	-2.320 (2.184)
z(i)^2	--	0.013*** (0.005)	--	3.193 (2.028)

Number of observations is 614 (C = 320, T = 294).

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

All regressions included pre-treatment controls.

**Figure 1: Treatment effects by caregiver educational attainment and household wealth**



Panel A depicts estimated treatment effects ( $\hat{\lambda}_1 + \hat{\lambda}_2 z_i + \hat{\lambda}_3 z_i^2$ ) and 95% confidence intervals obtained from the following specification:  $y_i = \alpha_1 + \lambda_1 T_i + \lambda_2 T_i z_i + \lambda_3 T_i z_i^2 + x_i' \gamma + \varepsilon_i$ , where  $z_i$  refers to caregivers' education (left hand side graph) and household wealth (right hand side graph). Panel B depicts a locally weighted scatterplot smoothing of play activities on caregiver education and household wealth. In each graph, results are presented for the control and treatment groups and, therefore, treatment effects are given by the vertical distance between the two functions.

Several important results emerge from the analysis presented in the tables and figures above.

- (i) There is no evidence of heterogeneity in treatment effects on the variety of play activities by caregivers' educational level. In particular, impacts are positive, significant and amount to approximately 0.5 activities across the entire education distribution.
- (ii) Household wealth has a significant effect on the impact of the intervention.
- (iii) There is evidence to suggest that treatment effects are a non-linear function of wealth. There is, however, a monotonic and significant increase in treatment effects as household wealth raises up until to the 75<sup>th</sup> percentile of the distribution.
- (iv) There is no evidence of significant treatment effects in the lower 25% of the wealth distribution. This result is robust to all the specifications considered.

## 5.2 Measurement and treatment effects on caregivers' expectations regarding the importance of parent-child interactions for child development

Caregivers' perception regarding how important are parent-child interactions during early childhood for the development of their children should play an important role in shaping parenting practices. Under the premise that parents try to provide what they believe is best for their children, variation in these beliefs should conduce to variation in observed behaviour. As discussed in Bornstein and Putnick (2012), "variation on childrearing philosophies, values and beliefs mediates differences in childrearing practices vis-à-vis local and larger physical and social environments" (Bornstein and Putnick (2012), p. 57). Caregivers' understanding of the significance of their role and of particular activities that can be carried out during their children's early years are part of these set of beliefs (Hoff et al., 2002).

The programme has no explicit objective in terms of caregivers' expectations or beliefs about the importance of parent-child interactions for child development. Despite this, *facilitadoras* are expected to offer messages about the importance of parenting practices for the child's wellbeing (PNCM, 2013). It is therefore reasonable to postulate that the intervention can affect caregivers' perception regarding their role and the importance of certain activities for child development. In fact, this effect could be one of the channels through which behavioural change is achieved.

As already mentioned, this study aimed at collecting information on caregivers' expectation of the importance of parent-child interactions for child development by means of an eight-item scale. Each item proposed a statement and the caregiver had to indicate (through a visual aid) how much does she agree or disagree with that statement. In order to ensure that caregivers shared a meaningful and concrete idea of "child development" when completing the scale, they were first asked about the ideal educational attainment and occupation they would like their child to achieve. The statements of the scale make reference to these goals and how their accomplishment relates to early childhood as a sensitive period for development, caregivers' role during this period, and caregivers' engagement in educational play activities. The specific items are presented in Appendix 2.

Results in terms of the internal consistency and validity of this instrument are mixed. On one hand, the scale exhibited low internal consistency with a Cronbach alpha estimate that ranged between 0.46 (with the full sample) and 0.5 (if we focus on caregivers with more than completed primary education -45%-, or those who have Spanish as their mother tongue -64%-).

During the pilot exercise, it was noted that caregivers had difficulties understanding the statements and the nature of the exercise (i.e. that they had to communicate an opinion regarding what was being said). These difficulties can be related to caregivers' limited verbal communication skills, as confirmed by the fact that the internal consistency of the instrument is sensitive to the educational attainment of the participant. Caregivers' mother tongue also played a role, possibly because of noise introduced when the statements were translated to the local idiom (Quechua).

After the pilot exercise, efforts were made to simplify the statements and train enumerators to better guide the process. As a result, seven out of the original eight items exhibited the

expected correlation with the rest<sup>16</sup> but, as already mentioned, overall consistency ended up being low (Cronbach alpha = 0.5), although still above the range of values that can be judged as “unacceptable” (Gliem and Gliem, 2003).

On the other hand, in terms of validity, the scores obtained from the final 7-item scale exhibit the expected positive socioeconomic gradient and, importantly, also predict the scores obtained in the quality of the home environment index. Table 5.1 in Appendix 5 documents the relation between the scores that can be obtained from the scale<sup>17</sup>, household wealth and caregiver education. We encounter a positive relation consistent with what has already been documented (at least in the developed world) for the beliefs parents hold about their role in achieving the goals they value for their children: lower-SES parents believe they have less control over the outcome and should play a more passive role (Bornstein and Putnick, 2012; Hoff et al., 2002).

Tables 5.2-5.4 in Appendix 5 present results for the partial correlation between the scores obtained in the scale and those obtained in the quality of the home environment index, its subcomponents and the variety of play activities. There is a positive and statistically significant partial correlation (after holding observable pre-treatment characteristics constant) between our measure of caregivers’ expectation of the importance of parent-child interactions for child development and caregivers’ parenting practices. Remarkably, this positive partial correlation is significant for the two subcomponents more closely related to caregivers’ actions and attitudes towards their children (“interaction and play activities” and “responsiveness and control practices”). Within the first subcomponent, partial correlation is also significant with the variety of play activities offered by the caregiver.

In Table 8 below, I present treatment effects for the two outcome measures built with the final 7-item scale. Clearly, there is no evidence of significant average treatment effects on caregivers’ expectations regarding the importance of parenting activities for child development.

An analysis by education and wealth groups, however, reveals the existence of positive and significant effects among the wealthiest caregivers (see Table 9). A comparison between treatment and control groups of the relationship between caregivers’ expectations and household wealth (see Figure 2) confirms the presence of consistently larger treatment effects in the upper part of the wealth distribution. This same pattern is not apparent if we evaluate treatment effects by caregivers’ education. These results are robust to considering the aggregate score of the scale and to restricting the sample to those caregivers who have Spanish as their mother tongue, for whom the internal consistency of the scale is larger (see tables 5.5-5.8 in Appendix 5).

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<sup>16</sup> The last item was excluded because it exhibited a negative correlation with the rest.

<sup>17</sup> These two outcome measures are: (i) an average score (with values between 1 and 4); and (ii) an aggregate score (with values between 7 and 28). It is only possible to build the aggregate score for those caregivers that answered all seven items.

**Table 8: Treatment effects on caregivers' expectations regarding the importance of parent-child interactions for child development**

	<b>Obs.</b>	<b>Mean control group</b>	<b>Mean treatment group</b>	<b>Difference</b>	<b>Controlled difference</b>	<b>d</b>
Average score (1-4)	614 (C=320; T=294)	2.951	2.995	0.044 (0.039)	0.034 (0.032)	0.097
Aggregate score (7-28)	579 (C=304; T=275)	20.776	21.076	0.300 (0.266)	0.219 (0.230)	0.089

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Controlled difference is the estimated effect including pre-treatment controls.

Effect size (d) calculated as the standardized controlled difference.

**Table 9: Treatment effects by household wealth and caregiver education quartiles on caregivers' expectations regarding the importance of parent-child interactions for child development (scale average score)**

<b>(a) Caregiver education</b>				
	First quartile (Q1)	Second quartile (Q2)	Third quartile (Q3)	Fourth quartile (Q4)
Treatment effect	0.025 (0.049)	0.126*** (0.044)	0.057 (0.057)	-0.045 (0.077)
Difference w.r.t Q1		0.101 (0.068)	0.032 (0.076)	-0.070 (0.088)
<b>(b) Household wealth</b>				
	First quartile (Q1)	Second quartile (Q2)	Third quartile (Q3)	Fourth quartile (Q4)
Treatment effect	-0.013 (0.047)	0.058 (0.051)	-0.056 (0.060)	0.144*** (0.058)
Difference w.r.t Q1		0.070 (0.060)	-0.043 (0.085)	0.157** (0.075)

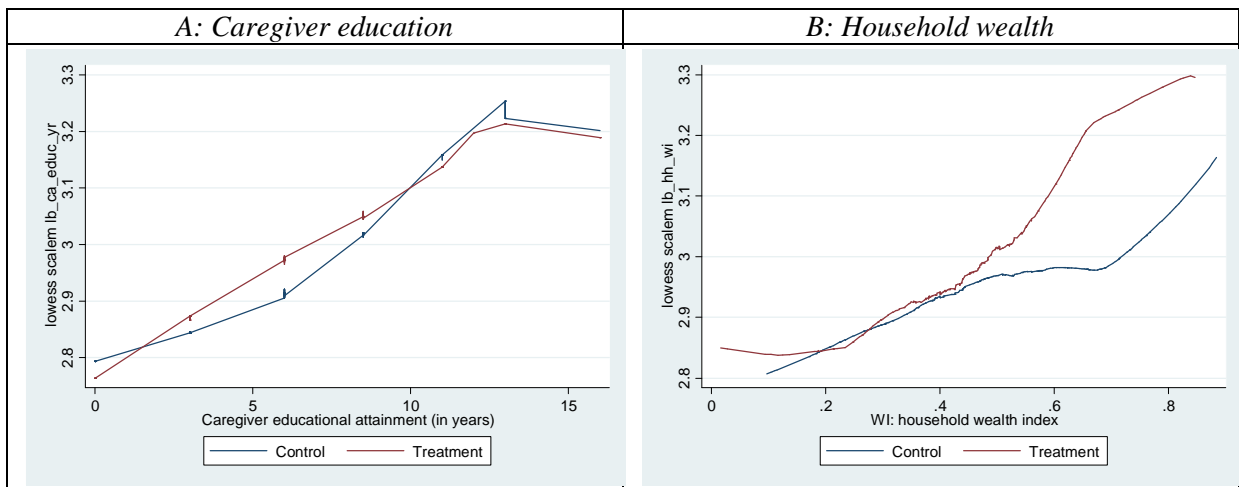
Number of observations is 614 (C = 320, T = 294).

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Treatment effects and differences estimated using an interaction between treatment status and membership to each wealth or caregiver education quartile. All regressions included pre-treatment controls.



**Figure 2: Relationship between caregivers’ expectations regarding the importance of parent-child interactions for child development (average score) and caregivers’ education and household wealth**



Graphs depict a locally weighted scatterplot smoothing of the average score obtained in the expectations scale on caregiver education (panel A) and household wealth (panel B). In each graph, results are presented for the control and treatment groups and, therefore, treatment effects are given by the vertical distance between the two functions.

## 6. Concluding remarks

Despite the explicit interest that home-visiting ECD interventions implemented in the developing world have in enabling caregivers to provide enriched interactions to their children, there is scant evidence regarding the effect of these interventions on the home environment and, especially, on caregivers’ engagement in the provision of stimulation opportunities for children. In addition, the literature tends to overlook the mechanisms behind caregivers’ behavioural change, and its strong emphasis on the transference of “parenting skills” carries the implicit assumption that caregivers’ lack of knowledge about certain activities that can be performed with their children is the major binding constraint to be confronted.

This analysis aimed at contributing to the ECD literature by providing causal evidence about the effects of a scaled-up home-visiting intervention on parental behaviour, and by exploring the constraints limiting this behavioural change. For this, three research questions were proposed: (i) can a home-visiting ECD intervention working at scale deliver an improvement in the quality of the home environment?; (ii) can a home-visiting ECD intervention working at scale change parental behaviour so as to increase the amount of stimulation offered to the child by the caregiver; and (iii) what constraints faced by caregivers limit the effect of this intervention on caregiver engagement in educational play activities with the child?

The answers to the first two research questions follow directly from the average treatment effects found in the analysis. In particular, estimated treatment effects of the *Cuna Mas* home-visiting programme on the quality of the home environment are positive, statistically significant ( $p < 0.01$ ) and have a size ( $d = 0.5$ ) comparable to that found for other interventions of much more smaller scale and efficacy trials conducted in the developing

world (Attanasio et al., 2013; Bentley et al., 2010; Grantham-McGregor et al., 1991; Powell et al., 2004; Walker et al., 2004).

Treatment effects on caregiver behaviour related to the provision of stimulation opportunities for the child are also positive and statistically significant. In fact, it was possible to identify an increase in the variety of play activities offered to the child by the caregiver, in addition to those occurring during home visits ( $d = 0.3$ ;  $p < 0.01$ ).

If we address the third research question, results presented in this analysis indicate that constraints limiting the effect of this intervention appear to be related to household wealth but not to caregivers' educational attainment. Household wealth has a significant role in determining the size of treatment effects on both caregivers' participation in play activities and caregivers' expectation regarding the importance of parent-child interactions for child development. In particular, low levels of wealth can render the intervention ineffective in changing these behaviours and expectations, while the effect on caregivers' participation in play activities exhibits a positive wealth gradient for most of the support of the wealth distribution.

Combined with the fact that there is no wealth gradient in the number of visits provided or the expansion in play material<sup>18</sup>, these results suggest that, over and above "parenting skills", caregivers are required to input other resources which poorer parents are finding more difficult to give up. A plausible candidate for this additional resource is time.

It has been documented that the amount of time that parents devote to their children influences their development (Fiorini and Keane, 2012), so parental time allocation decisions and parenting practices relevant for child development appear to be related. It is also well documented that the amount of time that parents devote to their children increases with families' socioeconomic status (Guryan et al., 2008), so family resources seem to matter for parental time allocation decisions.

The fact that poorer caregivers face larger "time constraints" can be related to either a larger opportunity cost of childcare time (as they have to forgo consumption of other goods which is already relatively small)<sup>19</sup> or to a smaller expected return from allocating additional time to childcare duties. In this regard, a positive wealth gradient in caregivers' expectation regarding the importance of parent-child interactions for child development is one of the results documented by this analysis. Moreover, the fact that an expansion in these expectations was not observed in the lower part of the wealth distribution is consistent with the "time constraints" hypothesis proposed to explain why behavioural change is not occurring among the poorest caregivers.

A time allocation model would surely help in formalising this discussion and is left for future research. On the empirical front, information on time-use patterns (including childcare time) would be useful to assess the effects of home-visiting interventions on caregivers' time

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<sup>18</sup> The number of visits provided is fairly constant across the entire wealth distribution and, therefore, always close to the sample mean which is 25. The average effect on the number of types of play material is close to 1 and is also stable across the wealth distribution. There is, therefore, no evidence to suggest that the positive wealth gradient in treatment effects is due to heterogeneity in the treatment received.

<sup>19</sup> Larger utility losses are related to lower consumption levels if there is a diminishing marginal utility in consumption.

allocation decisions and provide more empirical support to the “time constraints” hypothesis outlined above.

Further research devoted to understanding these constraints is important because of its potential policy implications. This analysis has presented evidence that suggests that incentives for caregivers’ behavioural change will fall as deprivation increases, and that the design of appropriate curricula, materials and activities for a successful transference of “parenting skills” to caregivers will not necessarily suffice to produce a shift in the provision of stimulation opportunities for children. If the “time constraints” hypothesis holds, these results might call for an explicit emphasis on changing caregivers’ expectations as part of the objectives of these interventions, or for the inclusion of an incentive mechanism offering an expansion in present consumption opportunities.

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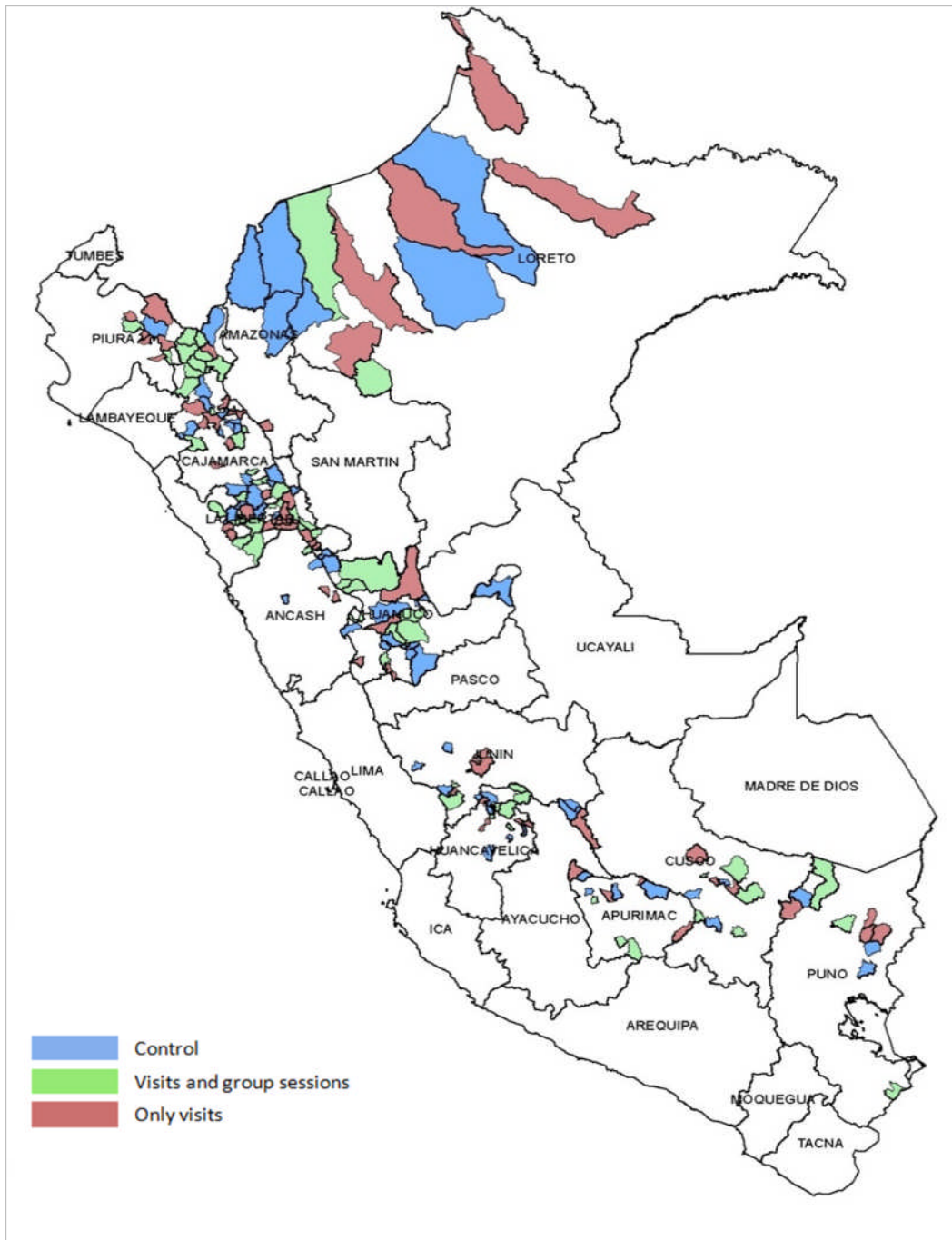
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**Appendix 1: Geographical distribution of the districts involved in the evaluation**

*Figure 1.1 Districts selected for the evaluation exercise of the rural component of programme Cuna Mas*



*Table 1.1 Districts and regions in the final sample*

	Control group			Treatment group		
	Region	Province	District	Region	Province	District
1	Apurimac	Andahuaylas	Santa Maria de Chicmo	Apurimac	Antabamba	Juan Espinoza Medrano
2	Cajamarca	Cajabamba	Cachachi	Apurimac	Aymaraes	Caraybamba
3	Cajamarca	Cajamarca	Cospan	Cajamarca	Cutervo	Santo Domingo de la Capilla
4	Cajamarca	Cajamarca	Jesús	Cajamarca	Hualgayoc	Bambamarca
5	Cajamarca	Jaen	Colasay	Cajamarca	Jaen	Chontali
6	Cajamarca	San Ignacio	San Jose de Lourdes	Cajamarca	Jaen	San Jose Del Alto
7	Cusco	Paucartambo	Huancarani	Cajamarca	San Ignacio	La Coipa
8	Huancavelica	Acobamba	Anta	Cajamarca	Santa Cruz	Catache
9	Huancavelica	Huancavelica	Huachocolpa	Cusco	Canas	Yanaoca
10	Huancavelica	Tayacaja	Acraquia	Cusco	Chumbivilcas	Capacmarca
11	Huanuco	Huamalies	Monzón	Cusco	Paucartambo	Paucartambo
12	Huanuco	Huánuco	Santa Maria del Valle	Huanuco	Huacaybamba	Huacaybamba
13	Huanuco	Leoncio Prado	Hermilio Valdizan	Huanuco	Huacaybamba	Pinra
14	Huanuco	Pachitea	Umari	Huanuco	Huamalies	Miraflores
15	Junin	Huancayo	Pucara	Huanuco	Leoncio Prado	Mariano Damaso Beraun
16	Junin	Tarma	Tapo	Junin	Chupaca	Yanacancha
17	Junin	Yauli	Huay-huay	Junin	Concepcion	Chambara
18	La Libertad	Sánchez Carrion	Sanagoran	La Libertad	Santiago De Chuco	Quiruvilca
19	Puno	Carabaya	Ollachea	Piura	Huancabamba	Sondorillo
20	Puno	San Antonio De Putina	Quilcapuncu	Puno	Carabaya	Usicayos



**Appendix 2: Quality of home environment, household, caregiver and child characteristics in the districts considered for the evaluation**

	Control (a)	Treatment (b)	Diff. (a) – (b)	Treatment Included (c)	Treatment Excluded (d)	Diff. (c) – (d)	Diff. (a) – (c)	Diff. (a) – (d)
Quality of home environment index (0-1)	0.583	0.595	-0.012 (0.012)	0.608	0.585	0.022 (0.019)	-0.024 (0.015)	-0.002 (0.014)
Household wealth index (0-1)	0.442	0.443	-0.001 (0.019)	0.459	0.432	0.027 (0.026)	-0.017 (0.024)	0.01 (0.023)
Household members	5.495	5.384	0.111 (0.1)	5.406	5.368	0.039 (0.153)	0.089 (0.125)	0.127 (0.11)
Caregiver's age	28.365	28.144	0.221 (0.31)	28.118	28.163	-0.045 (0.386)	0.247 (0.421)	0.202 (0.367)
Caregiver's educational attainment (years)	6.250	6.636	-0.386 (0.33)	6.989	6.376	0.613 (0.479)	-0.739* (0.408)	-0.126 (0.377)
Caregiver is married (yes = 1)	0.253	0.221	0.031 (0.03)	0.214	0.227	-0.013 (0.039)	0.039 (0.038)	0.026 (0.037)
Caregiver worked outside household last week (yes = 1)	0.635	0.689	-0.054 (0.042)	0.757	0.639	0.118** (0.053)	-0.121** (0.052)	-0.004 (0.05)
Number of children under caregiver's care	1.023	1.031	-0.007 (0.006)	1.036	1.027	0.009 (0.008)	-0.012* (0.007)	-0.003 (0.006)
Caregiver's first language is Spanish (yes = 1)	0.584	0.639	-0.055 (0.081)	0.592	0.673	-0.081 (0.115)	-0.008 (0.104)	-0.089 (0.093)
Caregiver is the mother (yes = 1)	0.970	0.979	-0.009 (0.007)	0.983	0.975	0.008 (0.008)	-0.014 (0.009)	-0.006 (0.009)
Child's age (months)	12.738	13.011	-0.273 (0.275)	13.280	12.814	0.467 (0.358)	-0.542 (0.363)	-0.076 (0.32)
Child is male (yes = 1)	0.490	0.511	-0.021 (0.021)	0.506	0.515	-0.008 (0.031)	-0.016 (0.027)	-0.025 (0.023)
Number of observations	46	52	--	22	30	--	--	--

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Appendix 3: Survey questionnaire and characterization of the quality of the home environment

### Survey questionnaire

<b>A Parenting practices</b>		
<b>&gt; Let us talk about the activities you carry out with (NAME)</b>		
<b>1. Responsive breastfeeding and feeding</b>		
501	Enumerator, indicate: ¿Is the child 6 months old or more?	1 Yes >> skip to question 510 2 No >> continue with question 502
502	Are you currently breastfeeding or bottle-feeding (NAME)?	1 Yes, breastfeeding >> continue with question 503 2 Yes, bottle-feeding >> continue with question 503 3 No >> skip to question 513
503	What do you do with (NAME) while you breastfeed him/her? Enumerator > do not read the options, mark all that apply	1 Looks at the child 2 Talks to the child, sings or reads to him/her 3 Cares child 4 Other (specify) _____ 5 Does nothing with child
504	Do you perform any other activity (housework, for example) while you breastfeed (NAME)?	1 Yes, while breastfeeding the child, she also... Specify _____ 2 No, no other activity, she only breastfeeds the child
505	Between yesterday afternoon and today's morning, has (NAME) had any liquid or food other than breast milk?	1 Yes Specify _____ >> skip to section 2: Interaction with child 2 No >> skip to section 2: Interaction with child
510	Are you currently breastfeeding or bottle-feeding (NAME)?	1 Yes, breastfeeding >> continue with question 511 2 Yes, bottle-feeding >> continue with question 511 3 No >> skip to question 513
511	What do you do with (NAME) while you breastfeed him/her? Enumerator > do not read the options, mark all that apply	1 Looks at the child 2 Talks to the child, sings or reads to him/her 3 Cares child 4 Other (specify) _____ 5 Does nothing with child
512	Do you carry out any other activity (housework, for example) while you breastfeed (NAME)?	1 Yes, while breastfeeding the child, she also... Specify _____ 2 No, no other activity
513	Is (NAME) currently eating any solid foods?	1 Yes >> continue with question 514 2 No >> skip to section 2: Interaction with child
514	Who does usually feed (NAME)?	1 Primary caregiver 2 Activity is not carried out by primary caregiver > indicate code _____ 2. (NAME)'s mother; 3. (NAME)'s father; 4. (NAME)'s brothers or sisters; 5. (NAME)'s grandparents; 6. Other 3 The child eats by him/herself
515	What do you do with (NAME) while he/she eats? Enumerator > do not read the options, mark all that apply	1 Talks to the child 2 Plays or sings with child 3 Encourages child to participate in the activity, teaches child how to use a spoon or fork 4 Allows child to participate in the activity, allows him/her to use a spoon or fork 5 Other (specify) _____ 6 Does nothing with child
516	Do you carry out any other activity (housework, for example) while (NAME) eats?	1 Yes, while the child eats, she... Specify _____ 2 No, no other activity

517	Usually, (NAME) eats: Enumerator, choose all the answers that apply	1	Breakfast					
		2	Mid-morning snack					
		3	Lunch					
		4	Mid-afternoon snack					
		5	Dinner					
		6	Other (specify) _____					
<b>2. Interaction with child</b>								
				<b>Yes</b>	<b>No</b>	<b>With whom?</b>	<b>Anyone else?</b>	<b>No. of days</b>
520	During the last 7 days, has anyone shared with (NAME) the following activities? Enumerator, consider the following codes to identify the person > 1. Primary caregiver <i>If it is someone different than the primary caregiver, use the following codes &gt;</i> 2. (NAME)'s mother 3. (NAME)'s father 4. (NAME)'s brothers or sisters 5. (NAME)'s grandparents 6. Other	1	Read books, look at pictures from a book with (NAME)	1	2			
		2	Told stories to (NAME)	1	2			
		3	Sang songs to or with (NAME), including lullabies	1	2			
		4	Took (NAME) outside the house	1	2			
		5	Played with (NAME) with his/her toys	1	2			
		6	Drew, painted or scribbled with (NAME)	1	2			
		7	Played with (NAME) to name objects, colours or numbers	1	2			
521	What do you do with (NAME) while he/she plays? Enumerator > do not read the options, mark all that apply	1	Talks to the child					
		2	Encourages child to participate in play					
		3	Allows child to play freely					
		4	Introduces challenging situations during play					
		5	Other (specify) _____					
		6	Does nothing with child					
522	Would you like to spend more time reading books, singing or playing with (NAME)?	1	Yes					
		2	No >> skip to question 524					
523	Why can't you spend more time reading books, singing or playing with (NAME)? Enumerator > do not read the options, mark all that apply	1	I have other things to do / I am busy / I need to work					
		2	The child plays with his/her brothers and sisters					
		3	The child gets tired, falls asleep					
		4	I would not know how to play with him/her					
		5	Other (specify) _____					
524	Who does usually bath (NAME)?	1	Primary caregiver					
		2	Activity is not carried out by primary caregiver > indicate code _____ 2. (NAME)'s mother; 3. (NAME)'s father; 4. (NAME)'s brothers or sisters; 5. (NAME)'s grandparents; 6. Other					
		3	The child washes him/herself					
525	What do you do with (NAME) during his/her bath? Enumerator > do not read the options, mark all that apply	1	Talks to the child					
		2	Plays or sings with child					
		3	Encourages child to participate in the activity, teaches child how to wash him/herself					
		4	Allows child to participate in the activity, allows him/her to wash him/herself					
		5	Other (specify) _____					
		6	Does nothing with child					
526	Do you carry out any other activity (housework, for example) during (NAME)'s bath?	1	Yes Specify _____					
		2	No, no other activity					
527	Who does usually change (NAME)'s clothes?	1	Primary caregiver					
		2	Activity is not carried out by primary caregiver > indicate code _____ 2. (NAME)'s mother; 3. (NAME)'s father; 4. (NAME)'s brothers or sisters; 5. (NAME)'s grandparents; 6. Other					
		3	The child changes his/her own clothes					

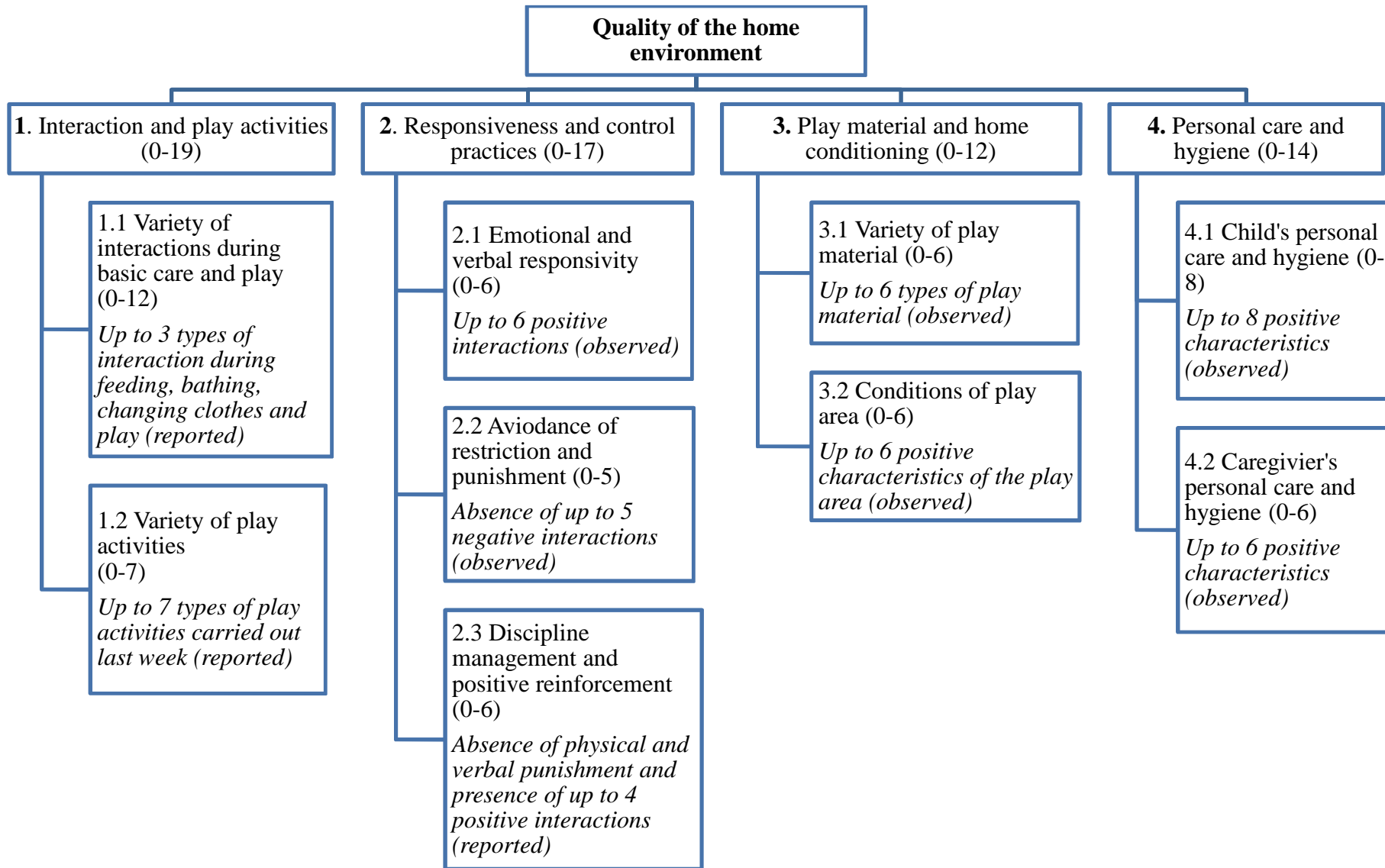
528	What do you do with (NAME) while changing his/her clothes? Enumerator > do not read the options, mark all that apply	1	Talks to the child
		2	Plays or sings with child
		3	Encourages child to participate in the activity, teaches child how to change his/her clothes
		4	Allows child to participate in the activity; allows him/her to change his/her clothes
		5	Other (specify) _____
		6	Does nothing with child
529	Do you carry out any other activity (housework, for example) while (NAME) eats?	1	Yes Specify _____
		2	No, no other activity
<b>3. Home conditioning</b>			
<b>&gt; I would like to know more about the places of the house and objects that (NAME) uses</b>			
530	Could you show me the place where (NAME) usually plays?	1	Yes
		2	No >> skip to question 532
531	Enumerator: observe and choose all characteristics that apply	1	The place is clean (not littered)
		2	It is well illuminated
		3	It is well ventilated
		4	Has a blanket or similar to prevent direct contact with the floor
		5	It is not near fire, objects that might injure the child, stairways, or the road
		6	None of the above
532	Could you show me the toys or objects that (NAME) usually uses to play?	1	Yes
		2	No >> skip to question 534
		3	Has no toys / uses no toys >> skip to question 536
533	Enumerator: observe and choose all types of toys that are present	1	Children books
		2	Materials to draw or paint
		3	Cuddly or role playing toys
		4	Push or pull toys
		5	Building blocks or puzzles
		6	Toys to play music
		7	None of the above
534	Could you show me the place where (NAME)'s toys are stored	1	Yes
		2	No >> skip to question 536
535	Enumerator: observe and choose all characteristics that apply	1	Has a box, bag or similar to store the toys
		2	Has no specific place, toys are around the house
536	Could you show me the place where you usually eat?	1	Yes
		2	No >> skip to question 538
537	Enumerator, observe: is it a place where the family can share a meal?	1	Yes
		2	No
538a	Could you show me the place where you usually wash or clean yourselves?	1	Yes
		2	No >> skip to the next section (question 540)
539a	Enumerator: observe and choose all characteristics that apply Do they have a water tap or bucket with clean water?	1	Yes
		2	No
538b	Could you show me the utensils you use for personal hygiene?	1	Yes
		2	No >> skip to the next section (question 540)
539b	Enumerator: observe and choose all characteristics that apply	1	They have a soap and a soapdish (an element that prevents contact of soap with dirt)
		2	They have a towel or cloth
		3	None of the above

4. Supervision and discipline management		
540	Sometimes, adults taking care of children have to leave the house to go shopping, wash clothes, etc. and have to leave the children. During the last 7 days...	¿How many times was (NAME) left at home without you for more than 1 hour? _____ If the answer is 0 times >> skip to question 542
541	¿Who does usually stay in charge of (NAME) in these cases?	1 Nobody / he/she stays alone
		2 He stays with > indicate code _____ 2. (NAME)'s mother; 3. (NAME)'s father; 4. (NAME)'s brothers or sisters; 5. (NAME)'s grandparents; 6. Other
542	Sometimes children misbehave and parents have different ways of managing discipline. During the last 7 days, when (NAME) misbehaved, how did you disciplined him/her? Enumerator > do not read the options, mark all that apply	1 Slapped, pinched child or used "chicote"
		2 Shouted at child
		3 Threatened child
		4 Child was left alone until he/she stopped crying
		5 Talked to child
		6 Other (specify) _____
		7 Did nothing
543	During the last 7 days, when (NAME) was well-behaved or did something you asked, what did you do? Enumerator > do not read the options, mark all that apply	1 Gave him/her a reward
		2 Hugged, cuddled him/her
		3 Praised him/her verbally, applauded him/her
		4 Did nothing
		5 Other (specify) _____
B Expectations regarding child development		
> Let us now talk about the future of (NAME)		
550	What job would you like (NAME) to do in the future?	Specify: _____
	Which educational attainment would you like (NAME) to achieve?	Primary <input type="checkbox"/> 1    Second. <input type="checkbox"/> 2    Higher <input type="checkbox"/> 3
551	Let us now think about the path that (NAME) needs to follow in order to achieve these goals. How much do you agree or disagree with the following statements?	1 Now that (NAME) is a small child is an important stage if he/she is to achieve (...) education and become (...)
		2 It does not depend on you that (NAME) achieves (...) education and becomes (...)
		3 (NAME) will start learning only after he/she enrolls in school
		4 If you spend more time playing with (NAME), you will help him/her to achieve (...) education and become (...)
		5 You are more important than school teachers for (NAME) to be able to achieve (...) education and become (...)
		6 Now that (NAME) is a small child it is better if he/she learns on his/her own
		7 It is useless to tell stories to (NAME) because he/she does not understand them
		8 Now that (NAME) is a small child he only needs to be clean and well fed

**C Interactions during the interview, physical appearance and hygiene**

560	Was it possible to observe the interaction between the caregiver and the child during the interview?	1	Yes			
		2	No >> state the reason _____ >> skip to question 562			
					<b>Yes</b>	<b>No</b>
561	Enumerator: choose yes/no according to what you observed regarding the interaction of the caregiver and his/her partner with the child during the interview	1	Gave toys or appropriate activities to the child	1	2	
		2	Child was kept under their supervision	1	2	
		3	They spontaneously vocalized to child at least twice	1	2	
		4	They responded verbally to child's verbalizations at least once	1	2	
		5	They told the child the name of an object or person at least once	1	2	
		6	They spontaneously praised child at least twice	1	2	
		7	Their voice conveyed positive feelings towards child	1	2	
		8	They caressed/kissed/hugged child at least once	1	2	
		9	They did not shout to child	1	2	
		10	They did not express annoyance or hostility to child	1	2	
		11	They did not slap or spank child	1	2	
		12	They did not scold or criticize child	1	2	
		13	They did not interfere or restrict child more than three times	1	2	
562	Enumerator: choose yes/no according to what you observed regarding the physical appearance and hygiene of the caregiver during the interview	1	His/her face is extremely dirty	1	2	
		2	His/her hair is extremely dirty	1	2	
		3	His/her hands are dirty	1	2	
		4	His/her clothes are extremely dirty	1	2	
		5	Has open wounds	1	2	
563	Was it possible to observe the physical appearance and hygiene of the child during the interview?	1	Yes			
		2	No >> state reason _____ >> finish questionnaire			
					<b>Yes</b>	<b>No</b>
564	Enumerator: choose yes/no according to what you observed regarding the physical appearance and hygiene of the child during the interview	1	His/her face is extremely dirty	1	2	
		2	His/her hair is extremely dirty	1	2	
		3	His/her hands are dirty	1	2	
		4	His/her clothes are extremely dirty	1	2	
		5	Has appropriate clothes for the weather	1	2	
		6	Nappies (if any) have not been changed for a long time	1	2	
		7	Has open wounds	1	2	

Figure 3.1: Characterization of the quality of the home environment



#### Appendix 4: Complete regression results for treatment effects on the quality of the home environment

	Aggregate index		Index components			
	All components (1)	Complete information (2)	Play activities (3)	Responsiveness (4)	Play material (5)	Care and hygiene (6)
Treatment	0.059*** (0.013)	0.057*** (0.014)	0.068*** (0.013)	0.062*** (0.021)	0.098*** (0.023)	0.010 (0.011)
Baseline index	0.244*** (0.048)	0.235*** (0.039)	0.195*** (0.035)	0.062 (0.043)	0.102** (0.047)	0.114*** (0.029)
Household wealth index (0-1)	0.140*** (0.039)	0.080* (0.042)	0.080 (0.049)	0.057 (0.047)	0.256*** (0.078)	0.140*** (0.035)
Household members	0.001 (0.002)	-0.000 (0.003)	-0.004 (0.004)	0.001 (0.003)	0.006 (0.004)	-0.000 (0.001)
Caregiver's age	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Caregiver's educ. attainment (years)	0.004*** (0.001)	0.003 (0.002)	0.009*** (0.002)	0.003 (0.002)	0.008*** (0.003)	0.002 (0.001)
Caregiver is married (yes = 1)	0.003 (0.013)	0.004 (0.013)	0.004 (0.015)	-0.008 (0.020)	0.030 (0.021)	0.020* (0.010)
Hours worked last week by caregiver	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Number of children under caregiver's care	-0.040* (0.020)	-0.034* (0.019)	-0.048* (0.028)	-0.022 (0.028)	-0.096** (0.044)	-0.020 (0.021)
Caregiver first language is Spanish (yes = 1)	0.002 (0.013)	0.012 (0.014)	0.029* (0.015)	-0.017 (0.018)	0.001 (0.024)	0.023* (0.012)
Caregiver is the mother (yes = 1)	-0.038 (0.032)	-0.044** (0.021)	-0.054 (0.039)	0.029 (0.046)	-0.095** (0.045)	-0.043*** (0.012)
Child's age (months)	-0.001* (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.002)	0.001** (0.001)
Child is male (yes = 1)	0.000 (0.008)	0.011 (0.009)	-0.004 (0.015)	0.018* (0.010)	-0.006 (0.014)	0.012 (0.008)
Constant	0.483*** (0.055)	0.482*** (0.046)	0.338*** (0.072)	0.559*** (0.083)	0.491*** (0.081)	0.796*** (0.059)
Observations	486	614	614	548	537	558
R-squared	0.294	0.186	0.196	0.073	0.204	0.171

Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



**Appendix 5: Results related to caregivers' expectation of the importance of parent-child interactions for child development**

*Table 5.1: Socioeconomic gradients  
(by caregiver education and household wealth quartiles)*

<b>(a) Caregiver education</b>	Q1	Q2	Q3	Q4
Caregiver expectations regarding importance of parent child interactions (average score: 1-4)	2.835	2.95	3.004	3.164
Difference w.r.t Q1		0.115***	0.169***	0.329***
Caregiver expectations regarding importance of parent child interactions (total score: 7-28)	20.021	20.715	21.016	22.164
Difference w.r.t Q1		0.694***	0.885***	2.143***

<b>(b) Household wealth</b>	Q1	Q2	Q3	Q4
Caregiver expectations regarding importance of parent child interactions (average score: 1-4)	2.874	2.976	2.979	3.06
Difference w.r.t Q1		0.102**	0.105**	0.186***
Caregiver expectations regarding importance of parent child interactions (total score: 7-28)	20.295	20.924	20.973	21.443
Difference w.r.t Q1		0.629**	0.678**	1.148***

. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

*Table 5.2: Caregivers' expectations' partial correlation with the quality of the home environment (scale average score)*

	Aggregate index		Index components			
	All components (1)	Complete information (2)	Play activities (3)	Responsiveness (4)	Play material (5)	Care and hygiene (6)
Treatment	0.057*** (0.013)	0.055*** (0.013)	0.065*** (0.013)	0.060*** (0.021)	0.097*** (0.023)	0.009 (0.011)
Baseline index	0.235*** (0.049)	0.222*** (0.040)	0.175*** (0.032)	0.055 (0.043)	0.103** (0.047)	0.112*** (0.030)
Household wealth index (0-1)	0.132*** (0.037)	0.074* (0.039)	0.071 (0.045)	0.046 (0.043)	0.253*** (0.077)	0.138*** (0.035)
Household members	0.001 (0.002)	-0.000 (0.002)	-0.005 (0.004)	0.000 (0.003)	0.006 (0.004)	-0.000 (0.001)
Caregiver's age	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Caregiver's educ. attainment (years)	0.003** (0.001)	0.002 (0.002)	0.006*** (0.002)	0.001 (0.002)	0.008** (0.003)	0.001 (0.001)
Caregiver is married (yes = 1)	-0.000 (0.013)	0.001 (0.013)	-0.002 (0.015)	-0.013 (0.020)	0.029 (0.021)	0.019* (0.010)
Hours worked last week by caregiver	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Number of children under caregiver's care	-0.041** (0.019)	-0.034* (0.018)	-0.049 (0.029)	-0.022 (0.025)	-0.096** (0.043)	-0.019 (0.021)
Caregiver first language is Spanish (yes = 1)	-0.001 (0.013)	0.008 (0.014)	0.022 (0.015)	-0.022 (0.018)	-0.001 (0.024)	0.021* (0.012)
Caregiver is the mother (yes = 1)	-0.035 (0.032)	-0.043** (0.019)	-0.053 (0.036)	0.028 (0.045)	-0.094** (0.045)	-0.043*** (0.012)
Child's age (months)	-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.002)	0.001** (0.001)
Child is male (yes = 1)	-0.000 (0.007)	0.010 (0.009)	-0.004 (0.014)	0.017* (0.010)	-0.006 (0.014)	0.012 (0.008)
<b>Scale average score</b>	<b>0.043*** (0.012)</b>	<b>0.053*** (0.018)</b>	<b>0.089*** (0.018)</b>	<b>0.067*** (0.020)</b>	<b>0.021 (0.020)</b>	<b>0.016 (0.010)</b>
Constant	0.377*** (0.066)	0.352*** (0.058)	0.115 (0.092)	0.397*** (0.099)	0.436*** (0.098)	0.756*** (0.060)
Observations	486	614	614	548	537	558
R-squared	0.309	0.205	0.222	0.094	0.206	0.174

Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

*Table 5.3: Caregivers' expectations' partial correlation with the quality of the home environment (scale aggregate score)*

	Aggregate index		Index components			
	All components (1)	Complete information (2)	Play activities (3)	Responsiveness (4)	Play material (5)	Care and hygiene (6)
Treatment	0.057*** (0.013)	0.055*** (0.014)	0.067*** (0.014)	0.059*** (0.021)	0.098*** (0.023)	0.011 (0.010)
Baseline index	0.235*** (0.052)	0.224*** (0.042)	0.181*** (0.033)	0.035 (0.045)	0.104** (0.046)	0.115*** (0.034)
Household wealth index (0-1)	0.141*** (0.039)	0.080* (0.041)	0.080* (0.046)	0.056 (0.046)	0.261*** (0.081)	0.141*** (0.039)
Household members	0.002 (0.003)	0.001 (0.003)	-0.004 (0.004)	0.002 (0.003)	0.007 (0.004)	-0.000 (0.001)
Caregiver's age	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.002 (0.001)	-0.001 (0.001)
Caregiver's educ. attainment (years)	0.004*** (0.001)	0.002 (0.002)	0.006*** (0.002)	0.002 (0.002)	0.009*** (0.003)	0.001 (0.001)
Caregiver is married (yes = 1)	-0.000 (0.014)	0.002 (0.014)	-0.003 (0.016)	-0.011 (0.021)	0.030 (0.022)	0.019* (0.011)
Hours worked last week by caregiver	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Number of children under caregiver's care	-0.039** (0.019)	-0.032* (0.018)	-0.047 (0.030)	-0.019 (0.025)	-0.093** (0.043)	-0.021 (0.021)
Caregiver first language is Spanish (yes = 1)	0.002 (0.013)	0.010 (0.015)	0.026 (0.016)	-0.018 (0.018)	0.007 (0.025)	0.019 (0.012)
Caregiver is the mother (yes = 1)	-0.036 (0.033)	-0.043** (0.019)	-0.054 (0.037)	0.029 (0.044)	-0.103** (0.048)	-0.042*** (0.012)
Child's age (months)	-0.001* (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.003 (0.002)	0.001*** (0.001)
Child is male (yes = 1)	0.003 (0.009)	0.013 (0.010)	0.001 (0.016)	0.021* (0.011)	-0.002 (0.016)	0.010 (0.008)
<b>Scale aggregate score</b>	<b>0.007*** (0.002)</b>	<b>0.008*** (0.003)</b>	<b>0.014*** (0.003)</b>	<b>0.011*** (0.003)</b>	<b>0.004 (0.003)</b>	<b>0.002 (0.002)</b>
Constant	0.351*** (0.071)	0.328*** (0.060)	0.084 (0.094)	0.366*** (0.101)	0.409*** (0.098)	0.783*** (0.062)
Observations	458	579	579	518	504	528
R-squared	0.324	0.210	0.227	0.102	0.226	0.167

Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

*Table 5.4: Caregivers' expectations' partial correlation with the variety of play activities offered by the caregiver*

Variety of play activities offered by caregiver	(1)	(2)
Treatment	0.509*** (0.144)	0.527*** (0.141)
Household wealth index (0-1)	1.034*** (0.340)	0.976*** (0.318)
Household members	-0.086*** (0.031)	-0.093*** (0.029)
Caregiver's age	-0.025*** (0.008)	-0.022*** (0.008)
Caregiver's educ. attainment (years)	0.099*** (0.019)	0.099*** (0.018)
Caregiver is married (yes = 1)	-0.192 (0.120)	-0.202* (0.120)
Hours worked last week by caregiver	0.003 (0.003)	0.003 (0.003)
Number of children under caregiver's care	-0.343 (0.285)	-0.364 (0.281)
Caregiver first language is Spanish (yes = 1)	0.089 (0.139)	0.042 (0.141)
Caregiver is the mother (yes = 1)	-0.509 (0.335)	-0.484 (0.343)
Child's age (months)	-0.019* (0.011)	-0.018 (0.011)
Child is male (yes = 1)	0.099 (0.123)	0.053 (0.109)
Baseline score	0.243*** (0.037)	0.238*** (0.036)
<b>Scale aggregate score</b>	<b>0.053** (0.025)</b>	
<b>Scale average score</b>		<b>0.297* (0.170)</b>
Constant	1.073 (0.792)	1.375* (0.805)
Observations	579	614
R-squared	0.290	0.287

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 5.5: Treatment effects by household wealth and caregiver education quartiles on caregivers' expectations regarding the importance of parent-child interactions for child development (scale aggregate score)**

<b>(a) Caregiver education</b>				
	First quartile (Q1)	Second quartile (Q2)	Third quartile (Q3)	Fourth quartile (Q4)
Treatment effect	0.173 (0.349)	0.924*** (0.319)	0.314 (0.400)	-0.353 (0.539)
Difference w.r.t Q1		0.751 (0.486)	0.141 (0.516)	-0.525 (0.617)
<b>(b) Household wealth</b>				
	First quartile (Q1)	Second quartile (Q2)	Third quartile (Q3)	Fourth quartile (Q4)
Treatment effect	-0.313 (0.365)	0.483 (0.361)	-0.382 (0.429)	1.039** (0.399)
Difference w.r.t Q1		0.796* (0.438)	-0.069 (0.614)	1.353** (0.551)

Number of observations is 579 (C = 304, T = 275).

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Treatment effects and differences estimated using an interaction between treatment status and membership to each wealth or caregiver education quartile. All regressions included pre-treatment controls.

**Table 5.6: Treatment effects on caregivers' expectation of the importance of parent-child interactions for child development (caregivers with Spanish as mother tongue)**

	Obs.	Mean control group	Mean treatment group	Difference	Controlled difference	d
Average score (1-4)	393 (C=208; T=185)	2.984	3.040	0.056 (0.055)	0.046 (0.046)	0.122
Aggregate score (7-28)	379 (C=199; T=180)	20.965	21.3167	0.352 (0.375)	0.276 (0.331)	0.104

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Controlled difference is the estimated effect including pre-treatment controls.

Effect size (d) calculated as the standardized controlled difference.

**Table 5.7: Treatment effects by household wealth and caregiver education quartiles on caregivers' expectations regarding the importance of parent-child interactions for child development (scale average score; caregivers with Spanish as mother tongue)**

<b>(a) Caregiver education</b>				
	First quartile (Q1)	Second quartile (Q2)	Third quartile (Q3)	Fourth quartile (Q4)
Treatment effect	0.007 (0.069)	0.177*** (0.058)	0.088 (0.072)	-0.053 (0.089)
Difference w.r.t Q1		0.170* (0.092)	0.081 (0.097)	-0.060 (0.098)
<b>(b) Household wealth</b>				
	First quartile (Q1)	Second quartile (Q2)	Third quartile (Q3)	Fourth quartile (Q4)
Treatment effect	-0.039 (0.058)	0.057 (0.072)	0.005 (0.105)	0.145** (0.066)
Difference w.r.t Q1		0.095 (0.081)	0.043 (0.124)	0.184* (0.091)

Number of observations is 393 (C = 208, T = 185).

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Treatment effects and differences estimated using an interaction between treatment status and membership to each wealth or caregiver education quartile. All regressions included pre-treatment controls.

**Table 5.8: Treatment effects by household wealth and caregiver education quartiles on caregivers' expectations regarding the importance of parent-child interactions for child development (scale aggregate score; caregivers with Spanish as mother tongue)**

<b>(a) Caregiver education</b>				
	First quartile (Q1)	Second quartile (Q2)	Third quartile (Q3)	Fourth quartile (Q4)
Treatment effect	0.042 (0.501)	1.175*** (0.411)	0.515 (0.518)	-0.416 (0.629)
Difference w.r.t Q1		1.133 (0.674)	0.473 (0.690)	-0.458 (0.702)
<b>(b) Household wealth</b>				
	First quartile (Q1)	Second quartile (Q2)	Third quartile (Q3)	Fourth quartile (Q4)
Treatment effect	-0.3996039 (0.425)	0.399 (0.521)	-0.077 (0.754)	1.012** (0.471)
Difference w.r.t Q1		0.799 (0.595)	0.322 (0.888)	1.412** (0.652)

Number of observations is 379 (C = 199, T = 180).

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Treatment effects and differences estimated using an interaction between treatment status and membership to each wealth or caregiver education quartile. All regressions included pre-treatment controls.