"The Impact of a Technical Training Program for Childcare Providers on Children's Well-being"

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Abstract

Hogares Comunitarios is the most important early childhood program in Colombia for the poorest. The program provides childcare for around 12 children at the home of one of the mothers in the community and contains an important nutritional component. In 2007, an evaluation of the program that assessed around 28,000 children including participants and eligible non-participants, indicated that there were severe flaws in the quality of care provided which significantly decreased the potential positive effects of the program. In particular, it revealed that care providers (*madres comunitarias*) had, on average, low education levels and were not appropriately trained for childcare. As a result, a program that consists of a technical-professional degree in child development and care for *madres comunitarias* was implemented. In this paper, we assess the effects of this program on the quality of care offered at *hogares comunitarios* and the effects on participant children's nutritional and health status, cognitive and non-cognitive development. The evaluation takes advantage of the geographic gradual expansion of the program to construct a sort of rotational random experiment. The results indicate that (1) the quality of care significantly increased, (2) the pedagogical process has improved, in particular, productive activities with children and use of pedagogical resources, and (3) interaction with parents has improved. As a result of these changes, there have been positive and significant effects on participant children in treated *hogares comunitarios* on health, cognitive and non-cognitive outcomes, particularly for children between the ages of 6 months and 3 years of age.

JEL codes: J13, I20, H43
Key words: Impact evaluation, early childhood program, training program.

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1. Introduction

Hogares Comunitarios is the most important early childhood program in Colombia for the poorest. The program provides childcare for around 12 children at the home of one of the mothers in the community and contains an important nutritional component which provides 70% of daily nutrients. By 2010, the program covered about 1.2 million children from households in SISBEN[2] 1 and 2 and cost close to US$297 per child per year. The program has probably the highest coverage rates for comparable programs[3] in other Latin-American countries, with the exception of Cuba. In particular, coverage in 2009 was about 13% (of all children between the ages of 0 to 5)[4] while other countries in the region had coverage rates below 4.5%.

In 2007 an evaluation of the program that assessed around 28,000 children including participants and eligible non-participants concluded that long exposure to the program had positive effects on children's nutrition, cognitive and non-cognitive development (Bernal et al. 2009). However, it also indicated that there were severe flaws in the quality of care provided which significantly decreased the potential positive effects of the program. In particular, it revealed that care providers (*madres comunitarias*) had, on average, low education levels and were not appropriately trained for childcare.

Bernal et al (2009) report that an important fraction of *madres comunitarias* are high-school dropouts. Close to 16% had primary school or less, 68% had more that primary school but had not completed high-school and the remaining 16% were high-school graduates with at least one year of college or technical education. In addition, the evaluation reported that *madres comunitarias*' knowledge about children's development, safety standards and effective childcare practices had significant voids, as measured by the self-reported KIDI scale (Knowledge of Infant Development Inventory; McPhee, 1981). On average, *madres comunitarias* answered correctly 58% or the KIDI scale. Though the average is higher than half, it is lower than it should be for daycare providers and significantly lower than professional childcare providers.

A detailed evaluation of pedagogical routines within the *hogar comunitario* revealed that most activities aimed almost exclusively at free play and personal care routines, and with very low frequency was time devoted to more structured activities with specific pedagogical objectives such as story-telling, reading books, playing games with numbers, letters, colors, etc. The evaluation also identified problems in the quality of infrastructure and processes in the *hogar comunitario* that were linked to negative effects of the program on cognitive outcomes.[5]

[2] SISBEN is an instrument used in Colombia to focalize social policy. It is constructed based on a survey that inquires about sociodemographic characteristics of the household.

[3] For example, *Hogares de Cuidado Diario* in Venezuela, *Programa de Desarrollo Infantil* in Bolivia, *Programa Nacional Wawa Wasi* in Peru, and *Estancias y Jardines Infantiles* in México.

[4] Coverage rate is 20% of elegible children in the appropriate ages belonging to households in SISBEN 1 and 2. We report the coverage rate here with respect to all children between 0-5 years of age to compare more easily with other Latin-American countries.

[5] Negative effects compared to control children who lived in the same neighborhoods as participant children, were eligible but did not participate in the program and had comparable sociodemographic characteristics to participant children.

Bernal et al (2009) also report measures of quality of care based on the Family Day Care Rating Scale (FDCRS). This scale evaluates seven dimensions of family day care centers: (1) Space and furnishings, (2) Personal care routines, (3) Listening and talking, (4) Learning activities, (5) Social development, (6) Parents and provider and (7) Provisions for special needs children. Each dimension is rated from 1 (inadequate) to 7 (excellent) after a one-day observation of the center by a trained expert (generally a psychologist). Based on the scale, the authors report the infrastructure index (item 1) and the quality of processes index (items 2 to 7).[6] On average, *hogares comunitarios* scored a total 3.1/7.0, 3.2/7.0 in the processes index and 2.5/7.0 in the infrastructure dimension.[7] These scores suggest that only the minimum required conditions are met in the daycare setting according to international standards. There is great variability in scores in family day care centers for vulnerable children. In the literature, these scores range from 2.8 to 5.4 (Fuller, Kagan, Loeb & Chang, 2004; Li-Grinning & Levine, 2006). This means that *hogares comunitarios* ranks in the lower part of the range which suggests quality problems. Similar issues have been reported to be found in other Latin-American countries. For example, in Costa Rica, the comparable program was terminated due to problems with quality of care.

The quality issues identified in the evaluation partly explain the program's negative effects on children's cognitive development with respect to eligible non-participant children in comparable socioeconomic conditions. However, extended exposition to the program was shown to improve children's nutritional status, cognitive and non-cognitive development.

The findings of this evaluation partly motivated the design and implementation of the professional-technical program on education and early childhood attention for *madres comunitarias* offered jointly by the institution that administers *hogares comunitarios* (Instituto Colombiano de Bienestar Familiar, ICBF) and the National Learning Agency (SENA) in charge of adult training programs in Colombia. The program offers a professional-technical degree in three semesters and approximately 2,640 hours. The program aims at (1) guiding the educational processes during early childhood with specific curricular guidelines, (2) promoting psychosocial development during early childhood, (3) promoting children's health and nutrition from gestation to the age of 6, (4) providing training for attention in cases of sudden illness or accident, and (5) promoting an ethical environment.

In this paper, we evaluate the effects of this professional-technical training program in early childhood attention (PTECA) offered at no cost to *madres comunitarias* who voluntarily agree to participate when offered the opportunity. The program has been gradually introduced through regions and neighborhoods at a somewhat random pace and order. We exploit this gradual expansion in Bogotá to construct a sort of rotational random experiment which we use to assess the effects of the program on the quality of care offered at *hogares comunitarios* and the effects on participant children's nutritional and health status, cognitive and non-cognitive development.

The results indicate that (1) the quality of care significantly increased, (2) the pedagogical process improved, in particular, the implementation of productive activities with children and the use of pedagogical resources, and (3) interaction with parents increased and improved. As a

[6] See NICHD (2001) for details.
[7] In Bogotá, these scores correspond to 2.66/7.0 total, 2.66/7.0 processes and 2.67/7.0 infrastructure.

result of these changes, there have been positive and significant effects on participant children in treated *hogares comunitarios* on health, cognitive and non-cognitive outcomes, particularly for children between the ages of 6 months and 3 years of age.

These results are interesting because they suggest that it is possible to improve quality in this inexpensive program. In addition, the program only costs around US$650 per graduated *madre comunitaria*. Furthermore a professionalized *madre* does not receive more salary nor is required to comply with additional requisites than non-professionalized *madres*. Given that several other Latin-American countries have implemented similar early childhood programs, and the number of children benefitted by this kind of programs is increasing, the policy implications of our results are quite relevant.

This paper is organized as follows. In section 2 we describe the program in detail. In section 3 we present the evaluation strategy. In section 4 we present the results of the evaluation and finally section 5 concludes.

2. The PTECA Program

The ICBF together with SENA designed and implemented the PTECA program to offer professional-technical training to care providers of Hogares Comunitarios (HCB) known as *madres comunitarias* (MC), in topics of early childhood development and attention. The program's objective is to offer pedagogical tools that (1) respond with quality and pertinence to the needs of children between the ages of 0 and 6 years of age, (2) stimulate constant thought, training and research about these needs, (3) design responses to concrete problems that are latent in different modes of early childhood programs and (4) promote participation and permanent interactions with parents and the community (SENA, 2007).

The program has a total length of 2,640 hours of training, out of which 1,320 are guided classes with instructors, 440 correspond to individual work and 880 are devoted group and individual projects. For the direct instruction component, MC have to attend SENA facilities three nights a week from 5:30pm to 9:30pm and Saturdays from 7am to 4pm. On average, MC take 3 semesters to graduate from the program. The methodological strategy is based on the development of individual and group projects with the guidance of a professional instructor during teaching times. There is an emphasis on individual work that promotes the ability to solve real problems. MC that successfully complete the program receive a technical-professional degree in early childhood development and care. The program is free for MC but the total cost per MC for SENA is approximately US$650.

The program is structured en six modules:

(1) Educational processes during early childhood. The objective of this chapter is develop the ability to implement teaching-learning-evaluation strategies based on modern pedagogical methodologies; design and implement activities that integrate the three dimensions according to early childhood cognitive developmental stages; and design individualized teaching and learning strategies that take into account the child's individual potential and the family and cultural context.

(2) Promote development of socio-emotional abilities during early childhood. The objective of the module is to develop the ability to design and implement activities that promote socio-emotional development according to early childhood developmental stages; develop the ability to design individual teaching and learning strategies that take into account the child's individual potential and her specific family and cultural context, aimed at promoting socio-emotional development; guide families and communities in issues related to non-cognitive development of children between the ages of 0 and 6.

(3) Assistance in cases of accident and sudden illness. The objective is to develop the ability to inform users, parents and the community about health services available in their community; develop the ability to offer CPR in cases of accident of sudden illness to children and adults.

(4) Care of children's nutritional and health status from gestation to 6 years of age. The objective is to develop the ability to inform families about the fundamental rights and obligations for peaceful coexistence within the family and the community; provide guidance and assistance to expectant mothers and newborns with a specific emphasis on prevention of malnutrition and the importance of breastfeeding; promote health and illness prevention of children younger than six; provide basic assistance during illness episodes of young children in the household, the community and the institution according to existing protocols.

(5) Ethics, transformation and leadership within the community. Taking advantage of MC's role as leaders in the community, the module has the objective of developing the ability to appropriately inform the community about services including health, judicial, nutritional, welfare, etc. that they could have access to, and use their leadership to promote children's wellbeing in their communities.

MC that participate in the PTECA have to be high school graduates and be older than 17 years of age. Participation in the program is free for MC, but they have to incur all costs related to transportation to and from the institution, materials and uniforms.[8] At completion, they receive a technical-professional degree in Early Childhood Development and Attention. With this degree, they could work as care providers for public or private daycare centers, or as childcare providers at other institutions such as thematic parks, clubs, malls, etc.

The program is currently offered in Colombia's main cities, gradually expanded across municipalities and neighborhoods. A group of around 80 to 90 MC initiates the program every trimester. During the initial stage of the program, ICBF gradually expanded the program across municipalities and neighborhoods without any systematic order according to relatively vague criteria. At the beginning of each quarter, ICBF issues a call for participation in the program in a specific neighborhood in each city. MC interested in participating in the program express interest by signing up in a waiting list at the local ICBF office. The MC included in the list are then invited by SENA to participate in presentation about the program and requirements for participation. Immediately after, MC register for courses and initiate classes within two to three weeks. However, some MC attending the presentation do not register for the program because

[8] These costs are closet o US$25 per month for transportation, US$55 per semester for uniforms and US$43 per semester for materials and other expenses associated with participation in the program (amounts reported by MC during our survey).

they realize that time required to successfully complete the program is more that they can devote, or need to postpone entrance because do not fully comply with the requirements for participation yet. At graduation, professionalized MC do not have additional obligations or rights. In particular, they neither earn more salary than non-participating MC nor they have to show better results either.

In Bogotá the PTECA program started around mid-2007. In January 2009, the first cohort of 50 MC graduated. Since then, approximately every six months around 50 MC successfully finish the program.

3. Evaluation Strategy of the PTECA program in Bogotá

The objective of the evaluation is to assess the effects of the PTECA program on quality of care offered at HCB and on participating children's well-being. In other words, evaluate the effects of beneficiary children in HCB with professionalized MC. In particular, we measure the impact of the program on (1) quality of care offered at HCB, (2) children's nutritional status, (3) children's health status, (4) children's cognitive and socio-emotional development, (5) psychomotor development of children younger than 3. Quality of care offered is measured in various dimensions including: infrastructure and processes within the HCB, quality of pedagogical activities during the day, fulfillment of administrative requirements regarding hygiene, food handling, personnel, infrastructure, etc. within the HCB, and interaction of MC with parents.

3.1. Definition of treatment and control groups

We take advantage of the gradual and somewhat random expansion of the program in Bogotá to construct the treatment and control groups for the evaluation.

1) **Treatment group**: this group corresponds to 67 MC that successfully graduated from the PTECA program in January 2009 and July 2009.[9] These were randomly selected from the total 100 MC that had graduated in both cohorts. It is desirable to children in participating HCB would be exposed to the professionalized MC for as long as possible (exposed to treatment) as some of the outcomes variables take time to respond to treatment. For example, nutritional changes and improvements in cognitive ability take time. Thus, we included only MC that graduated at least 6 months prior to measurement.[10]

2) **Control group**: this group consists of 73 MC that expressed interest in the program after ICBF extended a call for enrollment in PTECA in their neighborhoods, and signed up in the waiting lists in the corresponding local ICBF offices.

[9] Initially, the treatment group included a total of 75 MC randomly drawn from the total 100 MC graduated in January and July 2009. Same number of MC was selected for the control group. However, we lost a few in both groups during field work for some of the following reasons: early closing for Christmas vacation as field work extended all the way through December 6th, refusal to answer the survey, inexistent addresses, MC that had left the program, or MC for a different mode of attention (FAMI HCB and not traditional HCB, which is the object of this evaluation).

[10] As the results reported later suggest, children must be exposed to treatment for at least a year in order to observe significant changes in some of these outcome variables.

For purposes of this evaluation, this call in September and October 2009 was extended to more neighborhoods than necessary. In other words, each call usually requires one neighborhood to complete one cohort's enrollment; however, to increase the waiting list and obtain a big enough sample size for this evaluation, ICBF extended the call in three different neighborhoods in Bogotá: Bosa, San Cristóbal and Ciudad Bolívar.

A total of 278 MC expressed interest in the program and signed up at their local ICBF offices (51 in Bosa, 92 in San Cristóbal and 135 in Ciudad Bolivar[11]). The call was not simultaneous in the three neighborhoods and no particular order was followed. SENA offered a presentation about the program for the first two calls only. These were attended by 130 MC out of a total of 143 that expressed interest in the first two neighborhoods. Finally, around 80 MC of these were assigned to the group that would start the program in October 2009 and the remaining MC were assigned to the group that would start classes in January 2010, and hence would constitute a potential control group. This assignment was not random, but rather on a first-come first-served basis. Out of the 198 MC that were postponed for January 2010, we randomly selected 75 to be part of our control group. A detailed description of the composition of treatment and control groups is presented in Table 1.

The key argument in this evaluation is that MC that express interest in the program at their local ICBF offices and sign up in the program's waiting lists are a valid counterfactual for MC that have successfully graduated from the program. In particular, we require that the former group is very similar to the latter in terms of observed sociodemographic characteristics and also unobserved features that are related to participant children's wellbeing such as motivation and commitment to their job as care providers of children in their communities.

Historically, out of the total number of MC that express interest in the program, at most 15% decide not to participate after attending the presentation about the PTECA program offered at SENA. Out of the remaining 85%, a faction of MC initiate classes immediately after and another fraction postpone entrance for one quarter until they organize their personal issues to be able to devote the amount of time required for successful completion of the program. Hence, MC that sign up for waiting lists are a plausible control group, as most MC that express interest in the local offices eventually end up entering the PTECA program.

Thus, it seems reasonable to use these MC as a control group given that expressing interest in the program and attending the presentation meeting (some of them) reflects that they are motivated, interested in the learning process, and willing to invest some time to improve their knowledge about children's development. This is clearly not the case in cases where the MC does not express interest in spite of the fact that the program has been offered by ICBF in her community.[12]

[11] Differences in sizes are due to differences in interest for the program but mostly due to differences in program size.

[12] It is worth mentioning, however, that the control group selected in this way may provide a valid counterfactual for MC that eventually *enter* the PTECA program but not necessarily those that *successful graduate* from the program after two or three semesters. For initial cohorts, dropout rates were extremely high reaching close to 40%, however, this rate has significantly dropped since reaching levels close to 15-20%. This means that treatment and control groups could still be systematically different for this reason. This is something we go back to in the empirical analysis.

In sum, the treatment and control groups defined in this way closely resemble a rotational random experiment that takes advantage of the gradual geographic expansion of the program across neighborhoods in Bogota. We later verify the hypothesis that both groups of MC are practically identical in the data in a wide array of observable characteristics that include household income and other characteristics of the household, which confirms the validity of our counterfactual.

Table 1. Definition of treatment and control groups

TREATMENT GROUP	CONTROL GROUP	TOTAL
67 HCB whose MC graduated from the program in January 2009 or July 2009.	73 HCB whose MC has expressed interest in the program by signing up in the waiting list at the local ICBF office.	140 HCB
Children 0-3 yrs: 189 Children 3-5 yrs: 689 Total number children: 778	Children 0-3 yrs: 199 Children 3-5 yrs: 725 Total number children: 924	Children 0-3 yrs: 388 Children 3-5 yrs: 1414 Total children: 1802

3.2. Measurement of outcome variables

We assess the effect of PTECA on: (1) quality of care offered at HCB, (2) children's nutritional status, (3) children's health status, (4) children's cognitive and socio-emotional development, (5) psychomotor development of children younger than 3. Quality of care offered is measured in various dimensions including: infrastructure and processes within the HCB, quality of pedagogical activities during the day, fulfillment of administrative requirements regarding hygiene, food handling, personnel, infrastructure, etc. within the HCB, and interaction of MC with parents.

Each of these dimensions is directly associated with expected results of the program given the objectives, curriculum content and guidelines. In Tables 2 and 3 we summarize the instruments used to measure each of these outcome variables in the five selected dimensions. These instruments were collected between Noviembre 23 y Diciembre 11 de 2009 based on surveys to parents and MC, direct observation of surveyor of HCB and activities within the HCB, and direct measurement of children, e.g., anthropometric measurements. [13]

First, we measure the effect of the program on quality of care offered at HCB (see Table 2). To do this, we include four measures: (1) the Family Day Care Rating Scale (FDCRS) (Harms, T.,

[13] In the methodological report of this evaluation we provide more a more detailed description of each of the direct evaluation instruments included in this study. See Bernal and Helo (2009), "Informe Metodológico de la Evaluación de Impacto del Programa F&API".

Clifford, R.M, & Creer, D., 2002) designed to measure quality of infrastructure and quality of processes (e.g., quality of interactions between the care provider and children); (2) compliance of administrative ICBF guidelines which are recorded after careful observation by the surveyor of things related to cleanliness, children's hygiene, quality of infrastructure, characteristics of personnel in charge of food processing, etc.; (3) implementation of conducive learning environments which we measure by asking about daily routines within the HCB including personal care and pedagogical activities, use of creative pedagogical material such as recyclable objects including newspapers, bottles, cartons, etc., and the frequency of pedagogical activities outside of the HCB such as visits to parks, museums, and other recreational facilities; and (4) interaction of MC with beneficiary parents which we measure by asking parents about the frequency and type of information that the MC shares with them about their children's development and by asking the MC and the parent whether MC takes actions in cases of children's illnesses.

Table 2. Outcome Variables at MC and HCB level

Area	Outcome Variable	Description	Sample
Quality of care	Family Day Care Rating Scale (FDCRS)	Evaluates the quality of care provided at HCB differentiating infraestructure from processes	All HCB
HCB guidelines	Compliance with administrative guidelines.	% of compliance by category	All MC
Implementation of conducive learning environments	MC survey	-Productive pedagogical routines in the HCB -Creative use of pedagogic material -Pedagogic activities with children outside the HCB	All MC
Interaction with parents	MC and parents survey	-Shares information about children's development with parents -Takes at least one action in cases of illness of children	All MC

Second, we measure the effect of the program on children's outcome variables that include health and nutritional status, cognitive, psychomotor and non-cognitive development. These variables are described in Table 3.

Table 3. Outcome Variables at the child level

Area	Outcome Variable	Description	Sample
Health	Diarrhea	Illness in the last 15 days	Children age 0-6
	Cough, cold or flu	Illness in the last 15 days	
	Other discomfort	Illness in the last 15 days	
	Complete vaccination	Complete vaccination scheme given age	
Nutrition	Height for age	Z-scores for each variable	Children age 0-6
	Weight for age		
	Weight for Height		
Psychosocial Development	Penn Interactive Peer Play Scale-PIPPS	MC report on social behavior during playtime	Children age 3-6
	-Aggressive behavior	Range 1 to 4 – lower is better	
	-Social Isolation	Range 1 to 4 - lower is better	
	-Adequate Interaction	Range 1 to 4 - higher is better	
	Ages and stages – Socioemotional (AS-SE)	Parental report test on child's socioemotional behavior by age range Lower is better	Children age 0-6
Cognitive Development	Ages and Stages Test (ASQ-3)	Parental report test on child's cognitive ability by age range	Children age 0-3
	-Communication	Higher is better	
	-Problem Solving		
	Woodcock Johnson-Muñoz	Cognitive ability and learning ability test	Subsample of 540 children 3-6 years of age
	-Intellectual Ability	directly applied to the child	
	-Verbal Ability	Standardized scores	
	-Mathematical Reasoning	Higher is better	
	-Knowledge of the World		
Psychomotor Development	Ages and Stages Test (ASQ-3)	Parental report test on child's psychomotor ability by age range	Children age 0-3
	-Fine Motor Function	Higher is better	
	-Gross Motor Function		

We measure children's health by asking about incidence of diarrhea, cough, cold or flu and other discomforts within the previous 15 days by parental report. Nutritional status is assessed based on Z-scores for height for age, weight for age and weight for height. Socio-emotional development is assessed by (1) the PIPPS scale which behavioral patterns of children during playtime and is reported by MC. It measures 32 items which differentiate between negative social behaviors (e.g., social, cooperation) and negative social behaviors (e.g., isolation and

aggressiveness); and (2) the socio-emotional Ages and Stages questionnaire which consists of a survey completed by parents of children between the ages of 3 months and 66 months to measure social and emotional development. The test consists of 8 different questionnaires that vary across age ranges not longer than 6 months. The number of total items varies from 18 to 32 depending on the questionnaire.

Finally, we measure cognitive and psychomotor development by using (1) the Ages and Stages Questionnaire for children between 0 and 3 years of age, which contains two sections that measure cognitive development, in particular, communication and problem solving and two sections that measure fine and gross motor development. These too are questionnaires answered by parents designed appropriately by age range; and (2) Woodcock-Muñoz Battery III (WJM-III; Muñoz-Sandoval, A.F., Woodcock, R.W., McGrew, K.S., & Mather, N., 2005), which measures cognitive development and learning ability by direct measurement of children older than 3. We collected this measure in a subsample of 540 children between the ages of 3 and 6.[14]

4. Evaluation Results

We surveyed 67 treatment HCB and 73 control HCB for a total of 140 HCB. 1,802 children were registered in these 140 HCB but only 1,365 were present and surveyed during the day of our visit. However, we were able to assess an additional 295 children at home even if they had been absent the day of our visit to the HCB. In total, we have outcome variables for 1,545 children and the same number of household sociodemographic surveys.

4.1. Description of the treatment and control groups

In Table 4 we present a comparison of MC by group. In particular, we show differences in sociodemographic variables such as household average income and expenditures, whether the MC's household was surveyed with the SISBEN focalization instrument,[15] if the household has a SISBEN level less or equal to 2[16], household composition (household size, number of children, marital status of the MC and relationship with the head of the household), average MC's income associated with her work in the HCB, MC's household wealth quintile[17], time as MC and number of children in her HCB.

[14] We complement this impact evaluation by running focus groups and in-depth surveys with MC in both groups and parents in both groups.

[15] The Sistema de Información de Selección de Beneficiarios (SISBEN) is an instrument developed to identify potential beneficiaries of social programs in Colombia. The SISBEN score is constructed based on a household survey that inquires about sociodemographic characteristics of the household.

[16] This threshold identifies the poorest segment of the Colombian population, and thus, makes them eligible for a variety of social programs including HCB, Familias en Acción, etc.

[17] Household wealth index: Factor analysis of questions related with durable goods ownership, and characteristics of the household such as quality of floors and walls and availability of public utilities.

Table 4. Comparison of MC and HCB by group

	OBSERVABLE CHARACTERISTICS	TREATMENT	CONTROL	DIFFERENCE P-VALUE
	Number of observations	67	73	
1	SISBEN survey (%)	68.7	72.6	0.611
2	SISBEN level 2 or less condition on being surveyed (%)	84.7	91.1	0.365
3	Household's average monthly income (thousands $)	1,223.2	1,388.2	0.234
4	Household's average monthly expenditures (thousands $)	882.8	874.3	0.919
5	MC's age	40.9	40.9	0.981
6	MC's average schooling attainment	12.4	11.6	0.015 **
7	MC is head of household (%)	26.86	30.13	0.671
8	MC is head of household's spouse (%)	65.66	61.64	0.624
9	MC is head of household's daughter (%)	7.46	5.48	0.636
10	MC is married or cohabiting (%)	68.66	71.23	0.742
11	MC is separated, widow or single (%)	31.3	27.4	0.611
13	Household's size	4.09	4.16	0.752
14	Number of children under 18 in household	1.45	1.56	0.506
15	ICBF monthly contribution for work in HCB (thousands $)	323	328	0.153
16	Monthly participation fees for work in HCB (thousands $)	281	306	0.278
17	% of HCB in lowest wealth quintile [&]	16.4	21.9	0.414
18	% of HCB in highest wealth quintile [&]	22.4	19.2	0.643
19	Wealth index [&]	8.448	8.582	0.429
21	% membership to contributive health insurance	94.0	94.5	0.901
22	% membership to subsidized health insurance	2.97	1.37	0.513
23	Continuous time as MC (years)	10.16	7.92	0.038 **
24	Number of children in the HCB	13.17	12.43	0.159

*** Statistically significant difference at 1%, ** at 5%, * at 10%

[&] Household's wealth index: Principal component of Factor analysis of questions related with durable goods ownership, and characteristics of the household such as quality of floors and walls and availability of public utilities.
Index between 0 & 9.2 with mean 8.518.
The p-value of chi-2 for the null hypothesis that the distribution by wealth index quintiles is different between groups is 0.19.

The first column corresponds to the treatment group, i.e., professionalized MC, and the second column corresponds to the treatment group. The third column reports the p-value for the null hypothesis that the difference between the two groups is statistically insignificant.

The results presented in the table indicate that MC from the treatment group are not significantly different from MC in the control groups in all these dimensions with the exception of schooling attainment and total time serving as MC in the community. As it was expected, MC in the treatment group have a higher schooling attainment precisely because the treatment consists of a professional-technical degree. So this is clearly unsurprising.

In Table 5 we summarize these results by estimating a linear probability model for the probability of belonging to the treatment group. The model includes all variables in Table 4 with the exception of educational attainment of the MC because this is precisely the treatment outcome. Individually, MC's age and time as MC are statistically significant. However, the model is not jointly significant, with an F test of 1.48 with p-value equal to 0.1138. This means that we reject the null hypothesis that all these observable characteristics jointly explain whether a MC belongs to the treatment group or the control group.

Table 5. LPM for the probability that a MC belongs to the treatment group

Dependent variable -> Treatment dichotomic variable (1=treated, 0= control)

Explanatory variable	Coefficient	Standard error
SISBEN survey	0.00123	(0.0969)
Household's monthly expenditures (thousands $)	-1.6E-08	(0.0000)
MC's age	-0.01882	(0.0084) **
MC is head of household	-0.17328	(0.1764)
MC is head of household's daughter [1]	-0.15509	(0.2367)
MC is separated, widow or single [2]	0.20297	(0.1818)
Monthly income for work at HCB (thousands $)	1.1E-07	(0.0000)
Household's size	0.01704	(0.0453)
Number of children under 18 in household	-0.05015	(0.0616)
First wealth quintile	-0.06777	(0.1415)
Second wealth quintile	0.13731	(0.1432)
Third wealth quintile	-0.18887	(0.1345)
Fourth wealth quintile [3]	0.13433	(0.1407)
Contributive regime health insurance	0.02086	(0.2328)
Subsidized regime health insurance	0.11778	(0.3799)
Continuous time as MC (years)	0.03429	(0.0098) ***
Number of children in the HCB	0.00903	(0.0140)
Number of observations	138	
R-squared	0.173	
F test for joint significance	1.48	p-value=0.1138

Robust standard errors.

*** Statistically significant difference at 1%, ** at 5%, * at 10%

[1] Excluded category: MC is head of household's spouse

[2] Excluded category: MC is married or cohabiting

[3] Excluded category: fifth wealth quintile

The regression excludes MC's education because treatment consists of an additional year of education.

In sum, these results indicate that MC from both groups are basically identical in these observable dimensions. This is interesting because it validates the evaluation design and provides evidence that MC in the program's waiting list are a reasonable counterfactual for treatment MC. In turn, this implies, that we can simply compare average outcomes of one group with average outcomes of the other group to obtain program effects, as there is no evidence of self-selection into the program (treatment MC compared to MC in the waiting lists).

In Tables 6 y 7 we provide a similar exercise for beneficiary households. In other words, we compare sociodemographic characteristics of households of beneficiary children in the treatment and control groups.

Table 6. Comparison of beneficiary households by group

	OBSERVABLE CHARACTERISTICS	TREATMENT	CONTROL	DIFFERENCE P-VALUE	
	Number of observations	770	806		
1	SISBEN survey (%)	63.1	74.0	0.000	***
2	SISBEN level 2 or less condition on being surveyed (%)	93.9	97.52	0.004	***
3	Household's average monthly income (thousands $)	946.4	908.2	0.188	
4	Household's average monthly expenditures (thousands $)	681.9	635.8	0.013	**
5	Mother's age	28.6	28.6	0.922	
6	Mother's schooling mean	10.4	10.0	0.102	
7	Mother is head of household (%)	14.31	14.08	0.888	
8	Father present (%)	70.83	70.64	0.941	
9	Mother is married or cohabiting (%)	72.18	70.23	0.418	
10	Mother is separated, widow or single (%)	27.1	29.6	0.296	
12	Household's size	4.32	4.36	0.633	
13	Number of children under 18 in household	2.06	2.13	0.138	
14	% of children in lowest wealth quintile [&]	19.55	20.32	0.679	
15	% of children in highest wealth quintile [&]	19.16	20.96	0.319	
16	Wealth index [&]	3.558	3.509	0.327	
18	% contributive health insurance	61.94	57.54	0.095	*
19	% subsidized health insurance	33.62	37.62	0.120	
20	Maternal employment status	71.32	71.90	0.811	
21	Working mother's average earnings (thousands $)	498	479	0.535	
23	Employment status of the head of the household	91.12	90.16	0.561	

*** Statistically significant difference at 1%, ** at 5%, * at 10%

[&] Household's wealth index: Principal component of Factor analysis of questions related with durable goods ownership, and characteristics of the household such as quality of floors and walls and availability of public utilities.

Number between 0 & 5.2 with mean 3.53.

The p-value of chi-2 for the null hypothesis that the distribution by wealth index quintiles is different between groups is 0.79.

The first column in Table 6 shows average sociodemographic characteristics of households of children in treated HCB and the second column presents the same average for households of

children in control HCB. The last column shows the p-value for the null hypothesis that the difference between the two is statistically insignificant. Again, these results suggest that both groups are very similar in terms of wealth, maternal age, education and employment status, household structure (marital status, presence of the father, female head of households, households size, number of children, etc.), type of health insurance, maternal labor income, etc. Individually, a few variables are statistically different between the two groups including whether the household has SISBEN survey, fraction of households with SISBEN level less or equal to 2 and average monthly expenditures. In particular, control households have a higher likelihood of having SISBEN survey, having lower SISBEN level and lower average expenditures.

However, once we estimate a LPM for the probability that the household belongs to the treatment group, we observe that all these observable sociodemographic characteristics do not jointly explain the probability of treatment (see Table 7). In particular, the F test is 1.33 with a p-value of 0.168. In other words, we reject the null hypothesis that both groups are statistically different.

Table 7. LPM for the probability that a household belongs to the treatment group

Dependant variable -> Treatment dichotomic variable (1=treated, 0= control)

Explanatory variables	Coefficient	Standard error
SISBEN survey	-0.13128	(0.0335) ***
Household's average monthly income (thousands $)	2.0E-08	(0.0000)
Mother's age	0.00109	(0.0023)
Mother's education	0.00172	(0.0029)
Female head of household	-0.00016	(0.0484)
Father present	-0.03962	(0.0605)
Mother is separated, widow or single [1]	-0.03531	(0.0645)
Household's size	0.01967	(0.0164)
Number of children under 18 in household	-0.02856	(0.0226)
First wealth quintile	0.08666	(0.0615)
Second wealth quintile	0.06255	(0.0589)
Third wealth quintile	0.07275	(0.0589)
Fourth wealth quintile [2]	0.07061	(0.0585)
Contributive regime health insurance	0.03402	(0.0692)
Subsidized regime health insurance	0.04906	(0.0734)
Maternal employment status	-0.02213	(0.0327)
Number of observation	1254	
R-squared	0.017	
F test for joint significance	1.33	p-value=0.1682

Robust standard errors.

*** Statistically significant difference at 1%, ** at 5%, * at 10%

[1] Excluded category: MC is head of household's spouse

[2] Excluded category: fifth wealth quintile

We conclude that both groups are observationally equivalent both in terms of sociodemographic characteristics of MC and her households, and sociodemographic characteristics of households of beneficiary children. These results suggest that the control group is a valid counterfactual for our treatment group, and thus, we can estimate the treatment effect by using a difference estimator.

4.2. Methodological Evaluation Strategy

As we discuss in section 3.2, we assess the effects of PTECA program on the quality of care (at the MC and HCB level) and on the well-being of beneficiary children (at the individual level). See Tables 2 and 3 for details. We define the outcome variable at the child level as y_{ij}, where i represents child $i = \{1, \dots, n\}$ cared for by MC $j = \{1, \dots, J\}$. For example, , y_{ij} can be the nutritional status of child, her health status, or cognitive development. On the other hand, we define an outcome variable at the HCB/MC level as y_j where j represents la MC $j = \{1, \dots, J\}$. Although the estimation strategy is identically and crucially hinges on the results presented in section 4.2, it is important to discuss these cases independently as the unit of observation differs.

First, we refer to the model in which the outcome variable is at the child level, i.e., y_{ij}. The main characteristic of this model is that data structure is hierarchical. The hierarchy emerges because children are grouped in HCB and the fact that treatment is at the MC (i.e. HCB) level and not at the child level. [18]

At the child level (level 1) the model is given by:

$$y_{ij} = \beta_{0j} + e_{ij} \qquad (1)$$

where y_{ij} represents the outcome variable of child $i = \{1, \dots, n\}$ cared for by MC $j = \{1, \dots, J\}$; β_{0j} represents the average of that outcome variable for MC j; and $e_{ij} \sim N(0, \sigma^2)$ represents the deviation of y_{ij} with respect the HCB's average associated to each child.

At the MC level (level 2) the model is given by:

$$\beta_{0j} = \gamma_{00} + \gamma_{01} D_j + u_j \qquad (2)$$

where γ_{00} represents the (weighted) average of the outcome variable y_{ij} over the entire sample; γ_{01} represents the treatment effect (i.e., the difference between the treatment group and the control group) on the selected outcome variable; D_j is a treatment indicator ($D_j = 1$ if HCB belongs to the treatment group y $D_j = 0$ if HCB belongs to the control group); and $u_j \sim N(0, \tau^2)$ represents the deviation associated to each MC.

[18] Treatment, i.e., a professional-technical degree for the MC is received by the MC who cares for the child and not directly by the child. We expect, however, that the child benefits from treatment as he will receive better quality care provided by the treated MC.

After replacing equation (2) into (1) we obtain the mixed model given by:

$$y_{ij} = \gamma_{00} + \gamma_{01} D_j + u_j + e_{ij} \qquad (3)$$

with individual effects $e_{ij} \sim N(0, \sigma^2)$ that represent the variation of each child with respect to their HCB's average, and $u_j \sim N(0, \tau^2)$ which represents the variation of each MC with respect to the sample average. In this case, σ^2 represents the variability across children within HCB and τ^2 represents the variability across HCB.

The null hypothesis for the parameter of interest in this model is:

$$\mathrm{H}_0: \gamma_{01} = 0 \; vs. \; \mathrm{H}_1: \gamma_{01} \neq 0.$$

In other words, the null hypothesis to evaluate whether the treatment effect is statistically significant or not.

Of course, the model can also include one or more control variables, X_j, at the MC level or at the child level in the following way:

$$y_{ij} = \gamma_{00} + \gamma_{01} D_j + \gamma_{02} X_j + u_j + e_{ij} \qquad (4)$$

shere γ_{02} represents the effect of control variable, X_j on outcome variable y_{ij}. In this case, the variability across HCB is reduced to $\tau^2_{|X}$ because there is an observable characteristic that explains part of the variability, and we can explicity control for that particular source of variation.

As usual, estimation of model (4) crucially depends on the assumption about the correlation between the unobserved group effect u_j and the variable of interest D_j, and the correlation between the individual effect e_{ij} and the variable of interest D_j. In section 4.2 we present evidence that suggests that program participation is independent of sociodemographic characteristics of MC and sociodemographic characteristics of children. Thus, it is plausible to assume that D_j is exogenous in this model. For that reason, we just need to treat the hierarchical model as a random effects model. In other words, estimation of (4) by OLS produces a consistent and unbiased estimator of the treatment effect but it is necessary to appropriately correct the standard errors by clustering at the HCB level. [19]

Note that in the case of outcome variables at the MC/HCB level, like for example, compliance with administrative guidelines or quality of care, the model is much simpler and consists of a simple regression with random effects u_j only. In this case, the model is simply estimated by OLS.

[19] The presence of the group effect, u_j, generates correlation across individual observations. For that reason, the standard error has to be appropriated computed by clustering at the HCB level.

4.4. Effects of the program on quality of care provided at HCB

The effects of the PTECA program on quality of care provided at HCB are measured by the following four instruments: (1) Family Day Care Rating Scale for the quality of care provided, in particular, we report total scale, processes subscale which indicates the quality of interactions between the children and the care provider, and infrastructure subscale which measures the quality of physical infrastructure; (2) compliance with administrative ICBF guidelines in the HCB, (3) design and implementation of conducive learning environments which we measure by the frequency of pedagogical activities and the frequency of use of pedagogical material such as newspapers, cartons, bottles, old books, etc. in the HCB; and (4) interaction of the MC with parents of beneficiary children which we measure by asking about how often parents receive information about their child's development and whether the MC takes any action when a child gets sick, including informing and advising the parent.

In Table 8 we present estimated treatment effects for all these variables. As explained in the previous section, these are OLS estimates of equation (4). In the second column we show averages for each outcome variable in HCB with professionalized MC. The first panel presents program effects on quality of care provided at HCB as measured by the FDCRS scale. The FDCRS scale evaluates 7 dimensions of the childcare environment provided at the family day care center: (1) space and furnishings, (2) personal care routines, (3) listening and talking, (4) activities, (5) interaction, (6) program structure, and (7) parents and provider. Each dimension is scored from 1 to 7, where 1 reflects the worse conditions and 7 the best. This instrument is completed by properly trained psychologist after careful observation of the HCB and the activities within for a sufficiently long period of time (at least two to three hours). Based on the seven subscales, we then construct a total FDCRS score, and two subscales. The *infrastructure* subscale (corresponding to item (1) above) and the *processes* subscale (corresponding to the average of items (2) through (7) above).

The mean FDRCS score in the sample is 3.8/7.0. In 2007, a national evaluation of the HCB program[20] reported an average FDCRS of 2.66/7.0 in Bogotá. These results suggest that the quality of care has improved significantly between 2007 and 2009 in the city. Mean processes subscale is 3.98/7.0 and infrastructure subscale is 3.1/7.0.[21]

According to the results presented in Table 8, the program had a positive a significant effect on the quality of care as measured by FDCRS. In particular, the effect is positive and marginally significant in the case of total scale and processes scale and significant at the 5% confidence level in the case of infrastructure. The size of the effect ranges from 0.2 to 0.3 points of a 1 to 7 scale.

These results are quite encouraging given that they show that training MC actually translated into observable changes in the HCB aimed at improving quality of care offered. FDCRS scores attained my treatment mothers are consistent with reports in international studies that have investigated the quality of care provided in family day care centers for low-income families in

[20] See Bernal et al (2009).
[21] These were 2.67 and 2.66 respectively in the 2007 evaluation reported in Bernal et al (2009).

cities. For example, Cooley and Ginning (2006) studied different modes of care for vulnerable groups of population, mainly Hispanics in Boston, San Antonio and Chicago. The authors report FDCRS/ECERS scores of around 3.95 (with a standard deviation of 1.55). Fuller, Kagan Loeb and Wang-Chang (2004) who studied similar programs in San Francisco, San Jose and Tampa, reported FDCRS scores of 3.0, 2.8 and 3.8 respectively.

Table 8. Treatment effects on quality of care offered at HCB

Outcome Variable	Mean with PTECA	Treatment effect	Standard Error	No. Of obs.
QUALITY OF CARE OFFERED				
▫Total FDCRS scale (max. 7.0)	3.98	0.194	(0.109) *	139
▫FDCRS Processes Subscale	4.11	0.192	(0.115) *	139
▫FDCRS Infrastructure Subscale	3.31	0.316	(0.130) **	139
COMPLIANCE OF ADMINISTRATIVE GUIDELINES [1]				
▫Guidelines related to personnel (especially kitchen personnel)	0.20	0.347	(0.175) **	135
▫Guidelines related to kitchen area	-0.02	-0.068	(0.181)	133
▫Guidelines related to food consumption area	0.05	0.063	(0.171)	131
▫Guildelines related to protective practices	0.19	0.330	(0.177) *	131
▫Total compliance of guidelines index	0.06	0.063	(0.156)	131
DESIGN OF CONDUCIVE LEARNING ENVIRONMENTS				
▫Index of frequency of pedagogical routines [2]	0.23	0.311	(0.149) **	140
▫Index of use of pedagogical material in the HCB [2]	0.20	0.322	(0.159) **	139
▫Index of routines and pedagogic materials combined [2]	0.25	0.356	(0.144) **	139
▫Frequency of pedagogical activities outside the HCB [3]	0.23	0.309	(0.169) *	139
INTERACTION WITH PARENTS				
▫Provided information to the parents in the last 7 days about health, nutrition, or use of health service for children	0.92	0.105	(0.058) *	137
▪Response of MC to cases of illness in HCB				
Took, at least, an action	0.91	0.068	(0.041) *	243
Informed the mother of the child	0.80	0.020	(0.052)	247
Measures to avoid contagion	0.13	-0.058	(0.047)	247
Other [4]	0.26	0.120	(0.049) **	247

*** Statistically significant difference at 1%, ** at 5%, * at 10%

▫ Models at MC level control for average monthly income, SISBEN survey, MC's education, household's size, number of children in the household and number of children in HCB (MC single-parent household, MC's age and in some cases time as MC).

▪ Models at family level include as aditional controls household characteristics like wealth quintile, mother's education, SISBEN survey, single-parent household, household's size and number of children. Standard errors are robust to HCB clusters.

[1] Items correspond to principal component of question srelated to compliance of ICBF administrative guidelines in the HCB by subsections

[2] Principal component of frequency of pedagogic routines in HCB and the use of pedagogical materials. A number between -2.6 and 2 with mean zero.

[3] Principal components of the frequency of visits to libraries, museums, parks, recreational facilities and others.

[4] Referred child to appropriate health institution, offered home-made medication, bought medication for the child.

The second panel in Table 8 shows the variables that measure compliance with administrative ICBF guidelines, by area. Each item presented corresponds to the principal component of each section. This is reported by the surveyor after observation of the HCB and MC during an entire day. For example, the first index called "guidelines related to kitchen personnel" refers to compliance with guidelines regarding the personnel that cooks for children. Among others, it includes items like wearing a bonnet, masks, and clean finger nails, no coughing, sneezing or spitting, if they wash their hands before cooking and after using the bathroom, etc. A higher principal component indicates higher compliance with guidelines.

Similarly, the other three items correspond to the principal component of compliance of each area. Guidelines related to kitchen area, for example, includes items like cleanliness of the kitchen, refrigerator and cabinets where food is stored; guidelines related to food consumption area include items regarding the tables and chairs where children take their lunch, cleanliness of the area, absence of garbage, absence of animals, whether children wash their hands before eating and after using the bathroom, etc. Protective practices refers to existence of cycle of menus, substitution lists for menus, whether recipes are standardized or not, whether there are at least two preparations that use bienestarina[22] every day, and whether the HCB has bienestarina the day of our visit.

Finally, the total compliance index corresponds to the principal components of all sections. By construction, all have mean cero. As observed in Table 8, we report a positive and statistically significant effect of the program in guidelines related to kitchen personnel and protective practices. In particular, the effect in both cases is around 0.33 of the index, which corresponds to a third of the standard deviation. This is a quantitatively important effect. In particular, kitchen personnel guidelines are particularly important for health and nutrition as it includes items like cleanliness of kitchen and whether personnel wash their hands before cooking and after using the bathroom. Protective practices guidelines are also relevant for nutritional status as they refer to standardization of procedures regarding menus for children.

In the third panel of Table 8, we report outcome variables related to the design and implementation of conducive learning environments. We measure this by using two instruments. The first is the principal component of the frequency of a list of pedagogical activities. For each activity the MC can answer whether the activity is implemented once a day, sometimes a week, sometimes a month, rarely or never. The variable reported is the principal component of all responses. A higher index indicates higher frequency of pedagogical activities. These include, among others, teaching colors, letters, numbers, shapes, solving problems, writing, body parts, concentration, gross and fine motor development, language, reading books, etc.

The second measure of appropriate learning environments measures the frequency with which the MC uses recyclable material for pedagogical purposes. For example, cartons, newspapers, bottles, old books, other organic materials, etc. Possible responses include many times, some times and never. The number reported is the principal component of 10 questions. We report a positive a significant effect in both cases. In particular, there is a positive effect of about one third of a standard deviation. We also measure whether there is a higher frequency of

[22] A fortified component used in various meal preparations.

pedagogical activities outside of the HCB including places like museums, parks and other recreational facilities. In this case, we also estimate a positive and marginally significant effect of almost a third of a standard deviation.

Finally, in the last panel of Table 8 we report some measures of the degree of interaction of the MC with beneficiary parents. In particular, we report whether the MC shared information about the child's development within the previous week or not, and whether she took at least one action in cases in which the child got sick. In both cases, we report a positive although marginally significant effect of the program. We observe, however, that there is a strongly significant program effect on the probability that the MC referred the child to the appropriate health institution or provided some kind of medication in cases of illness.

Finalmente, los resultados presentados en el Cuadro 8 indican que existe una diferencia a favor del grupo de tratamiento en la frecuencia de actividades fuera del HCB (0.2 vs. -0.18). Es decir, el proceso educativo que integra a la comunidad es más profundo entre las MC profesionalizadas que entre las MC del grupo de control.

In sum, the results reported in this section suggest that MC in the treatment group have actually implemented what they learnt[23] and implemented better pedagogical practices in their HCB, including closer interaction with parents. These changes are reflected in better quality of care, better compliance with administrative guidelines, and higher frequency of pedagogical routines and better use of pedagogical materials.

4.5. Effects of the program on the well being of beneficiary children

We measure the effects of the program on children's nutritional status, children's health status, children's cognitive and socio-emotional development, and psychomotor development of children younger than 3. Each dimension is measured the instruments described in Table 3.

In Table 9 we present estimated treatment effects for all these variables. As explained in the previous section, these are OLS estimates with standard errors clustered at the HCB level. The first panel presents program effects on children's health status. In particular, we report effects on the probability of incidence of diarrhea, cold, flu or cough or other illness in the last 15 days, and complete vaccination scheme given child's age. The results indicate that there is a positive effect of the program on incidence of cold, flu or cough of about three percentage points, with 9.11% being average incidence in the treatment group, when comparing the entire treatment group with the control group (see third and fourth columns in Table 9). However, once one restricts the treatment group to MC that successfully completed the PTECA program in December 2008 (and thus graduated in January 2009) we observe larger effects and a significant effect on incidence of diarrhea as well. In particular, we estimate a treatment effect of 5 percentage points on the incidence of cold, flu or cough and approximately 1.9 percentage points in the case of diarrhea (see sixth and seventh columns in Table 9).

[23] Anecdotally, surveyors would be able to identify treated HCB after a few minutes of observation even if the HCB status (treatment vs. control) was never revealed to them a priori.

Table 9. Treatment effects on participant children's well being

Outcome variable	Mean with PTECA	Entire treatment group			Only MC treated in 2008		
		Treatment effect	Standard error	No. obs	Treatment effect	Standard error	No. obs.
HEALTH							
Incidence of diarrhea	1.59	-0.0049	(0.0106)	1,328	-0.0195	(0.0115) *	840
Incidence of cough, flu or cold	9.11	-0.0373	(0.0190) **	1,447	-0.0506	(0.0220) **	1,004
Incidence of other illness	3.87	0.0155	(0.0116)	1,365	0.0078	(0.0155)	955
Complete vaccination	62.27	-0.0547	(0.0398)	1,325	-0.0723	(0.0624)	902
NUTRITION							
Height for age	-0.81	-0.0010	(0.0606)	1,132	0.0464	(0.0885)	769
Weight for age	-0.58	0.0148	(0.0631)	1,132	0.0304	(0.0960)	769
Weight for height	-0.04	0.0246	(0.0623)	1,140	0.0074	(0.0984)	777
Chronic malnutrition	-0.98	0.0082	(0.0163)	1,164	0.0449	(0.0280)	796
Global malnutrition	-0.47	-0.0070	(0.0135)	1,182	-0.0007	(0.0194)	812
Acute malnutrition	0.18	-0.0001	(0.0053)	1,165	-0.0033	(0.0070)	797
Overweight	9.55	-0.0083	(0.0078)	1,153	-0.0037	(0.0115)	790
Thinness by body mass index	5.10	0.0029	(0.0039)	1,145	0.0082	(0.0082)	781
Obesity by body mass index	0.80	0.0007	(0.0136)	1,192	-0.0081	(0.0202)	811
PSYCHOSOCIAL DEVELOPMENT							
PIPPS - Aggressive behavior	2.03	0.0521	(0.0547)	567	0.0581	(0.0788)	405
PIPPS - Social isolation	1.62	0.0975	(0.0624)	664	-0.0552	(0.1035)	476
PIPPS - Adequate interaction	2.79	-0.0661	(0.0705)	696	0.0891	(0.0963)	500
ASQ - Socioemotional	52.75	-1.6875	(1.2290)	1,413	-3.8857	(1.3760) ***	978
COGNITIVE DEVELOPMENT							
ASQ - Communication	48.30	1.8754	(1.4359)	284	0.6083	(1.9263)	189
ASQ - Problem solving	48.92	0.6552	(1.2202)	322	4.0663	(1.3371) ***	219
ASQ - Cognitive	97.22	3.0515	(2.2822)	285	5.7487	(2.7108) **	190
WM - Brief intelectual ability	87.71	-2.2651	(1.7464)	390	-1.2249	(1.8911)	269
WM - Verbal ability	80.76	0.1344	(1.4193)	397	-0.5936	(1.9625)	279
WM - Mathematical reasoning	85.12	1.4247	(2.4357)	450	1.8240	(2.7077)	317
WM - Knowledge of the world	83.41	1.4664	(1.1423)	399	2.1422	(1.5766)	280
PSYCHOMOTOR DEVELOPMENT							
ASQ - Fine motor skills	42.29	-2.2928	(1.6780)	335	1.2222	(2.2715)	221
ASQ - Gross motor skills	49.68	0.2136	(1.2982)	317	0.1919	(1.6843)	214

*** Statistically significant difference at 1%, ** at 5%, * at 10%

Robust standard errors by clustering at HCB level. Identical results if estimated by generalized least squares (random effects)

All models include child's gender and age controls.

[1] All of 67 HCB whose MC participated and graduated from the PTECA program

[2] The treatment group only includes the 26 MC that finalized the PTECA program in December 2008

In every case, other relevant explanatory variables for health outcomes include MC's educational attainment, maternal educational attainment, number of children in the HCB and number of children in the household. This is probably due to higher probabilities of contagion when the size of the group of peers increases. In addition, total income that the MC receives in compensation for her work in the HCB is a very important variable in explaining health outcomes. It is likely that these positive effect on health outcomes is the result of higher compliance with administrative outcomes associated with hygiene practices such as washing hands of kitchen personnel and children before eating/cooking and after using the bathroom; and a better response of the MC to cases of illness which might help avoid contagion.

The second panel in Table 9 shows program effects on indicators of children's nutritional status. We include Z-scores of height for age, weight for age and weight for height according to NCHS (1977) standards.[24] We also include indicators for chronic, global, and acute malnutrition, overweight (by weight for age), and thinness and obesity by body mass index. Average chronic malnutrition in the sample is about 9.7%, global malnutrition is 5.4% and finally acute malnutrition is around 0.8%.

We do not observe statistically significant program effects on any of the nutritional status variables. Same thing happens when one compares the control group with MC that successfully completed the program in December 2008, i.e., with children that had been exposed to the program for longer. The results indicate that differences in nutritional status are almost completely explained by differences in MC's wealth, her income received as compensation for her work as MC, the number of children in the HCB, mother's educational attainment, wealth of child's household and total number of children in the household. In other words, differences in nutritional status are almost completely attributable to differences in income conditional on number of children. In addition, qualitative results obtained from focus groups and in-depth interviews indicate that both, treatment and control MC, were fully aware of their role as promoters of children's health and nutritional status. This is very clear in their discourse about their responsibilities as care providers. However, there was a clear difference of treatment MC with respect to control MC, in that they were also aware of their role in the promotion of a more comprehensive development that included cognitive and non-cognitive dimensions.

In the third panel in Table 9 we show indicators of children's socio-emotional development. First, we report the Penn Interactive Peer Scale – PIPPS (Castro, Mendez and Fantuzzo, 2002). This instrument evaluates patterns of social interaction of children in the context of games. It is reported by the MC and contains 32 items that differentiate positive behaviors (e.g. cooperation) from negative ones (e.g., aggression and isolation). We use the scale to construct three subscales: positive interaction, aggression and isolation. All are scales from 1 to 4. For the first one, higher is better while the opposite occurs we the second and third. This instrument is designed for children older than 3 years of age, so it is only available for this subsample. The results in Table 9 indicate that there are no significant effects of the program on this indicator for children older than three.

[24] Results are very similar when using Z-scores by OMS (2005) standards.

Second, we present the instrument Ages and Stages – socioemotional for all children between the ages of 0 and 5. The instrument consists of a set of 8 questionnaires for parents aimed at identifying profiles of psychosocial development of children. The results indicate a positive and significant effect of the program only when we compare control children with children in HCB whose MC successfully completed the program in December 2008. In particular, we observe an effect of 3.8 scale points (mean=53 and s.d.=21), an effect of 7.7 scale points for children younger than three and the estimated effect for children older than three is statistically insignificant. This is a result suggests that it is easier to have larger impacts on younger children who have recently entered the program than on older children who have been exposed to the program without the intervention for longer.[25]

Finally, in the last panel in Table 9 we present treatment effects on children's cognitive development. To evaluate cognitive development of children older than three we use the Woodcock-Muñoz Battery III (WM-III; Muñoz-Sandoval, A.F., Woodcock, R.W., McGrew, K.S., & Mather, N., 2005) which as a standardized assessment instrument for cognitive and learning ability. We selected four of the test's subscales that allow us to get scores for brief intellectual ability, verbal hability, mathematical reasoning and knowledge of the word. We applied this test to a subsample of 540 children older than three.

In addition, we assessed cognitive ability of children younger than three by using the parent-reported Ages and Stages Questionnaire (ASQ). Using the subscales of communications and problem solving we construct a measure of cognitive ability and using the fine and gross motor development subscales we measure psychomotor development of all children younger than 3.

The results indicate positive and significant program effects on the problem solving subscale for children younger than three. This difference is statistically significant only when comparing control children with children in HCB whose mother completed the program in 2008, i.e., children who had been exposed to the program for a year. In particular, we estimate an effect of 4 scale points (mean=47, s.d.=11.5). For children older than three, we do not observe significant effects of the program. Once again, this evidence suggests that it is easier to have larger impacts on younger children who have recently entered the program than on older children who have been exposed to the program without the intervention for longer, and that this kind of intervention requires at least one year of exposure in order to observe positive results. There are no program effects on young children's psychomotor development.

These positive effects on cognitive and non-cognitive development are correlated with a more comprehensive discourse of treated MC about their responsibility for children's integral development in regards to communication, social skills, and cognitive development, on top of their role in children's health and nutritional status. Professionalized MC are clearly more able to talk about child development and teaching-learning strategies than control MC.[26] This is, in turn, reflected in better quality of care offered at HCB, better pedagogical routines within the HCB and more interaction with parents, all of which, have an effect on children's development.

[25] Something similar occurs with cognitive development which we report later in this section.
[26] Revealed during focus groups and in-depth interviews.

In sum, evident transformations in the HCB have had positive effects on children's health, and cognitive and socio-emotional development of children younger than three. The effects are stronger when we compare the control group with MC that successfully completed the PTECA longer ago, meaning that children have been exposed for the intervention for at least one year.

5. Conclusions

In 2007, a program consisting of a professional-technical degree for care providers at *Hogares Comunitarios* was implemented in Colombia, in response to evaluation results that suggested that potential positive effects of the program could be significantly reduced because of lack of appropriate training of *madres comunitarias*. The program consists of 2,640 hours of training after which MC obtain a professional-technical degree in child development and attention (PTECA). In this paper, we present results of the impact evaluation of this program ran by ICBF and SENA in the city of Bogotá. In November 2009 we interviewed 140 HCB and assessed most children registered in these centers. We basically use the gradual and somewhat random expansion of the program across neighborhoods in Bogota to construct a rotational random experiment. Around 67 HCB in the sample correspond to MC who had successfully graduated from the PTECA program in December 2008 or July 2009 (the treatment group), while the remaining 73 HCB correspond to MC who expressed interest in the program and signed up in the waiting lists at the local ICBF offices to start classes in January 2010 (the control group).

We present evidence that the two groups are, in fact, basically identical in a wide array of observable characteristics including household income, household composition, poverty levels, health insurance, compensation for their work in the HCB, etc. We thus, proceed to estimate impact effects by comparing mean outcome variables in the treatment group with mean outcome variables in the control group.

The main results can be summarized as follows:

1) We find a positive and significant effect of the program on quality of care in the HCB measured by the Family Day Care Rating Scale. In particular, we estimate an increase of 0.19 points in a scale of 1 to 7, being 7 the optimal quality of care, and being 3,84 the mean in the sample with a standard deviation of 0,64. This scale measures both, quality of infrastructure and quality of processes within the HCB. Both increase with program participation.

2) We find a positive and significant effect of the program on compliance of administrative ICBF guidelines, including guidelines regarding kitchen personnel and guidelines regarding protective practices. The former includes items like personal care of kitchen personnel and most, crucially, hygienic practices like washing hands before cooking and after using the bathroom. The latter includes items like existence of standardized recipes in the HCB, substitution lists, and the appropriate use of a fortified component called bienestarina.

3) We report positive and significant program effects on the frequency of pedagogical routines like reading books, teaching letters, numbers, colors and shapes, teaching body parts, etc.,

and the frequency of use of recyclable pedagogical materials like newspapers, cartons, bottles and old books.

4) We find a positive and significant effect of the program on the amount of information shared by the MC to children's parents about their development, including health and nutrition. In addition, we find a positive effect on the probability that the MC takes at least one action when a child gets sick, in particularly it is more likely that she refers the child to the appropriate health institution, takes him/her directly to the hospital, or provides a home-made medication.

5) These transformations in the HCB have implied, in turn, positive program effects on children's health (diarrhea and cold, flu or cough), socio-emotional development and cognitive development. First, in terms of health we report a positive effect on incidence of diarrhea and incidence of cold, flu or cough when comparing control children with children in HCB whose MC successfully graduated from the program one year ago. These favorable results are likely to be related with an improvement in compliance guidelines, especially those related to hygienic practices in the HCB, and to the fact that MC share more information about children's health with parents which might reduce contagion.

6) We report a positive and significant effect of the PTECA program on socio-emotional development of children but only when comparing control children with children that have been exposed to the program for at least a year. In addition, this positive effects is only significant for children younger than three and is about 7.7 scale points. In addition, we do not observe significant program effects on children older than three, neither measured by AS-SE nor by PIPPS. This evidence suggests that it is easier to have larger impacts on younger children who have recently entered the program than on older children who have been exposed to the program without the intervention for longer, and that this kind of intervention requires at least one year of exposure in order to observe positive results.

7) The results indicate positive effects of the program on cognitive development of younger children (0 to 3 years of age) as measured by the parent-reported ASQ. Again, this difference is only significant for children that have been exposed to the program for at least one year. The effect is roughly one third of a standard deviation. We do not observe significant program effects on cognitive development of children older than 3, neither measured by ASQ or by four different subscales from the WM battery.

8) There are no significant program effects on children's nutritional status. The results indicate that differences in anthropometric measures are completely explained by differences in wealth, both in HCB and their own household, and differences in household size and the number of children in the HCB. Focus groups and in-depth interviews reflect that all MC are aware of the role in promoting nutrition and health, but only treatment MC have a clear discourse about the responsibility in cognitive and socio-emotional development of participant children▪

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