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Nudging Parents to Increase Preschool Attendance in Uruguay

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Abstract[+]

Uruguay has increased it preschool enrollment, reaching almost universal coverage among four- and five-year-olds. However, more than a third of children enrolled in preschool programs have insufficient attendance, with absenteeism higher in schools in lower socioeconomic areas and among younger preschool children. This paper presents the results of a behavioral intervention to increase preschool attendance nationwide. Most previous experiments using behavioral sciences have looked at the impact of nudging parents on attendance and learning for school-age children; this is the first experiment looking at both attendance and child development for preschool children. It is also the first behavioral intervention to use a government mobile app to send messages to parents of preschool children. The intervention had no average treatment effect on attendance, but results ranged widely across groups. Attendance by children in the 25th–75th percentiles of absenteeism rose by 0.32–0.68 days over the course of the 13-week intervention, and attendance among children in remote areas increased by 1.48 days. Among all children in the study, the intervention also increased language development by 0.10 standard deviations, an impact similar to that of very labor-intensive programs, such as home visits. The intervention had stronger effects on children in the remote provinces of Uruguay, increasing various domains of child development by about 0.33 to 0.37 standard deviations. Behavioral interventions seeking to reduce absenteeism and raise test scores usually nudge parents on both the importance of attendance and ways to improve child development. In this experiment, the nudges focused only on absenteeism but had an effect on both.

Keywords: Preschool attendance, behavioral sciences, cognitive biases, absenteeism

JEL Codes: I24, I30, J13

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1. The Problem of Absenteeism in Preschool

Preschool is an invaluable opportunity for children to develop cognitive, socioemotional, and motor skills. But for children to obtain preschool gains, they must be there to learn. Absenteeism rates are typically much higher in preschool than at other school levels. Children who do not regularly attend preschool miss learning opportunities and interrupt their skills acquisition process, which may prevent them from reaching their potential.

The importance of early development transcends childhood; it has repercussions throughout individuals' lives. The literature shows that children with frequent preschool absences are likely to have lower academic results later on and perform worse in the labor market (Romero and Lee 2007; Ehrlich et al. 2014; Berlinski, Galiani, and Manacorda 2008; Taylor, Gibbs, and Slate 2000).

Preschool absenteeism is also important because it has not only individual but collective consequences. Absent children not only absorb less of the benefits of early education, they can also interrupt the development of other children by affecting the dynamics of the classes. Children who regularly miss class need more attention to be able to carry out assigned tasks, delaying the learning of their peers.

Absenteeism can also increase inequality, as children from lower-income households potentially gain more from attending early education programs but tend to be the ones who miss preschool more. Students from low-income environments are more likely to be absent (Ehrlich et al. 2014; Susman-Stillman et al. 2018); children exposed to hazardous environments may also attend less, because of health problems (Romieu et al. 1992).

Socioeconomic differences in learning and the acquisition of skills have been documented in the literature. In Ecuador for example, a child at age 5 whose mother completed only primary education has an 18-month delay in vocabulary development compared with a child whose mother completed tertiary education (Berlinski et al. 2015). Inequality in learning outcomes is pervasive and increases with age and schooling years, which makes intervening early in life particularly critical.

Uruguay has increased preschool enrollment, reaching almost universal coverage for four- and five-year-olds. Attendance is a big concern, however. In 2018, more than a third of Uruguayan children enrolled in public preschool centers had insufficient attendance (attended just 70–139 of the school year's 187 days). Students enrolled in schools in lower socioeconomic areas had higher levels of absenteeism. Absences are also seasonal, with peaks during the months of July, August, and September. In addition, absences decrease as the grade level increases (Ansari and Purtell 2018): Three-year-old children miss preschool more than four-year-olds, who in turn miss school more than five-year-olds. Once children enroll in primary school, attendance is much more consistent; in primary school, for example, only 11 percent of students have insufficient attendance.

This paper analyzes the effects of a behavioral intervention in Uruguay's public preschools (Consejo Educación Inicial y Primaria [CEIP] centers) across the country to reduce preschool absenteeism. The intervention consisted of a text message campaign that was delivered to parents using the government's mobile app GURÍ Familia, an educational information monitoring system for families designed by CEIP that allows centers and families to communicate with each other.

The fact that attendance increases between preschool and preschool, and increases dramatically in primary school, suggests that cognitive bias (such as the belief that early childhood programs are not as important as later school years) may be a key factor in preschool absenteeism (Ehrlich, et al. 2014; Dubay and Holla 2016; Kalil, Mayer, and Gallegos 2019; UNICEF,2014). To understand patterns of and reasons for absenteeism, we first conducted 10 focus groups with a total of 79 parents in different regions of Uruguay. The findings suggest that many absences—including days missed because of bad weather, family events, and medical appointments—could potentially be prevented. They also reveal that parents underestimate both the number of days missed and the short- and long-term gains of preschool.

We use the findings of the focus groups and insights from behavioral sciences to develop short messages encouraging parents to take their child to preschool on time and continuously throughout the week. The messages were sent to parents for 13 weeks using the GURÍ Familia mobile app. They described the short- and long- term benefits of preschool education, provided feedback on their child's absences in the previous three weeks, and helped families plan the week in order to minimize absenteeism. From a pool of 194 CEIP preschool centers, 97 centers were assigned to the treatment group (parents received weekly messages) and 97 were assigned to the control group (parents received no messages).

This paper presents the results of the first attempt in Latin America to reduce absenteeism in preschool-age children using behavioral science. It shows that nudging parents can be a cost-effective way to reach remote areas and families facing cognitive biases. Messages increased attendance in departments far from the capital, Montevideo, by 1.48 days over a 13-week period, suggesting that it is possible to affect behaviors at a low cost in hard to reach areas with the help of technology. Messages were also effective at reducing absenteeism in children with low to middle range of attendance, increasing their attendance by 0.32–0.68 days over the course of the experiment.

We link and frame the results of the intervention with child development using a unique and rich database from the Child Development Inventory, INDI for its Spanish acronym in Uruguay (Vásquez-Echeverría, (2020)[7]. The results suggest that nudging parents can increase preschool attendance and that improvements in child development potentially reduce inequality in opportunities. Specifically, language development rose by 0.10 standard deviations for the full sample of children in the treatment group relative to children in the control group. The effects on children in the northeast were far greater, with increases of 0.37 standard deviations in language, 0.35 standard deviations in cognitive development, and 0.33 standard deviations in attitudes toward learning.

The next section of this paper summarizes the evidence linking attendance in the early years with important short- and long-term outcomes. It shows how behavioral interventions can reduce absenteeism by addressing the cognitive biases of parents. Section 3 introduces the context of the intervention, the methodology, the empirical strategy, and the description of the data used. Sections 4 and 5 present the results and link them with early childhood development outcomes. Section 6 discusses the results and their policy implications.

[7] For more information, see https://indi.psico.edu.uy/

2. Literature Review

Improving learning takes more than just offering quality education for all; it also requires that students enroll and attend school on a regular basis, as there is broad consensus in the literature that absenteeism is strongly connected with poor outcomes. During the early years, absenteeism can result in lack of school readiness and lags in literacy and numeracy (Lehr, Sinclair, and Christenson 2004). Absenteeism is also associated with future academic performance and drop-out as well as productivity and income in the labor market (Young, 1996; Romero and Lee 2007; Ehrlich et al. 2014; Berlinski, Galiani, and Manacorda 2008; Taylor, Gibbs, and Slate 2000).

Several factors may influence preprimary attendance (Chang and Romero 2008; Jacob and Lovett 2017). Some are structural, associated with student characteristics and background (education of parents, household income, community infrastructure, transportation, and school- and community-related factors, among others). These factors are difficult and resource intensive to address (Black, Seder, and Kekahio 2014; Cardoso and Verner 2007; Jacob and Lovett 2017; Reid 2005; Romero and Lee 2007;Teshome 2012). Others are tied to cognitive biases that influence parents' decisions. They could be addressed using low-cost interventions (Mayer et al. 2015; Kalil, Mayer, and Gallegos 2019).

Behavioral science posits that individuals do not necessarily respond to their environment in a rational way when they make decisions. Psychological barriers are mental hurdles created as a result of the analysis of information. Evidence suggests the importance of cognitive biases and the lack of information on children's attendance to preschool programs, especially in low-income contexts (Susman-Stillman et al. 2018; Greenberg, Adams, and Michie 2016).

Small interventions that try to affect cognitive biases that affect day-to-day decisions can increase the effectiveness of interventions. By looking at the specific situations that parents face, researchers can redesign programs in ways that increase the chances that parents modify their behaviors without affecting their capacity for making choices.

Gennetian, Darling, and Aber (2016) identify three common behaviors and cognitive biases parents face when making decisions that affect the early childhood development outcomes of their children:

- present bias, which leads parents to underestimate the returns to education and miscalculate future benefits or rewards
- mismatched identity, which occurs when parents are not receptive to an intervention and lack empowerment because they have difficulty aligning with and incorporating the recommendations of a program
- limited attention, which makes it hard for parents to incorporate and apply the recommendations of a program into routine situations at home.

Care and upbringing decisions are affected by the fact that parents tend to discount future losses compared with present needs. This tendency is particularly common in contexts of poverty, where stress factors related to income instability and logistical and practical childcare constraints make parents focus on the present (Dohmen et al. 2010; Gennetian and Shafir 2015; Golsteyn, Gronqvist, and Lindahl 2013; Lawrance 1991; Mani et al. 2013; Spears 2011).

One of the most common examples is the dilemma parents face between sending a child to school, the benefits of which will materialize only in the future, versus allowing the child to drop and work to contribute to the household's income, in order to help it cover pressing current needs. When making human capital decisions, parents tend to underinvest when gains occur in the future. The fact that the benefits of early childhood education will materialize in the long run leads parents to underestimate their importance (Mayer et al. 2015)

Different sets of beliefs can also lead parents to undervalue education and attendance, particularly when children are young (Hammer et al. 2007; Henderson and Mapp 2002; Hoover-Dempsey and Sandler 1997). When early childhood education is perceived as an extension of childcare, parents often do not appreciate the learning opportunities their children miss every day they do not attend school (Robinson et al. 2018). In addition, when the school system does not recognize the socioeconomic challenges families are facing, there can be a feeling of mistrust and false beliefs regarding the value of schooling early in life (Hoover-Dempsey and Sandler 1997; Robinson et al. 2018).

Parents also tend to underestimate how often their children miss school. A survey conducted in the United States asked parents whose children had high absence rates how many school days their children had missed and how their absences compared with their classmates'. On average, parents reported that their children missed 9.6 fewer days than the average student, when they actually missed 17.8 days more on average (Rogers and Feller 2018). Even when parents value education and school attendance, they may not feel pressure to bring their children to school if they perceive that their children's participation is not below average (Robinson et al. 2018).

Sending information to parents has proven successful in improving school outcomes for children and youth. But is not just providing information that makes interventions effective; it is also the use of behavioral tools to deliver the information and change parents biases and beliefs**.** Various tools exist with which to modify cognitive biases: The intervention described in this paper applied some of these tools in an attempt to increase preschool attendance in Uruguay:

- *Reminders.* Parents may mean to bring their children to school every day but fail to comply. They can forget about their intention or procrastinate when they were supposed to take a specific action. Planning prompts have been shown to be effective in reducing student absenteeism (Kalil, Mayer, and Gallegos 2019). Text messages are the most commonly used way to communicate these reminders (Richburg-Hayes et al. 2014).
- *Positive affirmations.* Their environment may make it difficult for parents to process recommendations sent through a text message campaign. In low-income contexts, for example, parents' identities may not allow them to act on the campaign recommendations. Affirming their parental identity and their capacity as parents can increase their involvement in parenting support programs (Gennetian, Darling, and Aber 2016, Rogers et al. 2017).
- *Social norms.* People's decisions may affect the decisions of others, often unconsciously. Social influence can be used to directly or indirectly foster a particular type of behavior. Comparing an individual's behavior with that of her or his peers, neighbors, or friends is an effective way of changing behavior (Gennetian, Darling, and Aber 2016).
- *Feedback.* Parents may underestimate the number of days their children have been absent (Richburg-Hayes et al. 2014). Some researchers suggest that this lack of precision may be driven by limitations in parents' attention or by their bias with respect to their children (Kalil, Mayer, and

Gallegos 2019). Feedback messages can correct parents' mistaken beliefs about their children's attendance rate (Kalil, Mayer, and Gallegos 2019; Robinson et al. 2018; Rogers and Feller 2016).

- *Correcting false beliefs*. Beliefs can either facilitate or prevent people from behaving a certain way (Lewin 1951). People's false beliefs can arise from bias perceptions (Prentice and Miller 1993) or a lack of knowledge, and these beliefs can interfere with beneficial behaviors. Providing accurate information to correct parents' beliefs has proved helpful in increasing school attendance (Rogers and Frey 2014; Kalil, Mayer, and Gallegos 2019; Rogers and Feller 2018).
- *Gains in the short and long term.* Parents face intertemporal decisions in parental investment (Bloomfield, Balsa, and Cid 2019). They may fail to internalize the short- and long-run benefits of preschool education and the negative consequences caused by absences.

Parents tend to overestimate the performance of their children and underestimate their absences. Providing them with accurate information about their children's school results has been shown to be effective in improving educational outputs of children and youth (Bergman 2015; Berlinski et al. 2016). Some studies have focused on the use of behavioral tools to reduce absenteeism by correcting parents' mistaken beliefs about their children's attendance, correcting their false beliefs about the importance of attendance, empowering parents by acknowledging their influence over their children's school outcomes (positive affirmations), and sending reminders to help parents organize their time, through low-cost interventions like text messages (Rogers and Feller 2018; Rogers et al. 2017; Bergman and Chan 2019; Robinson et al. 2018; Kalil, Mayer, and Gallegos 2019). Table A.1 in the annex summarizes the interventions and describes their results.

For preschool children, behavioral interventions have increase attendance at low cost, although the literature is concentrated in developed countries. Robinson et al. (2018) find that an intervention that sought to change parents' false beliefs about pre-primary education through messages reduced absenteeism and chronic absenteeism in California. Parents received six rounds of mailings during the school year that promoted preschool attendance by stressing the importance of regular attendance, indicating the number of days the child missed, and promoting planning tools, to address parents' limited attention. The results showed that absenteeism declined by 7.7 percent, with chronic absenteeism declining by 14.9 percent.

To reduce absenteeism among preschool children participating in Head Start programs, Chicago implemented Show Up 2 Grow Up. This intervention sent four to six text messages a week to parents for 18 weeks. Four different types of messages were sent: reminders to send children to school, feedback on absenteeism, messages about the importance of preschool education, and planning prompts. The randomized control trial included 780 households at 9 preschool centers; it was implemented in three rounds from 2016 to 2017. The results show a statistically significant average treatment effect: The intervention increased the number of days attended by 2.5 (0.15 standard deviations) over the course of the intervention. The intervention also decreased the percentage of children that attended 85 percent or less of the time by 20 percent (Kalil, Mayer, and Gallegos 2019).

During the 2015/16 school year, a Pittsburgh public school implemented a connect-text intervention to reduce chronic absenteeism in initial education through a two-way system called Connect-Text, which allowed teachers and parents to exchange information. Parents received three types of information: messages with important information about school events (planning prompts), individual messages with feedback on the attendance of their child, and support messages with positive affirmations about the

importance of the school year and advice to strengthen their child's learning (positive parental identity). Messages were sent once a week. Smythe-Leistico and Page (2018) find that chronic absenteeism among children in the treated school (13.3 percent) was substantially lower than in the school in the control group (24.4 percent).

Cunha et al. (2017) analyze whether communication with parents works because it provides personalized information about students' absences or because it reinforces the importance of school attendance.[8] Messages that share information about children's absences had small effects. Messages with declarations about the importance of attendance accounted for 89–126 percent of the effects of messages with feedback about attendance. Doss et al. (2017) and Karlan, Morten, and Zinman (2012) show that differentiated information rather than generic messages improves results.

Several messaging interventions sent three to four messages a week, in the belief that more messages can improve the results but that too many can have counterproductive effects. Cortes et al. (2018) find that sending three messages a week is more effective in changing the reported behaviors of parents and increasing learning for children with the lowest achievements than sending five messages a week.

3. Methodology and Data

3.1 Context

Uruguay dramatically increased its preschool coverage in recent years, reaching almost universal education for children ages four and five. Its progress reflects major investment in infrastructure and education personnel to increase enrollment.

Attendance is a problem, however. In 2018, the chronic absenteeism rate (attendance at 90 percent or less of classes) was 81 percent, and insufficient attendance (attendance of just 70–139 of the school year's 187 days) was 38 percent (up from 30 percent in 2013). The average number of days absent rose from 34 days in 2013 to 41 days in 2018. Absences are seasonal, peaking in July, August, and September. Absenteeism is higher among children at schools in lower socioeconomic areas and among children in lower preschool grades.

The experiment was implemented in Uruguay, in collaboration with the Consejo Educación Inicial y Primaria (CEIP) at the Administración Nacional de Educación Pública (ANEP). CEIP oversees national education policy for preschool and primary education. To improve its management capacity, in 2011 CEIP launched the system GURÍ, a unified management system for records and information. This web information system registers information on students, parents, and teachers. It contains information on enrollment, student's attendance and grades, and teachers.

In 2016, CEIP launched the mobile app GURÍ Familia, which parents can use to access information on their children. The app also allows teachers and parents to communicate with each other. Annex figure A.1 shows a screenshot of the GURÍ Familia mobile app.

[8] The experiment described was conducted in Brazil. Parents in two treatment groups received either text messages about absences, tardiness, and completion of homework or text messages about the importance of attendance, punctuality, and homework completion; the control group received no text messages. Annex table A.1 provides more information on this study.

We partnered with CEIP to design and implement a communication campaign for parents with the goal of increasing preschool students' attendance. The campaign used the mobile app as a communication channel with parents. It sought to address behavioral biases that may prevent parents from taking their children to school.

3.2 Description of the Intervention

The intervention consisted of a text message campaign delivered using the mobile app. There are several benefits of using a mobile app to implement communication campaigns. One is the low cost of implementing and scaling it up. Once the programming of messages is done, the cost of expanding and replicating the campaign is almost zero.

Another benefit is that parents in Latin America change phone numbers frequently. The mobile app is independent of the cellphone number, helping maintain contact with parents. The app may also help prevent distrust from parents toward the messages, as they receive them through an institutional channel. The effectiveness of mobile apps to deliver information to parents is limited, however, by the low take-up of this technology.

The text messages targeted malleable factors that contribute to student absences. To understand why student absenteeism occurs, we conducted 10 focus groups with a total of 79 parents in different regions of Uruguay. The focus groups explored parents' perceptions, attitudes, and reported behavior on different dimensions that the literature has shown to be linked to student attendance (the instrument is shown in annex table A.2). The focus group results suggested that although some absences are produced by structural factors (such as illness or unexpected events), many absences (such as absences related to bad weather, family events, and medical appointments) are preventable. An intervention that targets malleable components of absence could, therefore, increase student attendance.

The focus groups also revealed that false perceptions and beliefs play a role in how parents think about attendance, with parents underestimating the number of days their children missed classes. This finding is consistent with the literature (Kalil, Mayer, and Gallegos 2019; Robinson et al. 2018; Rogers and Feller 2018). Preschool in Uruguay comprises grades 3, 4, and 5. Only the two last grades are mandatory. Whether preschool is compulsory or not may influence parents' beliefs and expectations. The focus groups revealed that parents value preschool education in general but that they underestimate the short- and long-term cognitive and life gains it yields, which may translate into lower investment in their children's preschool education.

Based on this research, we designed messages that included behavioral tools to address parents' biases. Each message included a personalization component that has proven to be effective (Karlan, Morten, and Zinman 2012). In addition, we combined four behavioral tools to induce parents to change behavior:

- *Feedback*. We sent a feedback message to parents every three weeks that included the number of times their children were absent.[9] If a child did not miss any days of school, the message ended

[9] Feedback was given every three weeks, to increase the probability that the child missed at least one school day in the month. Pre-treatment data showed that 53 percent of students missed at least one day every three weeks.

by congratulating the parent. An example of a feedback message is *"[Parent name], [child name] was absent [number] days in the last three weeks. Help [him/her] develop a habit of responsibility by avoiding missing more days the rest of the year!"*

- *Planning prompt*. We sent planning prompts to help parents associate their goals with concrete actions to achieve them or to identify potential events that might prevent them from achieving the goal. An example of this type of message is *"[Parent name]: Think about the reasons that may have prevented your child from attending school last year. Create a plan to avoid them this school year!"*
- *Positive parental identity.* We included messages with positive affirmations of parents' ability to ensure their children attended preschool, in order to increase their receptiveness to the message campaign. Examples of these type of messages are *"[Parent name], what [child name] learns in preschool will last for a lifetime. Help [her/him] go to preschool. You play an important role in improving [her/his] attendance!"*
- *Gains in the short and long term*. We designed messages that underlined the socioemotional and cognitive skills children gain by attending preschool. We also mentioned how missing days of class hampers these gains. These messages were delivered in two variations. The first combined negative and positive framing. The second disaggregated the benefits of preschool education in the short run (e.g., math skills) and the long run (e.g., future job prospects). Examples of this type of message are "*Hello [parent name]. Have you noticed the change in the development of [child name] since [she/he] attends preschool? Imagine what it would be like if [she/he] went every day. Let the rain not be an excuse, take [her/him]!"; "Hello [Parent name]. Preschool attendance is associated with better achievements in the educational trajectory. It is important that [child name] attend daily!"*

A total of 43 messages were designed and sent to treatment group parents during the last three months of the school year.[10] Parents in the control group did not receive messages. As some parents agreed to participate in the program after it started, on average we delivered 34 messages per parent. Annex table A.3 presents the numbers of messages per type of message.

Cunha et al. (2017) finds that alternating the time of delivery is more effective than sending messages at a fixed time. We therefore varied the day and time of delivery to prevent parents from anticipating the message. Every week we varied the frequency of messages: one week we delivered three messages, on Tuesday, Thursday, and Sunday; the following week we sent four messages, on Monday, Wednesday, Thursday, and Sunday. We limited the number of messages to a maximum of four, as more messages have been found to reduce the effect of the intervention (Cortes et al. 2018). We also combined weekend and weekdays, as the literature suggests heterogeneous effects conditional on which days messages are sent (Cortes et al. 2018). The timing of the delivery also varied, with messages sent at either 5 pm or 7 pm. We always sent a message on Thursday, because Friday is the day when students are most likely to miss class (see annex figure A.2). An introduction and a closing message were included at the beginning and end of the campaign. Table 1 describes each behavioral bias we sought to counter and how the intervention addressed it.

[10] The campaign started on September 22 and ended on December 22, 2019.

Table 1 Behavioral biases addressed by the intervention

Behavioral bias	*Description*	*Type of message*	*Example*
False beliefs	Parents underestimate how often their children are absent.	Feedback	[Parent name]: [Child's name] missed [number] days of preschool in the last three weeks. Daily attendance is important, don't let [him/her] be missed!
Present bias	Most people tend to invest less than optimally in a specific activity when the reward for engaging in the activity is received only in the future. Parents can fail to internalize the future benefits derived from their investments and consequently make short-sighted investment decisions in their children.	Gains in the short term	[Parent name]: Did you love it when [child's name] showed you how [she/he] could tie their shoes by [him/herself? [She/he] learns that and more every day in preschool. Do not stop taking [him/her] there!
		Gains in the long term	[Parent name]: Did you know that if [child's name] attends preschool every day, it generates lasting habits that will reflect in later grades? Don't let [him/her] be missed!
Mismatched identity	Parents do not believe that they can change their child's attendance through their own efforts. Parents are not receptive to intervention goals.	Positive parental identity	[Parent name]: What you do for [child's name] today—for example, taking [her/him] to preschool so [she/he] does not miss—will be reflected in [her/his] future. You have a key role in your child's education!
Limited attention	Parents forget to make decisions they intended to make and fail to take actions they planned to take. Day-to-day tasks may distract parents from more distant goals and cause them to pay limited attention to beneficial parenting practices.	Planning prompts	[Parent name]: Organize your time so that [child's name] can go to preschool every day. There are new lessons this week. Take [her/him]!

3.3 Participant Recruitment

We included in the experiment the 194 public schools in Uruguay that have only preschool classes. Using CEIP administrative data, we determined that 39,438 parents and children at those schools were registered in the GURÍ system. During the school year, 19,272 parents (49 percent) of parents with children at the 194 schools accessed the GURÍ mobile app at least once. We sent an information message and a consent form to those parents, informing them that their school was eligible for participating in a communication campaign to increase attendance and that they could choose whether or not to participate. Among them, 6,799 (17 percent of all parents registered in GURÍ and 35 percent of eligible parents) responded. Of the parents who responded, 4,098 (10 percent of all parents and 21 percent of eligible parents) agreed to participate in the campaign. We randomly assigned 97 preschools to treatment and 97 to control groups. As part of the enrollment process, we held online meetings with teachers and principals on the campaign and the eligibility of their school for the program.

3.4 Take-Up

One of the advantages of using GURÍ system data is that it allows us to study the differences in characteristics of parents who were eligible for the program and those who were not. We can also study whether parents who agreed to join the campaign differed from those that did not.

Table 2 compares the characteristics of and outcomes for parents who have access to GURÍ Familia and those who did not. It shows that students whose parents had access to the GURÍ mobile app have better overall outcomes than those who did not. They attended school 8.8 days more per year on average and were 4.7 percentage points more likely to attend school. They were also 5.5 percentage points less likely to fall into chronic absenteeism. Students in the sample attended a total of 145 out of the 187 school days (77 percent). Chronic absenteeism is prevalent, with 79 percent of students having an attendance rate of less than 90 percent.

Table 2 Sample characteristics of parents who were eligible and not eligible for the campaign and parents that agreed and did not agree to participate

	Comparison between non eligible and eligible parents					*Comparison between participants and nonparticipants*			
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(2)*	*(3)*	*(4)*	*(5)*
Item	*Sample mean*	*No access*	*Access*	*P-value*	*Observations*	*Do not accept*	*Accepts*	*P-value*	*Observations*
School socioeconomic status [a]	3.38	3.33	3.44	0.19	38,435	3.47	3.31	0.00	18,887
	(0.11)	(0.12)	(0.12)			(0.01)	(0.01)		
Grade 3	0.30	0.30	0.29	0.12	39,438	0.29	0.29	0.75	19,272
	(0.00)	(0.01)	(0.01)			(0.01)	(0.01)		
Grade 4	0.375	0.37	0.376	0.84	39,438	0.38	0.378	0.79	19,272
	(0.00)	(0.01)	(0.01)			(0.01)	(0.01)		
Grade 5	0.33	0.32	0.336	0.10	39,438	0.34	0.336	0.95	19,272
	(0.01)	(0.01)	(0.01)			(0.01)	(0.01)		
Is the father who accesses	0.37	0.34	0.39	0.01	37,364	0.39	0.39	0.89	19,272
	(0.02)	(0.02)	(0.02)			(0.02)	(0.02)		
Both parents access	0.34	0.30	0.37	0.00	37,364	0.37	0.37	0.86	19,272
	(0.02)	(0.02)	(0.02)			(0.02)	(0.02)		
Student gender	0.49	0.49	0.50	0.48	37,364	0.50	0.49	0.89	19,272
	(0.00)	(0.00)	(0.00)			(0.00)	(0.01)		
#Average number of parents per school	240.12	240.29	239.94	0.94	39,438	238.75	244.33	0.09	19,272
	(7.27)	(7.55)	(7.82)			(7.56)	(9.14)		
Attendance days	144.99	140.67	149.50	0.00	39,438	149.38	149.96	0.32	19,272
	(0.92)	(1.12)	(0.81)			(0.82)	(0.94)		
Attendance rate	0.78	0.75	0.80	0.00	39,438	0.80	0.80	0.32	19,272
	(0.00)	(0.01)	(0.00)			(0.00)	(0.01)		
Chronic absenteeism	0.79	0.81	0.76	0.00	39,438	0.76	0.76	0.54	19,272
	(0.01)	(0.01)	(0.01)			(0.01)	(0.01)		
Baseline attendance days	96.69	94.11	99.39	0.00	39,438	99.40	99.38	0.95	19,272
	(0.56)	(0.67)	(0.51)			(0.51)	(0.59)		
Baseline attendance rate	0.78	0.76	0.80	0.00	39,438	0.80	0.80	0.95	19,272
	(0.01)	(0.01)	(0.00)			(0.00)	(0.01)		

Baseline chronic absenteeism	0.77	0.80	0.74	0.00	39,438	0.74	0.75	0.40	19,272
	(0.01)	(0.01)	(0.01)			(0.01)	(0.01)		
N	39,438	20166	19,272			15,174	4,098		

Note: Columns 1–3 present estimated averages for all subjects in the sample and respective variables. Column 4 presents estimates of the differences between treatment and controls. Column 5 presents the number of observations for each indicator. Figures in parentheses are standard deviations.

a. School socioeconomic status is a categorical variable that takes values from 1 (lower) to 5 (higher).

*** significant at 1 percent level ($p < 0.01$), ** significant at 5 percent level ($p < 0.05$), * significant at 10 percent level ($p < 0.1$).

One or both parents can be registered in the GURÍ system. Among all students with a parent registered, 96 percent have a registered mother and 37 percent have a registered father**.** Among parents with an active session on the mobile app, the probability of both parents being enrolled is 7.2 percentage points; the probability that the father accessed the app is 4.3 percentage points higher. Parents whose children are in preschool grade 5 have a higher probability of accessing the app than parents whose children are in a lower grade. Among parents eligible for the intervention, those who agreed to join the intervention are enrolled in schools that have a lower socioeconomic classification and smaller enrollment.

The take-up results suggests that using the mobile app as a recruitment and treatment strategy limits the reach of the intervention to people who have access to it. Access may be associated with parent and school characteristics, but it is unclear whether other recruitment strategies would have had a different result (for example, if parents that decide to enroll would have been the same that already access the GURÍ app. Implementing strategies to increase access to the mobile app together with the message campaign could potentially increase coverage of this type of intervention. For this reason, before implementation of the intervention, we conducted an experiment to promote GURÍ FAMILIAS use. It increased the use of the app in the 97 treatment schools by 17 percentage points. We then re-randomized the schools to select treatment and control groups in the nudge experiment (Annex figure A.3 shows the timeline of both experiments).

3.5 Treatment Implementation

The intervention lasted 13 weeks, for a total of 63 school days. Table presents descriptive information on the messages delivered and read. To parents who enrolled before the intervention started, we delivered a total of 43 messages. Some parents agreed to participate after the intervention had started and received fewer messages. The mobile app metadata reveal whether parents read the messages. On average, parents read 70 percent of the messages sent.

Table 3 Summary statistics for messages sent and read

Item	*Mean*	*Standard deviation*	*Median*	*Minimum*	*Maximum*
Number of messages sent	34	13	42	1	43
Number of messages read	24	15	24	0	43
Percent of messages read	70	40	80	0	100
Observations	2,165				

Annex figure A.4 plots the distribution of the messages received by all parents and by parents joined the intervention after treatment started.

3.6 Data, Randomization, and Balance

We accessed information on student attendance using GURÍ. The system also has basic information on parents, such as relationship with the child and use of the mobile app. To complement these data, we conducted a short survey to parents through the mobile app. It included questions on parent and student characteristics, perceptions, and causes of absences; parenting behavior; communication behavior and channels with teachers; and perceptions of school quality. We also sent a survey to teachers, to collect data on their characteristics and communication behavior toward parents. The response rate for both

surveys was low, with only 186 parents and 85 teachers completing the survey (4.5 percent of parents and 43.8 percent of teachers).

The GURÍ system registers students´ absences. To calculate attendance during the intervention, we counted the potential school days and subtracted the total days the student was absent. We also identified students with chronic absenteeism (attendance rate of less than 90 percent).

Preschools were randomly assigned to the treatment or control group. We randomized at the school level to anticipate potential spillovers that could contaminate the control group and because of the interdependency of observations at the classroom level. A stratified randomization was implemented taking the (i) assignment to treatment to promote GURÍ FAMILAS use, (ii) median number of absences, and (iii) jurisdiction. We used GURÍ data to evaluate whether randomization achieved balance. Table 4 compares characteristics and outcomes at baseline for students, parents, and schools. We ran two comparisons. The first compares treatment and control groups for parents who were eligible to enroll in the campaign. The second compares parents who did and did not enroll in the campaign. There are no statistically significant differences in either subsample between the treatment and control groups.

Table 4. Sample characteristics

	Eligible parents					Parents enrolled in the campaign				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Item	Sample mean	Control	Treatment	P-value	N	Sample mean	Control	Treatment	P-value	N
Jurisdiction	11.51	10.98	12.02	0.28	19,272	11.76	11.31	12.17	0.37	4,098
	(0.48)	(0.72)	(0.65)			(0.48)	(0.71)	(0.66)		
School socioeconomic status	3.44	3.44	3.43	0.96	18,887	3.31	3.36	3.26	0.69	4,026
	(0.12)	(0.17)	(0.17)			(0.13)	(0.17)	(0.19)		
Grade 3	0.29	0.29	0.29	0.80	19,272	0.29	0.29	0.28	0.70	4,098
	(0.01)	(0.01)	(0.01)			(0.01)	(0.02)	(0.01)		
Grade 4	0.38	0.38	0.37	0.67	19,272	0.38	0.38	0.38	0.83	4,098
	(0.01)	(0.01)	(0.01)			(0.01)	(0.01)	(0.01)		
Grade 5	0.34	0.33	0.34	0.56	19,272	0.34	0.33	0.34	0.52	4,098
	(0.01)	(0.01)	(0.01)			(0.01)	(0.01)	(0.01)		
Father access	0.39	0.39	0.39	0.98	19,272	0.39	0.39	0.38	0.85	4,098
	(0.02)	(0.03)	(0.03)			(0.02)	(0.03)	(0.03)		
Both parents access	0.37	0.37	0.37	0.99	19,272	0.37	0.38	0.37	0.88	4,098
	(0.02)	(0.03)	(0.03)			(0.02)	(0.03)	(0.03)		
Student gender	0.50	0.50	0.49	0.73	19,272	0.49	0.50	0.49	0.35	4,098
	(0.00)	(0.01)	(0.01)			(0.01)	(0.01)	(0.01)		
Average number of parents registered	239.94	249.00	231.15	0.25	19,272	244.33	253.25	236.12	0.35	4,098
	(7.82)	(12.77)	(8.87)			(9.14)	(15.49)	(9.98)		
Average number of parents with access to the app	134.52	138.79	130.38	0.48	19,272	137.50	140.28	134.95	0.68	4,098
	(5.94)	(9.90)	(6.56)			(6.40)	(10.82)	(7.17)		
Average number of parents agreeing to participate in campaign	29.24	29.03	29.44	0.91	19,272	33.36	32.16	34.46	0.58	4,098
	(1.73)	(2.64)	(2.27)			(2.04)	(3.21)	(2.59)		
Take-up ratio (participation/access)	0.21	0.21	0.22	0.37	19,272	0.24	0.23	0.25	0.12	4,098

	(0.01)	(0.01)	(0.01)			(0.01)	(0.01)	(0.01)		
Pre-treatment access to app	0.29	0.29	0.28	0.88	19,272	-	-	-	-	-
	(0.01)	(0.02)	(0.02)							
Answers consent	0.35	0.34	0.36	0.34	19,272	-	-	-	-	-
	(0.01)	(0.01)	(0.01)							
Pre-treatment answers	0.20	0.20	0.20	0.57	19,272	-	-	-	-	-
	(0.01)	(0.01)	(0.01)							
Agreed to participate in campaign	0.21	0.21	0.22	0.37	19,272	-	-	-	-	-
	(0.01)	(0.01)	(0.01)							
Agreed before treatment began	0.12	0.12	0.12	0.48	19,272	-	-	-	-	-
	(0.01)	(0.01)	(0.01)							
Baseline attendance days	99.39	99.87	98.93	0.36	19,272	99.38	99.97	98.83	0.33	4,098
	(0.51)	(0.73)	(0.72)			(0.59)	(0.85)	(0.80)		
Baseline attendance rate	0.80	0.81	0.80	0.36	19,272	0.80	0.81	0.80	0.33	4,098
	(0.00)	(0.01)	(0.01)			(0.01)	(0.01)	(0.01)		
Baseline chronic absenteeism	0.74	0.74	0.75	0.61	19,272	0.75	0.74	0.75	0.67	4,098
	(0.01)	(0.02)	(0.02)			(0.01)	(0.02)	(0.02)		
Previous treatment assignment	0.59	0.59	0.59	0.98	19,272	0.58	0.58	0.58	0.99	4,098
	(0.04)	(0.06)	(0.06)			(0.04)	(0.06)	(0.06)		
N	19,272	9,490	9,782			4,098	1,964	2,134		

Note: Columns 1-3 present estimated averages for all subjects in the sample (treatment and control groups). Column 4 presents estimates of the differences between treatment and control and standard deviations in brackets. Column 5 presents the number of observations for each indicator. Figures in parentheses are standard deviations. *** significant at 1 percent level *(p* < 0.01), ** significant at 5 percent level (*p* < 0.05), * significant at 10 percent level (*p* < 0.1).

3.7 Estimation

The empirical strategy considered the subsample of children whose parents agreed to be part of the campaign. To estimate the effect of the communication campaign, we use the following equation:

$$\mathbf{Y_{ij}} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1 T_j} + \boldsymbol{\beta_2 X_{ij}} + \boldsymbol{\varepsilon_{ij}} \quad (1)$$

where Y measures the outcome of interest for student i in school j, T is a dummy variable that takes the value of 1 if the school is part of the treatment variable, $\boldsymbol{X}$ is a vector for control variables, and ε is the error term. The estimated parameter β_1 captures the causal effect of the treatment on the outcomes of interest. To increase precision, we cluster standard errors at the school level and estimate the effect with three specifications: no control variables, baseline individual variable value, and baseline values and variables that may be correlated with attendance and treatment take up. These variables are jurisdiction, access to the mobile app, pre-treatment absences, and participation in previous experiment.[11] Under the assumption of balanced groups, adding covariates increases precision without changing the estimate of β_1.

4. Results

Table 5 presents the results for attendance days, attendance rate, and chronic absenteeism. It shows that the campaign did not have an effect on average attendance days, attendance rate, or chronic absenteeism. Point estimates show a small non–statistically significant negative coefficient in the simple model. Adding pre-treatment attendance behavior and covariates shows a decline in standard errors, as expected; point estimates turn positive but remain non–statistically significant.

[11] Schools were part of a previous experiment. The treatment consisted of providing access to the GURÍ mobile app and motivating take-up by parent through online calls with teachers.

Table 5 Estimated treatment effect of message campaign on main outcomes

	Attended days			*Attendance rate*			*Chronic absenteeism*		
Dependent variable	*(1)*	*(2)*	*(3)*	*(1)*	*(2)*	*(3)*	*(1)*	*(2)*	*(3)*
Treatment	–0.12	0.42	0.47	0.00	0.01	0.01	0.01	0.00	0.00
	(0.75)	(0.36)	(0.36)	(0.01)	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)
Observations	4,098	4,098	4,098	4,098	4,098	4,098	4,098	4,098	4,098
Mean control	50.64	50.65	50.66	0.80	0.80	0.80	0.68	0.68	0.68
Controls	No	Yes	Extended	No	Yes	Extended	No	Yes	Extended

Note: Table presents the estimated treatment effect for students in the sample. Column 1 shows estimates without controls. Column 2 presents estimates just controlling for baseline. Column 3 controls for a vector for control variables including geographical, access to mobile app, and pre-treatment outcomes. Figures in parentheses are robust standard errors clustered at the school level.
*** significant at 1 percent level ($p < 0.01$), ** significant at 5 percent level ($p < 0.05$), * significant at 10 percent level ($p < 0.1$).

Similar campaigns have found that effects are heterogeneously distributed across quantiles (Kalil et al. 2019). We performed a quantile regression using the attendance distribution. Table 6 shows the effects for the 10th, 25th, 50th, 75th, and 90th quantiles. It reveals that attendance in the 25th, 50th, and 75th quantiles increased by 0.32–0.68 days over the 13-week period.[12] The magnitude of the effect seems to be greater for the lower quantiles, a result that is consistent with the finding of Kalil et al. (2019).

Table 6 Estimated treatment effect of message campaign by attendance quantile.

	Quantile				
Dependent variable	*10th percentile*	*25th percentile*	*50th percentile*	*75th percentile*	*90th percentile*
Treatment	0.25	0.68**	0.52***	0.32**	0.16
	–0.42	–0.27	–0.18	–0.15	–0.2
Observations	4,098	4,098	4,098	4,098	4,098
Mean control	26.91	37.94	43.86	48.17	49.5
Controls	Extended	Extended	Extended	Extended	Extended

Note: Table shows estimated coefficients of a quantile regression of attended days on an indicator for assignment to the treatment group at the 10th, 25th, 50th, 75th, and 90th quantiles, respectively. Figures in parentheses are bootstrapped standard errors (100 replications).
*** significant at 1 percent level ($p < 0.01$), ** significant at 5 percent level ($p < 0.05$), * significant at 10 percent level ($p < 0.1$).

These results shed light on the reasons for preschool absenteeism. The fact that children in the bottom quantile of attendance distribution (children who miss the most school) did not seem to be affected by the treatment may indicate that the limitations their families face in getting them to school are more structural than cognitive. Providing information about the importance of preschool may not have affected attendance because it did not solve the family's structural problems, which may be related to transportation, income, or limited opportunities. Children from the top quantile (children who attend school the most) belong to families that recognize the importance of preschool attendance. They were already aware of the information provided by the messages, which therefore had no impact on their behavior. Treatment was effective in changing the behavior of parents in the middle of the distribution, suggesting that cognitive barriers may be the dominant barrier to their children's preschool attendance.

Table 7 presents the effects by student grade, socioeconomic classification of the school, whether the school is located in the northeast,[13] whether parents received all the messages, student gender, and

[12] We ran the quantile regression including bootstrap *n* (100) repetitions. Without the bootstrap method, we do not find a significant difference for the eligible sample. With the bootstrap method, we find significant differences only for the 25th and 50th for quantiles of parents that agreed to participate in the campaign.

[13] Uruguay is composed of 19 departments. Departments in the northeast include Cerro Largo, Rivera, Salto, Artigas, and Treinta y Trés. These departments are less populous than the southern ones and perform worse on several indicators, including infrastructure, economic activity, health, education, and poverty (Rodríguez, Cossani, and Parrao 2018; Miranda 2014; Calvo et al. 2013; PNUD 2008; Rodríguez 2011; Barrenechea and Troncoso 2008).

whether the message was sent to the mother or the father. The results show non–statistically significant treatment differences in these dimensions, except for schools located in the northeast. Students in schools located in the northeast whose parents participated in the program increased their attendance by 1.48 days over the 13-week intervention.

Table 7 Estimated treatment effect of message campaign by demographic characteristics

Item	*Grade* (1)	*Socioeconomic status* (2)	*Border regions* (3)	*Full treatment* (4)	*Student male* (5)	*Father received message* (6)
Treatment	0.73	0.64	0.31	0.77	0.53	0.47
	(0.58)	(1.09)	(0.40)	(0.48)	(0.44)	(0.40)
Subgroup 1 x treatment	–0.50	0.01	1.48**	–0.52	–0.12	–0.16
	(0.57)	(1.51)	(0.74)	(0.46)	(0.41)	(0.48)
Subgroup 2 x treatment	–0.16	–0.31				
	(0.63)	(1.21)				
Subgroup 3 x treatment		0.52				
		(1.20)				
Subgroup 4 x treatment		–0.84				
		(1.25)				
Observations	4,098	4,026	4,092	4,098	4,098	4,041
Mean control	49.70	46.75	48.90	51.11	50.70	51.75
Controls	Extended	Extended	Extended	Extended	Extended	Extended

Note: All columns control for baseline information. Column 1 considers two subgroups and interactions (student enrolled in grade 4 or 5). Column 2 considers four subgroups and interactions (students attend school classified as socioeconomic quintile 2–5). Column 3 considers observation in the northeastern departments of Artigas, Rivera, Cerro Largo, Salto, and Treinta y Tres. Column 4 considers two subgroups and interactions (received full treatment or not). Columns 5 and 6 examine subgroups based on student and parent gender. Figures in parentheses are robust standard errors clustered at the school level.

*** significant at 1 percent level ($p < 0.01$), ** significant at 5 percent level ($p < 0.05$), * significant at 10 percent level ($p < 0.1$).

4.1 Intensity of Treatment Effect: Exploiting the Exogeneity of Treatment

Nudges were effective in influencing parents' cognitive biases and increasing attendance for some segments of the sample. To test whether the effect of the treatment was greater in parents who read more messages, we exploited the random assignment of treatment as a valuable exogeneity source. It is possible to know whether a parent opened a message, because unlike other studies, this intervention

used a mobile application to send the messages instead of SMS. Assuming that parents opening the messages translates into messages read, we instrumented the read of messages with the random assignment to treatment to test whether more messages read by parents translated into more days of preschool attendance for their children.

For the analysis, we created a binary variable to identify parents who read 24 or more messages, the average number of messages read in the treatment group. If a parent read 24 or more messages, the variable takes the value of one; if he or she read fewer than 24 messages, the value is zero. The first-stage results indicate that treatment status is a relevant instrument for messages read (table 8). As it is the result of a randomization, the exogeneity of the instrument is ensured. For the whole sample, there is no difference in attendance instrumenting by the randomization.

Table 8 Results of instrumental variables (IV) approach for whole sample

	(1)	*(2)*	*(3)*	*(4)*
	First stage	*Second stage*	*First stage*	*Second stage*
Item	*Read at least 24 messages*	*Attendance*	*Read at least 24 messages*	*Attendance*
Treatment	0.55***		0.55***	
	(0.02)		(0.02)	
Read 24 or more messages		–0.21		0.85
		(1.37)		(0.66)
Observations	4,098	4,098	4,098	4,098
Controls	No	No	Yes	Yes

Note: Figures in parentheses are robust standard errors clustered at the school level.
*** significant at 1 percent level ($p < 0.01$), ** significant at 5 percent level ($p < 0.05$), * significant at 10 percent level ($p < 0.1$).

Instrumental variable (IV) analysis was also conducted within the segments in which the treatment had a significant effect. Table 9 shows the result for border regions. After controlling for pre-treatment attendance behavior and covariates, we found that attendance for children in the northeast areas whose parents read 24 or more messages increased 4.44 days compared to parents who did not receive the nudges or read fewer than 24 messages over the course of the intervention. No difference was found by attendance percentiles (tables available upon request).

Table 9 Results of instrumental variables (IV) approach for parents in northeastern departments

Item	*(1)* ***First stage*** *Read at least 24 messages*	*(2)* ***Second stage*** *Attendance*	*(3)* ***First stage*** *Read at least 24 messages*	*(4)* ***Second stage*** *Attendance*
Treatment	0.46***		0.43***	
	(0.05)		(0.04)	
Read 24 or more messages		5.06**		4.44***
		(2.34)		(1.35)
Observations	432	432	432	432
Controls	No	No	Yes	Yes

Note: Figures in parentheses are robust standard errors clustered at the school level.
*** significant at 1 percent level (p < 0.01), ** significant at 5 percent level (p < 0.05), * significant at 10 percent level (p < 0.1).

In the northeast, where socioeconomic levels are lower, the nudges were effective to increase preschool attendance. Instrumental variable exercise shows that in these departments impacts over preschool attendance were bigger for those parents who read more messages. Low-cost interventions can have significant impacts on remote populations thanks to the use of technology. Several characteristics need to be taken into consideration to ensure that messages reach parents. Although this intervention was carefully designed to do so—messages were short, entertaining, and easy to read—it is possible to improve aspects such as delivery methods and graphic design, in order to engage the targeted population even more, ensuring a higher read rate and therefore better results.

4.2 Spillover Analysis

Text message campaigns can produce spillovers effects on individuals that did not receive the messages. Rogers and Feller (2018) find that a text message campaign to reduce student absenteeism had spillovers on nontargeted siblings living in the same household. Cunha et al. (2017) find that a text message campaign to improve education outcomes had spillover effects on students that did not receive the intervention within the same class. Berlinski et al. (2016) find evidence of incremental positive spillovers from having more children treated at the class level.

We study two potential spillovers. The first relates to the dissemination of information on the existence of the campaign. Parents who participated in the campaign and were selected to receive the messages may share the existence of the campaign and its content with others. Parents who did not participate may learn about the message from their peers and agree to participate.

Table 10 shows the probability of agreeing to participate in the campaign after the intervention started. Parents who accessed the mobile app in the treatment group had a 2 percentage point higher probability of agreeing to be part of the campaign than parents in the control group. Among all parents who participated in the campaign, the probability of participation after the intervention started was 6–8 percentage points higher for the treatment group. This result suggests that parents in the treatment

schools who initially did not consider joining or did not read the information message before the campaign started later accessed the mobile app and decided to join. This change may have occurred as a result of treatment parents sharing information about the campaign and promoting the messages' content, which motivated other parents in treated schools to join.

Table 10 Probability of joining the campaign after it had started

Dependent variable	*(1) Accepts after treatment*	*(2) Accepts after treatment*
All parents		
Treatment	0.01*	0.01**
	(0.01)	(0.01)
Observations	39,438	39,438
Controls	No	Yes
Eligible parents		
Treatment	0.02*	0.02**
	(0.01)	(0.01)
Observations	19,272	19,272
Controls	No	Yes
Parents who participated		
Treatment	0.06*	0.08***
	(0.03)	(0.03)
Observations	4,098	4,098
Controls	No	Yes

Note: Table presents the estimated treatment effect for students in the sample. For each dependent variable, it presents the estimates without controls and after controlling for covariates. Figures in parentheses are robust standard errors clustered at the school level.
*** significant at 1 percent level ($p < 0.01$), ** significant at 5 percent level ($p < 0.05$), * significant at 10 percent level ($p < 0.1$).

If information about the existence of the campaign was shared, information on the content could also be shared. Parents who did not participate in the campaign could have learned about the content of the messages from their peers. To explore this hypothesis, we analyzed the sample of parents who did not participate in the intervention, comparing treatment and control schools (table 11). There were 15,174 parents who did not join the campaign (38 percent of the total sample and 79 percent of the eligible sample).

Table 11 Balance test between treatment and control parents that did not join the message campaign

Item	*(1) Sample mean*	*(2) Control*	*(3) Treatment*	*(4) P-value*	*(5) N*
Jurisdiction	11.44	10.89	11.98	0.27	15,174
	(0.49)	(0.74)	(0.66)		
School socioeconomic status	3.47	3.46	3.48	0.96	14,861
	(0.12)	(0.17)	(0.17)		
Grade 3	0.29	0.29	0.29	0.86	15,174
	(0.01)	(0.01)	(0.01)		
Grade 4	0.38	0.38	0.37	0.67	15,174
	(0.01)	(0.01)	(0.01)		
Grade 5	0.34	0.33	0.34	0.62	15,174
	(0.01)	(0.01)	(0.01)		
Father access	0.39	0.38	0.39	0.93	15,174
	(0.02)	(0.03)	(0.03)		
Both parents	0.37	0.37	0.37	0.98	15,174
	(0.02)	(0.03)	(0.03)		
Student gender	0.50	0.50	0.50	0.93	15,174
	(0.00)	(0.01)	(0.01)		
Average number of parents registered	238.75	247.89	229.76	0.23	15,174
	(7.57)	(12.20)	(8.70)		
Average number of parent's access	133.71	138.40	129.10	0.43	15,174
	(5.91)	(9.82)	(6.46)		
Average number of parents that agreed to participate in intervention	28.13	28.22	28.04	0.96	15,174
	(1.65)	(2.50)	(2.17)		
Pre-treatment access	0.31	0.30	0.33	0.39	15,174
	(0.02)	(0.02)	(0.02)		
Answers consent	0.18	0.17	0.18	0.39	15,174
	(0.01)	(0.01)	(0.01)		
Pre-treatment answer	0.10	0.10	0.10	0.95	15,174
	(0.00)	(0.01)	(0.01)		
Baseline attendance days	99.40	99.84	98.96	0.39	15,174
	(0.51)	(0.73)	(0.72)		
Baseline attendance rate	0.80	0.81	0.80	0.39	15,174
	(0.00)	(0.01)	(0.01)		
Baseline chronic absenteeism	0.74	0.74	0.75	0.61	15,174
	(0.01)	(0.02)	(0.02)		
Observations	15,174	7,526	7,648		

Note: Columns 1–3 present estimated averages for all subjects in the sample and respective subsamples. Column 4 presents estimates of the differences between the treatment and control groups. Column 5 presents the number of observations for each indicator. Figures in parentheses are standard deviations.

*** significant at 1 percent level ($p < 0.01$), ** significant at 5 percent level ($p < 0.05$), * significant at 10 percent level ($p < 0.1$).

There were no differences in attendance between treatment and control schools in the sample of children whose parents did not participate in the campaign (table 12). For schools in the northeast, however, there was a significant effect of 1 additional day over the 13-week intervention. The magnitude of the effect is similar to the one for students whose parents were treated. This result is consistent with the findings of Cunha et al. (2017).

Table 12 Effects of message campaign on attendance of children from participating households

Item	*(1)* *Attendance days*	*(2)* *Attendance days*
Treatment	0.05	-0.07
	(0.20)	(0.22)
Remotest regions		1.04*
		(0.57)
Observations	15,174	15,174
Mean control	50.18	50.18
Controls	Extended	Extended

Note: Table presents estimated treatment effect for students in the sample. Figures in parentheses are robust standard errors clustered at the school level. *** significant at 1 percent level ($p < 0.01$), ** significant at 5 percent level ($p < 0.05$), * significant at 10 percent level ($p < 0.1$).

4.3 Exploring Mechanisms

We explore the mechanisms behind the effects using the results of parent and teacher surveys and secondary data from the Nutrition, Childhood Development and Health Survey (ENDIS 2015). The ENDIS captures information on parents' perceptions of their children's education, self-reported parenting behavior, and styles of parenting (e.g., use of corporal punishment).

Our survey reveals that teachers and parents in the treatment group reported changes in their use of the GURÍ Familia mobile app (table 13). Teachers in the treatment group reported that they knew more about the goal of the app than they did before the intervention; the survey results indicate that they used it more than teachers in the control group. Parents reported that the mobile app improved their involvement with their children's education. They also increased the use of the app, although the difference is not statistically significant. Teachers reported a reduction in their perception of written communication as an effective communication channel. This change is reflected in the fact that parents reported that they received less written communication from teachers than they had before the intervention. These results suggest that although the intervention did not have an average effect on attendance, it did change mobile app use behavior, a finding that is confirmed by the number of messages read by parents.

Table 13 Survey results

	(1)	(2)	(3)
Variable	*Northeast departments*	*Other departments*	*P-value*
Teacher survey			
Frequency of use of email for communication with parents (1–6, where 1 = never and 6 = daily)	1.06	1.38	0.29
Frequency of use of phone calls for communication with parents	4.5	4.15	0.41
Frequency of use of WhatsApp for communication with parents	4.75	3.58	0.07
Frequency of use of GURÍ Familia for communication with parents	2.5	2.25	0.55
Frequency of use of face-to-face communication with parents	5.69	5.67	0.93
Frequency of use of written communication with parents	3.13	4.13	0.01
Use of GURÍ Familia app (1–6, where 1 = none and 6 = a lot)	3.31	3.73	0.3
Knowledge of purpose of GURÍ Familia	3.81	4.26	0.14
Use of GURÍ Familia by parents	1.75	2.04	0.27
I feel more secure communicating through GURÍ Familia with parents (1–6, where 1 = none and 6 = a lot)	2	2.03	0.93
GURÍ Familia favors involvement of parents in education of their children	1.88	2.2	0.36
GURÍ Familia distances parents from the school	2.25	2.36	0.73
Observations	16	96	
Parent survey			
Travel time to reach preschool (minutes)	13.83	12.36	0.45
How many hours a week does your child attend preschool?	21.54	20.37	0.63
How many hours a week does your child devote to activities related to preschool at home?	6.04	4.91	0.34
Who usually helps your child carry out activities related to preschool? (1 = mother, 0 other)	0.96	0.91	0.44
How often are family trips in your household planned during the school season? (1 = never, 0 other)	0.54	0.43	0.31
During the last month of preschool, approximately how many days did your child miss preschool?	5.38	4.56	0.51
During this school year, approximately how many days did your child miss preschool?	15.92	17.56	0.55
In the past school year, approximately how many days did your child miss preschool?	14.17	13.23	0.72
Underestimation of absences (number of days)	19.21	15.59	0.4
Absence caused by structural issue, such as illness (1 = yes, 0 = no)	0.54	0.73	0.06
What is the reason your child missed preschool in the last month? (1 = illness, 0 = other)	0.58	0.63	0.69
What is the most common reason why your child is missing from preschool? (1 = illness, 0 = other)	0.54	0.73	0.05

Since March, how many times did you call, send an email to, or visit the preschool to talk about your child? (1–6, where 1 = never and 6 = more than four times)	4.92	4.42	0.21
How often does the preschool contact you to talk about your child? (1–4, where 1 = twice a month and 4 = less than once every three months)	2.67	3.11	0.06
Use of phone calls to communicate with the preschool (1–6, 1 = never and 6 = daily)	1.75	1.75	0.99
Use of WhatsApp to communicate with the preschool	2.96	1.84	0
Use of GURÍ Familia to communicate with the preschool	2.58	2.07	0.09
Use of face-to-face communication with the preschool	3.5	3.07	0.25
Use of GURÍ Familia (1–5, where 1 = never and 5 = always)	3.21	2.61	0.03
Teachers' use of GURÍ Familia	2.83	2.41	0.13
I believe that GURÍ Familia is more useful and safer than WhatsApp as a means of communication (1–5, where 1 = never and 5 = always)	2.33	2.45	0.69
GURÍ Familia favors my participation in my child's education	2.46	2.47	0.97
GURÍ Family distances me from school	1.92	1.54	0.1
Observations	24	162	

Looking at the responses by parents and teachers at schools in the northeast regions and comparing them with the rest of the sample allows us to identify some potential explanations for the effects. Parents in the northeast report were contacted by the school through the mobile app and WhatsApp more often than parents elsewhere. The survey results indicate that they were more likely than other parents to use the mobile app. Nevertheless, on average parents in the northeast read fewer messages than parents elsewhere. These results suggest that although parents in the northeast read fewer messages, the app was effective enough for them to report an increase in their use of it.

In Artigas, Rivera, and Cerro Largo, attendance levels at baseline were the lowest in Uruguay. An important finding is that parents living in remote departments are more likely to allow their children to miss school for reasons that could be avoided. They were 19 percentage points more likely to let their children miss school to be with their families and 10 percentage points more likely to let them miss school when the weather was bad (although this difference is not statistically significant). Parents in nonremote areas are 19 percentage points more likely to report illness as the main cause of absences.

ENDIS results are consistent with our survey data. They show that children in remote areas attend school fewer hours and fewer days a week than children in nonremote areas. The ENDIS notes that the probability of the respondent having worked the previous week is 7.5 percentage points higher in nonremote areas. Parents in nonremote areas are also 14.5 percentage points more likely than parents in remote areas to cite the need to work or the lack of someone to leave the child with as the main reason for not taking their child to preschool. The greater probability of working and a smaller network for the care of children may reduce the probability that parents can let their child miss school days in nonremote areas (Table 14).

Table 14 Results of the Nutrition, Childhood Development and Health Survey (ENDIS) (percent, except where otherwise indicated)

Variable	*Northeast departments*	*Other departments*
Sample characteristics		
Currently working	52.2	60.76
Child attends an educational center	75.98	82.16
What was main reason for sending your child to preschool?		
I had to work and preferred to take him or her to preschool	10.92	25.55
I had to work and could not pay someone to take care of my child at home	1.44	1.75
I had to work and I had no relatives to help me	1.15	1.41
Seemed good for him or her	75.57	63.03
To be able to study	0	0.45
At the recommendation of the pediatrician or specialist	6.61	4.01
To have time for myself	1.15	0.23
Other reason	3.16	3.56
Number of observations	348	1,769

Overall, the results suggest that parents who agreed to receive the messages read them and reported an increase in the use of the mobile app. Receiving the messages did not necessarily change parents' behavior, however. Our theory of change posits that behavior-based messages will be effective in addressing malleable causes for absences but ineffective in addressing structural causes. Both the parent survey and the ENDIS data suggest that malleable causes may be more prevalent among parents in the northeast. Absences in nonremote areas are more likely to reflect structural causes (such as illness).

Education systems in the region struggle to provide standard services in remote areas. Schools in the northeast have fewer and lower-quality resources; less supervision and support from local and central education management units; and worse educational outcomes. The message campaign proposes an effective and low-cost intervention to increase attendance in these areas, thereby helping reduce regional gaps in Uruguay.

4.4 Comparison with Other Studies

We find heterogeneous effects on the campaign, with attendance in remote areas increasing by almost 1.5 days over the 13-week intervention period. The magnitude of this effect is smaller than obtained by similar interventions. Kalil et al. (2019) obtain an increase of 2.5 days in attendance with an intervention that lasted 18 weeks; Robinson et al. (2018) and Rogers and Feller (2018) find similar impacts.

There are two important differences between these studies and our context and samples. First, the absenteeism levels in our sample are much higher than in previous studies. Kalil et al. (2019) cite a chronic absenteeism rate of 59 percent. Robison et al. (2018) cite a figure of 5.5 percent in the control group**.** In our sample, chronic absenteeism was 72 percent in the control group.

Second, our intervention was shorter than other interventions, which lasted between 18 weeks and a year. Kalil et al. (2019) report that their intervention had an effect after three months of exposure. They suggest that it may take several weeks to change parent behavior with respect to student attendance. The shorter period of exposure of our intervention may partially explain the smaller magnitude of the effect.

Our design incorporated behavioral tools similar to the ones proposed by Kalil et al. (2019). Our explorative analysis of mechanisms shows a similar pattern in the distribution of effects, with parents with more malleable barriers experiencing stronger effects.

We also find two kinds of spillover effects. The first is the increase in attendance by children of parents who did not receive the treatment similar to that of the treatment group. This result is consistent with the findings of Rogers and Feller (2018), Cunha et al. (2017), and Berlinski et al. (2016). We also document spillover effects in the take-up of the program, with an increase in the probability of joining the campaign among parents in the treatment group (see section 4.2).

This study is the first to implement a message campaign using a government mobile app. This methodology has proven to be effective and low cost, although it raises some questions about limitation in its coverage.

5. Results in Context: What Attendance Means for Early Childhood Development

We conducted additional analysis and merged administrative data on child development (namely, the INDI instrument) on a nationally representative sample of four- and five-years-old in CEIP preschools (the same sample used in this experiment, except for the three-year-olds, on whom there is no INDI information. The INDI was designed to assess school readiness. It covers four domains of child development—cognitive, motor, socioemotional, and attitudes toward learning—with seven indicators. The cognitive domain includes four indicators: language, math, executive functions, and self-projection. Our merged dataset resulted in a final sample of 2,800 observations, with child development data balanced between treatment and control groups and a nonresponse rate in the INDI of about 1 percent.

We hypothesized that attendance might mostly affect the cognitive or language domain, the aspect of development most affected by socioeconomic gradients (Berlinski et al. 2015). To test this hypothesis, we ran a regression of the standardized score of all INDI domains on the treatment dummy, controlling for jurisdiction, access to the mobile app, school income quintile, baseline attendance, and the baseline child development indicator. The results indicate that the intervention increased average language performance by 0.10 standard deviations (significant at the 10 percent level) (table 15). It did not affect other domains of INDI.

In northeast departments, this 13-week intervention increased cognition by 0.35 standard deviations (significant at the 5 percent), language by 0.37 standard deviations (significant at the 10 percent level), and attitudes toward learning by 0.33 standard deviations (significant at the 5 percent).[14] These

[14] Tables for these regressions are available upon request.

magnitudes are similar to human resource–intensive programs at scale, such as home visits (Attanasio et al. 2014) or part-time child care (Hojman and López Bóo 2018).

Table 15 Treatment effects on child development (INDI indicator)

Domain	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*Mean Control*	*Observations*
Language	0.09	0.10	0.13**	0.09	0.08	0.10*	0.38	2,807
	(0.08)	(0.08)	(0.06)	(0.08)	(0.06)	(0.05)		
Math	–0.03	–0.02	0.00	–0.03	–0.02	0.00	0.57	2,806
	(0.06)	(0.06)	(0.05)	(0.06)	(0.05)	(0.04)		
Executive function	–0.02	–0.02	0.00	–0.02	–0.02	–0.02	0.42	2,827
	(0.07)	(0.07)	(0.05)	(0.07)	(0.05)	(0.04)		
Self-projection	0.00	0.01	0.02	0.00	0.02	0.02	0.36	2,817
	(0.06)	(0.06)	(0.05)	(0.06)	(0.05)	(0.04)		
Cognition	0.02	0.03	0.06	0.02	0.03	0.04	0.48	2,780
	(0.07)	(0.06)	(0.05)	(0.07)	(0.05)	(0.04)		
Motor	–0.07	–0.06	–0.04	–0.07	–0.03	–0.02	0.38	2,813
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)		
Attitudes toward learning	–0.05	–0.04	–0.01	–0.05	–0.05	–0.03	0.39	2,838
	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)	(0.04)		
Controls	No	No	Yes	No	No	Yes		
Baseline attendance control	No	Yes	Yes	No	Yes	Yes		
Baseline child development indicator	No	No	No	Yes	Yes	Yes		

Note: All outcomes are standardized to the national Uruguayan norm and therefore expressed as standard deviations. Columns 1-6 display various specifications: with and without controls (a vector of variables, including geographical, access to the mobile app, and pre-treatment outcomes); use of baseline of attendance levels to control or not; and use of baseline INDI results or not. Figures in parentheses are robust standard errors clustered at the school level.

Two very similar interventions in primary schools in Chile and Brazil increased mathematics score by 0.08 standard deviations (Berlinski 2016) and 0.09 standard deviations (Cunha et al. 2017), respectively. The former was four months' long and the latter six months' long, suggesting increasing returns to this type of interventions. Bergman and Chan (2017) find that in secondary schools in the United States, exam scores increased by 0.10 standard deviations. Beyond the different age range of the target population, the interventions in the cited papers included information on the child's tests scores (and relative ranking) for parents, a very sensitive issue in many settings that our study did not include.

The heterogenous effects in the northeast are consistent with our theory of change that increased attendance contributes to child development because it provides longer exposure to learning opportunities. Missed days of school mean missed opportunities for problem resolution, motor development, and specific language and math stimulation, important bases of cognitive development.

Why the intervention did not affect average attendance but did affect average language development (and not other child development domains) is not clear. One hypothesis is that by increasing awareness of the importance of investments in early childhood education, the messages increased parental speech and verbal interaction with their children, resulting in a modest improvement in one of the domains with the largest deficits in Latin America. Many of the messages referred explicitly to language, and almost all referred to parental investments.

6. Discussion

No matter how big the efforts governments make to expand access to preschool services, since very often education in the early years is not compulsory, in last instance, it is up to the families to decide whether they enroll and take their children to the centers on a regular basis (Mateo Díaz and Rodriguez-Chamussy 2016). Structural issues—such as lack of transportation or the need to align work and preschool schedules—account for some absences by preschool children. But cognitive biases also affect parents' decisions to allow their children to miss days. The good news is that cognitive biases can be modified using very low-cost interventions that have proven to be effective.

To address cognitive barriers, we proposed a treatment based on information gathered in focus groups with parents of preschool children. The findings were consistent with the results of previous studies.

Our intervention represents the first attempt to use behavioral science to address low preschool attendance in Latin America. The use of behavioral tools in other countries used workshops or sent text messages. This intervention used an existing government mobile application as the channel of communication between preschool centers and families in Uruguay.

The results suggest that cognitive biases seem to have greater effects on people in the middle of the distribution of attendance. Families at the low end of the distribution may also have cognitive biases, but they struggle more with structural barriers (such as lack of transportation). Children with the highest rates of attendance probably come from families that recognize the importance of early education. Our treatment was not effective in either of these segments. In contrast, nudges were effective in influencing the behavior of parents whose children were in the middle of the distribution of attendance. This finding should be useful in tailoring future interventions and improving the targeting of public resources.

Our results show that behavioral nudges can have implications for inequality. The nudges where especially effective in tackling misconceptions about the importance of preschool in five departments far from the capital. All of these departments are in the northeast of Uruguay, which has a lower socioeconomic profile than the rest of the country. The fact that our intervention was effective in increasing attendance in these areas and that increased attendance was connected with better development outcomes for this group suggests the potential to use these interventions to close socioeconomic and geographic gradients.

Future research could vary the intensity of and exposure to treatment, the time of the year it is administered, the channels used to diffuse information, the context, the cognitive barriers tackled, and the behavioral tools used. Design is especially important given that the intensity of the treatment (the number of messages a parent reads) increased the impacts in remote regions.

Technology can be a key ally in contexts in which the problem for certain groups is not necessarily the service itself but the mindset behind their daily decisions. Given the low costs and scalability of these types of interventions, there is no reason why countries could not start implementing them. This kind of program can be particularly effective at preventing massive drop-outs of children and youth who were in the middle of their studies during the COVID-19 pandemic. Working in tandem with beneficiaries and their families can help ensure that they continue with their learning journeys.

Annex

Table A.1 Summary of interventions to reduce school absenteeism

Author	*Context*	*Objective*	*Treatment*	*Delivery strategy*	*Effect*	*Description*
Bergman (2015)	Students in grades 6–11 in school district in Los Angeles, California (United States) in 2010.	Attenuate biases of parents who overestimate educational performance of their children (correcting false beliefs).	Sent information to parents about assignments, homework, projects, essays, grades, and tests not completed by their children.	Bimonthly SMS to parents for six months.	Scores on standardized math test and grade point average increased 0.2 standard deviations. Effects on attendance at class/course level were positive but not statistically significant.	Randomized control trial (RCT) at student level (*N* = 279). Sample was stratified based on academic performance indicators, having a teacher who thought the intervention would be useful for the student, and having a valid phone number.
Berlinski et al. (2016)	Students from eight primary schools in low-income region of Chile in 2014.	Improve attendance, grades, and behavior (reduce Information gaps between parents and school).	Sent information to parents about their child's attendance, behavior, and grades in math (child's grades and class average).	SMS to parents for four months (weekly on class attendance and monthly on behavior and grades in math).	Average math scores increased 0.08 standard deviations. Probability of attending school more than 85 percent of time rose 6.6 percentage points. Percentage of students who were reported to have engaged in an extremely bad behavior decreased by 1.25 percentage points.	RCT (*N* = 1,500). Sample was stratified by grade level (classes were assigned to receive large or small percent of SMS). Treatment was assigned at student level.
Bergman and Chan (2017)	Students from 22 secondary schools in Kanawha County, West Virginia (United States)	Provide frequent information to parents about their children's academic progress in order to resolve information frictions and	Sent information/alerts to parents about number of absences of their child per class, number of assignments/homework child did not complete, and whether child had an	Weekly SMS. Monday: information on homework. Wednesday: information on absenteeism; last	Reduced number of failed courses by 38 percent, and increased class attendance by 17 percent. No effects on state test scores, but increased in	RCT (*N* = 11,000). Sample was stratified at school level and grade level to minimize potential spillover effects.

	during 2015/16 school year.	improve academic performance.	average score worse than 70 percent of the class.	Friday of every month: information on score (total of 52 SMS per family).	class test scores by 0.1 standard deviations.	
Cunha et al. (2017)	Ninth grade students from 287 schools in São Paulo, Brazil during second semester of 2016 school year.	Correct false beliefs about absences and importance of attendance, improve perceptions of parent's role in education, and compare results of different treatments on student attendance and grades.	Sent different types of information to parents to increase grades and reduce absenteeism. First treatment sent messages with information about attendance, tardiness, and completion of homework. Second treatment sent messages that raised awareness about school attendance, punctuality, and homework completion.	Weekly SMS for 18 weeks during second semester of school year.	Reduced absences by approximately 2.4 percent. No statistically significant differences between the two type of treatments were found. No differential impact on the absences by school level (elementary or secondary). Weekly communication increased attendance 2.1 percent and test scores 0.09 standard deviations. Sharing information had small or no additional effects. Messages with declarations improved results, accounting for 89–126 percent of the effects of information.	RCT (*N* = 19,253). Random assignment was done in two steps. In the first, schools were stratified to subsamples based on average math scores, average absenteeism rate, and percentage of parents enrolled in the intervention. In the second, students were stratified to groups within the class based on math scores.
Rogers et al. (2017)	Elementary and secondary students in a school district in Philadelphia, Pennsylvania	Improve student attendance by encouraging parents and correcting their beliefs about their children's absences. Also gave positive affirmations to parents to emphasize	Sent information to parents to reduce absenteeism. One treatment affirmed parents' role in their child's attendance and its importance. The second sent information on the number of absences of the child the previous school year.	A letter was sent to the homes of every student who had at least one absence the previous year, as a complement to the report card.	Reduced absences by about 2.4 percent. Results of the two treatments were not statistically significant different. No differential impact on absences by school	RCT (*N* = 51,000). Sample was stratified at school level, at grade level, and based on frequency of absences.

	(United States) in 2014.	their role in their child's attendance.			level (elementary or secondary).	
Robinson et al. (2018)	Preschool students in 10 schools in a county in California (United States).	Promote preschool attendance by correcting parents' false beliefs about the importance of regular preschool attendance and number of days child misses. The intervention tackled limited attention of parents promoting planning.	Sent information to parents to reduce absenteeism. One treatment sought to correct parent's false beliefs about the usefulness of preschool attendance and the number of days the child missed class. A second treatment sent emails containing the same messages as the first treatment plus additional messages to motivate parents to ask for help from their social network when they cannot take their child to the center.	Six rounds of mailings to parents during the school year.	Reduced absences 7.7 percent and chronic absenteeism by 14.9 percent reduction No significant differences absences between two types of treatment, but there was a 1.1 percent difference between two treatments.	RCT (*N* = 10,967). They performed a stratified randomization at school level and attendance level (bottom 60th percentile in attendance of participating districts in county during previous school year). Then another randomization was done within treatment group ("mailing only", "mailing + support").
Rogers and Feller (2018)	High-risk students in 203 elementary and secondary schools in United States in 2015.	Correct parents' false beliefs about total and relative absences of their child (compared with others).	Sent personalized information to parents about their child's attendance. Treatment 1 sent reminders about importance of attendance and ability of parents to influence them. Treatment 2 added information about student's absences. Treatment 3 added average number of absences of children in the class.	Five rounds of e-mails sent during school year for three years.	Reduced chronic absenteeism by 10 percent and increased test scores by 0.03 standard deviations. Sending information on average classroom absences had no additional effect.	RCT at household level (*N* = 28,080). Sample was randomized by school, grade, and absences strata during previous school year.

Smythe-Leistico, and Page (2018)	Preschool students in a public school in Pittsburgh, Pennsylvania (United States) during 2015/16 school year.	Reduce chronic absenteeism by correcting false beliefs about attendance and limited attention.	Sent information to parents. Three types of information provided: messages with information about school events, messages with feedback about child's attendance, and support messages with positive affirmations about the importance of school year and providing advice on ways to strengthen child's learning.	SMS sent to parents about once a week. Parents were able to reply to school.	Chronic absenteeism rate among children in the treated school (13.3 percent) was substantially lower than in control school (24.4 percent).	Single "synthetic" control school was built that corresponded to a weighted average of other public schools in Pittsburgh (based on previous chronic absenteeism and covariates).
Kalil, Mayer, and Gallegos (2019)	Early education students at nine Head Start centers in Chicago, Illinois (United States) during 2016/17 school year.	Reduce preschool absenteeism and tackle parent's cognitive biases about early education, such as false beliefs about attendance, underestimation of attendance, limited attention, and self-perception.	Sent four types of information to parents: reminders to send children to school, information on child's absences, risk aversion messages or importance of preschool education, and planning messages to help parents organize picking up their child. Intervention followed principles of behavioral sciences.	SMS to parents in three rounds: spring 2016, autumn 2016, and spring 2017. Three to five messages sent each week for 18 weeks in each round.	Modest but statistically significant effect on average attendance rates. Treatment effect size increased over time (February: 1.1 percent difference between treatment and control groups; May: 4.8 percent difference). Percentage of children who attended 85 percent of time increased by 20 percent.	RCT at household level (N = 780). Sample drawn from children 3–5 whose parents speak English or Spanish and have cellphone access.

Figure A.1 GURÍ Familia app screenshot

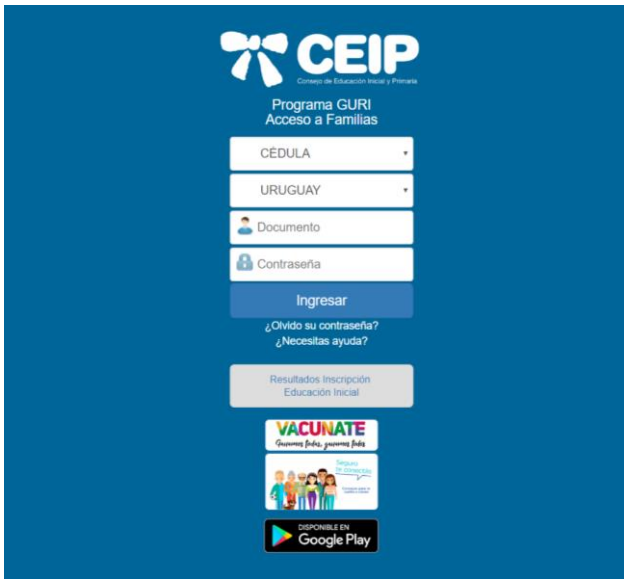


Table A.2 Topics covered in focus groups

1. **Knowledge of early childhood education and its importance** a. What do children learn in preschool? b. Is it different from primary school? c. What is most important thing a child 3–5 should learn? d. How important is preschool to your child's (early) education? e. Who do you think is better able to teach your child what he or she should learn at this age? f. How important is it for you that your child shares with other children his or her age in preschool? Why?
2. Perception of absences a. Does your child frequently miss school? b. If we ask you today, on average per month how many days your children are missing from preschool, would you be sure of the answer? Hint: Make sure to capture the reasons (why parents say no and why they say yes). c. How many times a month does your child arrive late or leave earlier?

d. What are the most frequent reasons for your child missing preschool? What are the most frequent reasons why your child is late or leaves earlier?

3. Consequences on child's development of regularly missing preschool

a. What do you think are the consequences on your child's development, if any, of regularly missing preschool?

b. Would you say that regular attendance at preschool is less, as, or more important than attendance at primary school?

c. What do you think are the long-term consequences (school and adult), if any, of regularly missing preschool?

d. What are the long-term consequences if someone is late for preschool? Hint: We refer to the impact on learning, humor, socioemotional development, integration into your classroom, etc.

4. Ability of parents to influence the fate of their children (locus of control)

a. Do you believe that the decisions you make as a parent affect the future possibilities of your child, or are these possibilities already fixed by their context?

b. Can you change your child's intelligence?

c. Can you change your child's personality?

5. Effect of social norms on early childhood education

a. In your social circle, how important is education?

b. In your social circle, how important is preschool education?

6. Quality of the educational center

a. What criteria did you use to choose the center in which your child is enrolled?

b. Would you be interested in having the power to evaluate the center and provide information in order to improve the center's quality?

c. Would you be willing to collaborate with such an initiative?

Table A.3 Number of messages sent, by type of message

Type of message	*Number of messages*
Welcome message	1
Feedback (false beliefs)	5
Importance of preschool and short-term effects of absence (present bias)	13
Importance of preschool and long-term effects of absence (present bias)	8
Positive parental identity (mismatched identity)	5
Planning prompts (limited attention)	10
Goodbye message	1
Total	43

Figure A.2 Distribution of absences by day of week, March 4–May 17, 2019

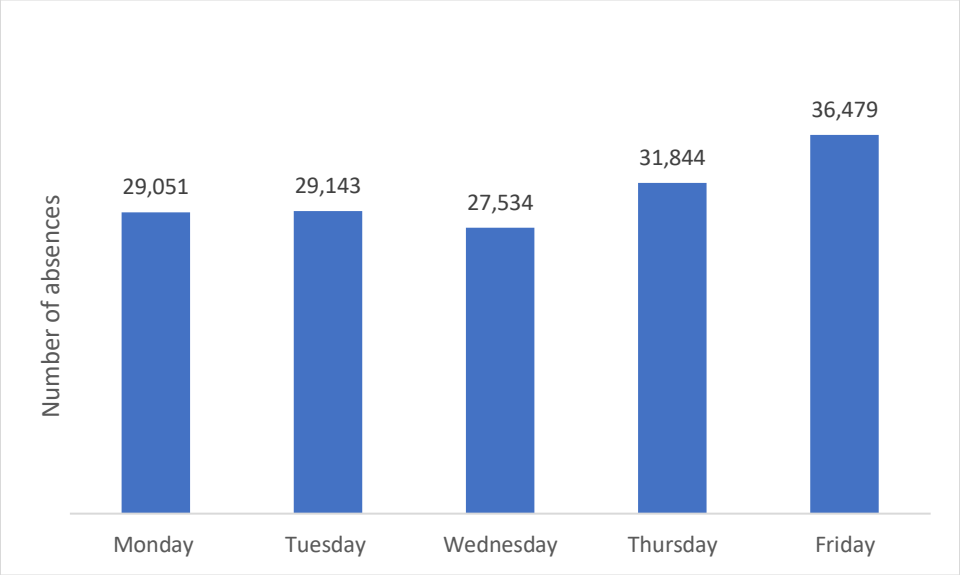


Figure A.3 Timeline of intervention

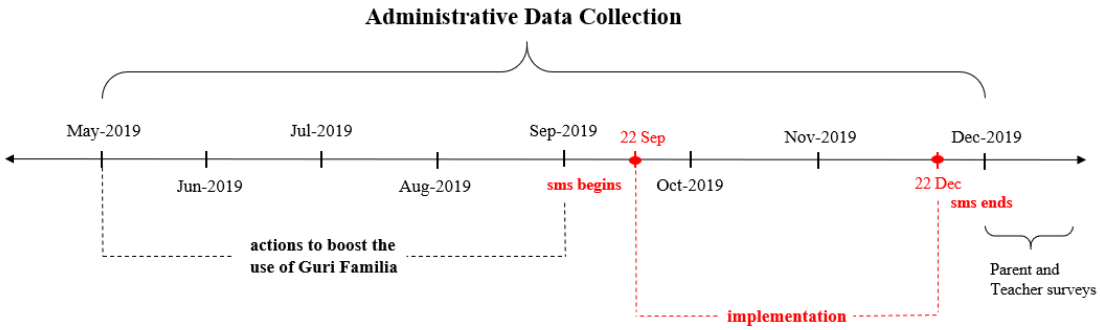
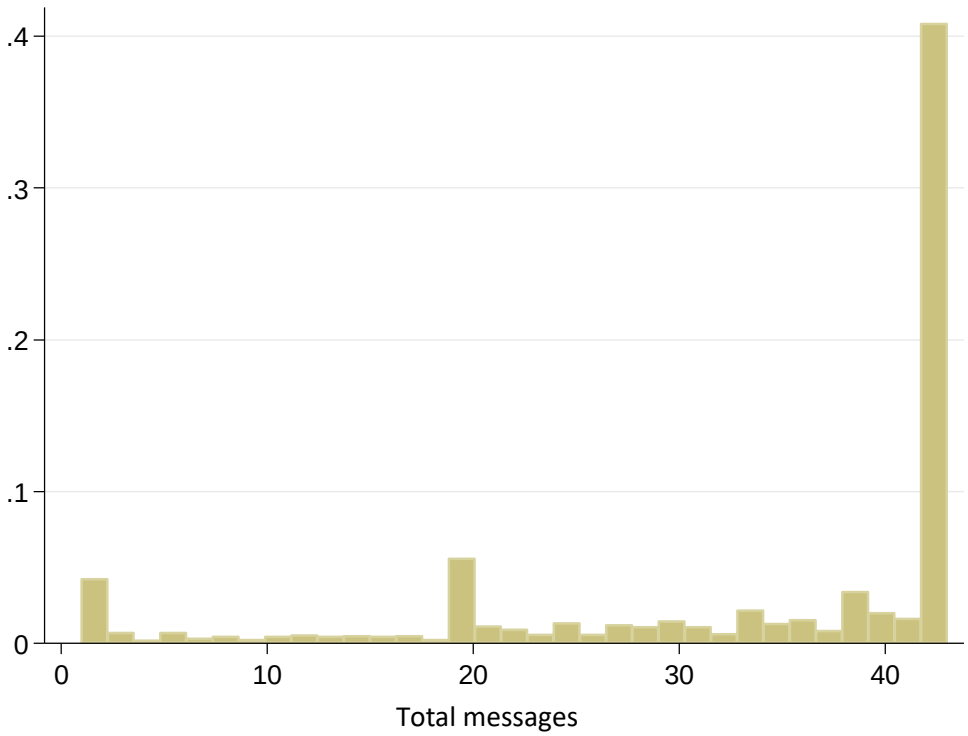
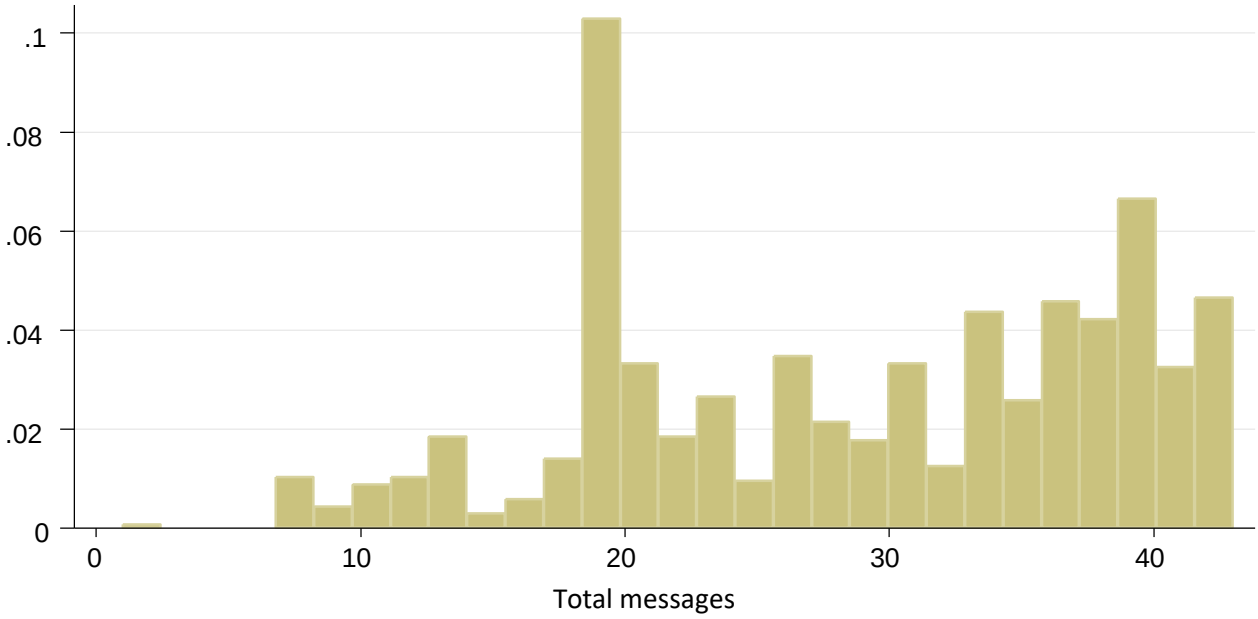


Figure A.4 Distribution of number of text messages sent

a. All parents



b. Parents who joined the intervention after treatment started



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