

**NUDGES TO IMPROVE LEARNING AND GENDER PARITY: SUPPORTING  
PARENT ENGAGEMENT AND GHANA'S EDUCATIONAL RESPONSE TO  
COVID-19 USING MOBILE PHONES  
[PARENTAL NUDGES PROJECT]**

**BASELINE REPORT**

**SUBMITTED TO  
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## 1 BACKGROUND AND CONTEXT

Ghana's schools were closed from mid-March 2020 through mid-January 2021 due to the COVID-19 pandemic. During that time, the Ministry of Education initiated a remote-learning program aimed at reaching students through radio, television, and Internet to ensure continuity of learning throughout the crisis. While schools have been re-opened for about one month, there are currently discussions of closing schools again due to a rise in Covid-19 cases in the country, and a return to remote learning activities. For remote learning to be successful, and for the return to schools to be equitable for all children, parent involvement is essential. The need to find low-cost, gender-sensitive solutions to minimize disruptions to learning and schooling is urgent, especially in Ghana's most disadvantaged northern regions. For many children, the ability to learn during the crisis and beyond will critically depend on their parents' engagement. However, parents often face informational barriers to support learning effectively. Further, parent engagement may vary by child gender, due to greater opportunity costs of schooling for girls (e.g., larger involvement of girls in household or care-work), lower perceived returns to girls' education, and widespread gender bias in social norms and aspirations. Yet it is unclear how to best communicate with parents, and how parents with low education levels and, often, pro-boy bias, can support (remote) learning effectively and sending all children back to school.

The health and economic crises resulting from COVID-19 negatively affected households' economic situations, especially the most vulnerable ones (Egger et al., 2021). It is possible that many children, particularly older girls, will not return to school after the crisis because of the need to work to support their families or due to early marriage and childbearing, and adolescent pregnancy. Ghana's Education Strategic Plan (ESP) and the Ghana Accountability Learning Outcomes Project (GALOP)—recognizes parents/guardians as key stakeholders in children's education and aims to develop a communications strategy to deliver key messages to teachers, parents, and students. While parents are required by law to enroll their children in school, the level of involvement in children's education is generally low, particularly in the poorer regions in northern Ghana.

Providing timely, actionable information to poor and low-educated parents, including via text messages as a low-cost approach, can attenuate these barriers and improve parental engagement (Bergman, 2019). If such interventions work during and after the pandemic, where stressors are greater than under non-emergency circumstances, and in a low-resource setting, is unknown.

To address the inequitable access to education and inequalities by child gender and households background during the Covid-19 pandemic, we developed the [Parental Nudges Project](#) (PNP). Researchers have partnered with [Innovations for Poverty Action](#) (IPA) and [Movva Technologies](#) to evaluate the impact of a text-message-based behavioral change intervention on improving parental engagement in educational activities, parental beliefs about returns to education, as well as improvements in children's learning, enrollment, attendance, and gender parity in education. This baseline report highlights the progress of PNP and provides an overview of the implementation of the intervention and evaluation activities, challenges to date, and lessons learned.

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## **2 PROJECT DESIGN AND IMPLEMENTATION**

### **2.1. IMPLEMENTATION ARRANGEMENTS**

The implementation of PNP involves several partners including the researchers and implementing partners. The PNP is developed collaboratively by academic researchers, Innovations for Poverty Action and Movva Technologies.

#### **2.1.1. IMPLEMENTING PARTNER**

Movva Technologies is a Brazil-based EdTech company that implemented the Eduq+ programme in collaboration with the governments of Brazil and Cote d'Ivoire. Movva is committed to changing people's behavior and bringing improvements to organizations and society. Since 2012, Movva powers simple and frequent communication to change the behavior of those who matter the most. Movva helps public and private sector organizations improve strategic indicators for improving desired outcomes.

#### **2.1.2. RESEARCH TEAM**

The core research team includes two principal investigators: [Prof. Sharon Wolf](#) (University of Pennsylvania) and [Dr. Elisabetta Aurino](#) (Imperial College London), who are responsible for leading the project and impact evaluation. This interdisciplinary research team represents the fields of economics, applied developmental psychology, and education. The team brings a wide range of expertise and perspectives directly relevant to this project, as well as strong contextual knowledge and linkages with education policymakers. They are responsible for the conceptualization of the research design, research strategies, and guidelines for the evaluation activities.

The research partner is IPA Ghana. IPA serves as the primary point of contact for the evaluation and is collaborating with the principal investigators to conduct the impact evaluation for PNP. IPA is a research and policy nonprofit that discovers and promotes effective solutions to global poverty problems. IPA brings together researchers and decision-makers to design, rigorously evaluate, and refine these solutions and their applications, ensuring that the evidence created is used to improve the lives of the world's poor. Since its founding in 2002, IPA has worked with over 600 leading academics to conduct over 830 evaluations in 52 countries including Ghana. This research has informed hundreds of successful programs that now impact millions of individuals worldwide.

#### **2.1.3. STAKEHOLDER PARTICIPATION**

Key stakeholders involved in the PNP include the Ministry of Education, Ghana Education Service, and key non-governmental organizations (NGOs) such as World Education Inc., NORSACC, and ActionAid working on girls' education and operating in the northern part of Ghana. The NGOs stakeholders provided a contextual understanding of girls' education in Ghana and the northern part of Ghana and made inputs into the design of the text messages.

## **2.2. DESCRIPTION OF THE INTERVENTION**

### **2.2.1. EDU+**

The program (EDU+) is a household-level intervention designed to improve school-aged children's outcomes by engaging parents in their children's learning. Through the program, the primary caregivers receive text messages in simple English with behavioral nudges targeting engagement in children's learning and development. The goal of the text messages is to bring parents closer to their children's school life by prompting parents to engage with their children on topics such as school, future plans, and sharing how they overcame similar challenges at their age. It also targets the development of non-cognitive (socio-emotional) skills, with themes such as positive discipline, growth mindset, and self-efficacy. As part of PNP, the research team partnered with Movva to incorporate an additional gender-equity perspective into the intervention by ensuring that messages for some households promote gender-equitable outcomes in supporting education and broader child development. Importantly, no curricular knowledge is required to engage with the messages. The content of the text messages has been adapted to the Ghanaian governments' updated plans to reopen schools and is aligned with the Ministry of Education's back-to-school and gender equality campaigns.

Movva Technologies, a Brazil-based social enterprise, developed the Edu+ platform for deploying text messages to the recipients. Nudges are structured around sequences in a format inspired by READY4KI, an eight-month-long text-messaging intervention for parents that targets the behavioral barriers to engaged parenting (York et al., 2017).

The platform allows for the automated scheduling of text messages. The text messages are designed as uni-directional. Each text message is limited to 160 characters in length. None of the messages is repeated during implementation.

### **2.2.2. THEORY OF CHANGE**

For many children, the ability to attend schools and learn effectively (especially with remote learning) critically depends on their parents. Yet poor parents face informational and social norm barriers to support learning (Bergman, 2019). Research shows that many parents, especially illiterate ones, do not believe education is important (CWIQ, 2003). Further, they may have biased beliefs about educational investment returns, especially for girls, or about what is socially expected regarding their engagement with child learning.

Negative shocks increase schooling opportunity costs, inducing decreases in educational investments, especially for girls (Bjorkman-Notqvist, 2013). During the Ebola crisis, girls were most negatively affected, increasing chances of school drop-out, sexual exploitation, and early marriage/childbearing (Bandiera et al., 2018). Further, while girls and women already bear larger shares of care- and housework generally, emerging evidence shows that the increased care stemming from the COVID-19 crisis is disproportionately assumed by females (e.g., older girls taking care of siblings during school closures) (Nesbid-Ahmed and Subrahmanian, 2020). These additional

work-load risks progress towards gender-parity and chances of returning to school when the crisis is over.

The Edu+ intervention tackles these issues in two ways: first, we provide timely, actionable information to parents via text messages as a low-cost intervention to attenuate parental behavioral and informational barriers to learning. Tackling these barriers improves parental engagement across all child age groups in high-and low-resource contexts (Bergman, 2019). However, evidence gathered during a crisis, where stressors are amplified, is currently lacking. Second, for a subset of parents, we will send text messages tailored to addressing biased beliefs and norms about girls' education, aiming to equalize educational opportunities, parental investments, and time use between learning and care-work. Previous evidence from Malawi (Haenni and Lichand, 2020) and India (Dhar et al., 2018) shows that similar simple interventions can promote more gender-equitable attitudes and child outcomes.

Key hypothesized mediators linking the intervention to improved child schooling outcomes include parental aspirations and expectations for children's education, returns to schooling, and parental engagement in children's education. For the treatment condition focused on gender-parity, we further hypothesize that reduced gender bias will be a key mediator for impacts on girls specifically.

### **2.2.3. THE INTERVENTION**

Two versions of the text message intervention are implemented: the regular educational behavioral nudges, that seek to promote family engagement in the education of children, and the gender-parity versions, that give a special emphasis on girls' education. Each are delivered for either 12 or 24 weeks.

1. Behavioral nudges: Nudges to primary caregivers supporting involvement with children's learning, their child's social-emotional development, academic aspirations, and engagement in remote learning activities during the school closures and into the summer. The behavioral nudges intervention will be implemented for 12 and 24 weeks for half of the households in the treatment groups.
2. Gender-parity nudges: In the gender-parity arm, the same themes and behaviors as the regular arm are stimulated, but particular messages include content promoting girls' education and addressing some common stereotypes around gender roles. The gender-parity intervention will be implemented for 12 and 24 weeks for half of the households in the treatment groups.

The text messages are available in simple English and are centered on the following themes:

1. Information and parent engagement in children's return to school.
2. Parent engagement in general education with their children's schooling.
3. Parental beliefs about returns to education and educational expectations and aspirations for children.
4. Children's socio-emotional development.

5. Gender-parity in education and behaviors/attitudes towards girls.

**2.2.4. DEVELOPMENT OF THE INTERVENTION**

Mowva Technologies designed the text message intervention with inputs from the researchers, IPA, World Education Inc., NORSACC, and ActionAid.

The text messages were designed based on a content strategy encompassing (a) empathetic communication (i.e., choosing themes that are compatible with people’s needs and with expected behavior change), (b) behavior change techniques (i.e., using behavior change techniques selected based on context), and (c) scheduling and organization (i.e., drafting the order in which themes are to be addressed over a given period). The text messages were developed in four stages: (a) establishing the structure and focus of the text messages, (b) drafting of the text messages, (c) content revision and modifications, and (d) piloting and final revisions. These processes followed an iteration process integrated into a process monitoring mechanism of piloting, feedback, and revision.

Table 1. Sample Text Message Sequence

Fact	Activity	Interaction	Growth
<i>Behavioral Nudges</i>			
IPA/EDU+: Your children’s FUTURE is now! On JANUARY 18 classes will be back! Making sure they ALL go back to school is how you commit to your children’s future.	IPA/EDU+: To ensure your kids remain safe while back at school, teach them how to wash their hands: a 20-second song might help them remember the duration!	IPA/EDU+: Study with safety. Face MASKS need to cover both MOUTH and NOSE and be TIGHT to their faces. Teach your children how to properly use it!	IPA/EDU+: Making sure your children attend school is your main DUTY as a GOOD parent: that way they will grow up to be SUCCESSFUL ADULTS!
<i>Gender-parity Nudges</i>			
IPA/EDU+: Girls and boys should have the same opportunities, rights, and obligations. It's the family's job to believe in and encourage girls to aim high.	IPA/EDU+: Ask your daughter: if you could change one thing between boys and girls, what would it be? Listen respectfully to her answer and talk it over with her.	IPA/EDU+: Encourage your daughter to believe in her fullest potential. Tell us if the boys and girls in your house are given different chores. (NO CHARGE FOR SMS)	IPA/EDU+: Believing in girls' potential starts at home, with the family believing boys and girls have the same skills and encouraging all children to aim high.

## 2.2.5. PILOTING AND PROCESS MONITORING

Two rounds of piloting and process monitoring were conducted by a pilot team composed of Movva, University of Pennsylvania, and IPA representatives from 20<sup>th</sup> December 2020 to 15<sup>th</sup> January 2021 (Table 2). 40 households within the study areas<sup>1</sup> were randomly selected to participate in the pilot and randomly assigned to receive a series of three messages in one of the four thematic areas, namely, positive discipline, interest in schoolwork, listening to children, and aspiration. Each series came in two variations - Edu+ and Gender Boost. Each sequence was sent to the pilot households and user-experience data was collected via surveys and interviews with caregivers.

Table 2. Pilot and Process Monitoring Schedule

Activity	Period
Design and finalization of 1 <sup>st</sup> round of pilot messages	Dec 10 – 15, 2020
1 <sup>st</sup> round of pilot messages sent	Dec 15 – 18, 2020
Process monitoring conducted and survey data and SMS records analyzed	Dec 19 - 21, 2020
Review of piloting results of 1 <sup>st</sup> round of pilot messages	Dec 22, 2020
Design and finalization of 2 <sup>nd</sup> round of pilot messages	Jan 4 – 7, 2021
2 <sup>nd</sup> round of pilot messages sent	Jan 8 - 11, 2021
Process monitoring conducted and survey data and SMS records analyzed	Jan 12 - 13, 2021
Final pilot team meeting to consolidate results and provide suggestions for final message edits	Jan 14, 2021
Messages finalized	Jan 15, 2021

Results from the first pilot week showed that only 33% of caregivers remembered reading the Edu+ messages, so the pilot team made a series of adjustments to the messages, including the time of day which they were sent, to increase message reading and retention. Caregivers voiced a preference for receiving messages in the early mornings or later in the evenings. In the second round of piloting, messages were sent at three different times based on respondent preferences to assess how timing may improve reception. Morning and evening times were much preferred by participants. Adjustments to the timing in addition to the language of the messages as well as the structure (e.g., putting IPA’s name at the very beginning) resulted in message retention increasing to 50% by the end of the second round of piloting. See Table 3.

Process evaluation was conducted using phone-based survey responses and process information from the 40 households. The process evaluation sought to assess the fidelity of implementing the text messages – message delivery, engagement, retention, satisfaction, and recommendations. Additionally, the SMS records from Movva Technologies were analyzed to establish whether the messages were delivered to households based on their original assignments. Additional and

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<sup>1</sup> Participants in the pilot exercise were excluded from the actual intervention.

ongoing piloting is recommended to continue improving the deployment mechanisms of the messaging to ensure as many caregivers as possible receive and read the messages.

Table 3. Key Indicators for Round 1 and Round 2 Piloting

Indicator	Round I		Round II	
	#	%	#	%
Reported receiving the SMS message	13/40	32.5%	19/36	52
Stayed over the pilot period	40/40	100%	36/40	90%
Read the message	10/13	77%	14/19	74%
Reported wanting to receive the message at a different time	13/15	87%	2/19	10.5%

### 2.2.6. TEXT MESSAGE DEPLOYMENT AND FIDELITY

Due to technical challenges in reaching some caregivers (i.e., delays in securing a dedicated short code for deploying the text messages and completing the enrollment of primary caregivers) and the need to reduce opt-out and keep primary caregivers engaged, the deployment of text messages followed a staggered series of two batches. The first batch consisted of 1,770 primary caregivers, and intervention implementation will span from 13<sup>th</sup> January 2021 to 30<sup>th</sup> June 2021. The second batch started on 10<sup>th</sup> February 2021 and covers 328 primary caregivers (including 98 reserved for replacement).

To ensure that the two groups are caught up, primary caregivers in the second batch were sent 3 messages per week<sup>2</sup> to ensure that both batches' pair during the 7<sup>th</sup> sequence of the text message deployment. This ensures that both batches complete the intervention at the same time while controlling for the frequency of text message deployment in the impact analysis.

Table 4 shows the delivery statistics of the messages delivered from 13<sup>th</sup> January to 6<sup>th</sup> April 2021. On average, 91% of the text messages sent to the participants were delivered. Only 9% of the text messages sent had expired. That is, the message has been sent and has either expired due to pending past its validity period (Movva's platform default is 48 hours), or the delivery report from the operator has reverted the expired as a final status.

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<sup>2</sup> Caregivers in Group 1 receive 2 messages per week.

Table 4. Message Delivery Statistics

	<i>Number/Percent</i>
Average # of messages sent per participant during the reporting period	27
Average # of messages delivered per participant	24
Average delivery rate per participant	91%
Average pending rate per participant	0%
Average expired rate per participant	9%
Averaged undelivered rate per participant	0%

### 2.2.7. IMPLEMENTATION CHALLENGES

The main challenges associated with the implementation of the intervention are as follows.

1. Difficulty in procuring a dedicated short code<sup>3</sup> for deploying text messages: Delays in procuring a dedicated short code and configuring the different networks into the short code remain one major cause of the delay in implementing the text messages intervention. To address this, the team temporarily relied on a shared short code from another project to kickstart the text message intervention.
2. Network connectivity issues. Due to the geographical location of the primary caregivers and network issues, some of the treatment households did not receive any of the text messages delivered to them. One strategy used was to pre-inform the primary caregivers to be aware of when the message would arrive so that they could position themselves to receive the text messages.
3. Illiteracy and lack of knowledge of receipt of text messages.

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## 3 METHODS: EVALUATION DESIGN AND IMPLEMENTATION

### 3.1. EVALUATION PURPOSE

The PNP evaluation seeks to serve three purposes: (a) to learn to what extent PNP’s objectives and goals have been achieved and/or make an overall judgment about the effectiveness of the text message intervention, (b) to improve the design and performance of future text message interventions aimed at promoting parental engagement in children’s education, and (c) to generate knowledge about good practices. The evaluation will provide pertinent information and lessons to assist the project partners and other stakeholders to better understand the initial results and contributions of the project.

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<sup>3</sup> Short codes are numbers that are shorter than the regular ten digits numbers. They are usually between three to six digits. Such assigned short codes will be the same for all the networks and the corresponding services will be provided and accessed free of charge by end users (consumers) irrespective of the network being used.

## 3.2. EVALUATION SCOPE

The scope of the evaluation is limited to the following time frame, which has shifted along with the delay in the project start date, and geographical area, and target groups.

Evaluation for PNP will be conducted for approximately 12 months, beginning in October 2020, with fieldwork to be completed in August 2021 and final report and closeout concluding September 2021. There are possibilities for conducting longer-term impacts extending beyond 2021 through raising additional funds.

In terms of geographical area, PNP operates in 16 districts/municipalities across the 5 regions (Northern, North East, Savannah, Upper East, and Upper West) in the northern part of Ghana. These regions are amongst the poorest regions in the country; they are rural and the most educationally deprived. Gender differences are also more pronounced as compared to regions in southern Ghana (Osei-Assibey, 2013).

PNP targets (a) households - parents or guardians and (b) their respective school-age children between 5 and 17 years in primary school [including kindergarten] and/or junior high school in the Northern, Savannah, North East, Upper East, and Upper West regions of Ghana. The sample is drawn from two previously completed studies. First, an impact evaluation of the [Communications for Development \(C4D\)](#) study (2012-2016), launched by the Ghana Health Service with funding from UNICEF in 12 districts of the three poorest regions<sup>4</sup> of Ghana. The sample included mothers with a child aged 0-5 years recruited in 2012. The C4D program relied on voice messages directly delivered to female respondents through their cell phones. The C4D sample has high rates of mobile phone ownership (83%). Second, even in a very negative scenario in which 52% of households from the C4D sample have changed phone numbers, we relied on a subsample of the [Graduating the Ultra Poor \(GUP\)](#) study from the same regions to obtain our desired sample size.

## 3.3. RESEARCH QUESTIONS

We have three primary research questions, and two secondary exploratory research questions:

1. Do nudges change parental beliefs about returns to education and expectations and aspirations?
2. Do nudges to parents in the form of SMS messages increase the rate of children returning to school and general engagement with education when schools reopen?
3. Do nudges improve children's learning outcomes in the short- and medium-term, and schooling outcomes (i.e., enrollment, attendance) in the medium-term?

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<sup>4</sup> These regions were, at the time, Northern, Upper East, and Upper West regions. Later Northern Region split into Northern, Savannah, and North East regions.

4. Are impacts more equitable across girls and boys if messages focus on gender parity in education and behaviors/attitudes towards girls? If so, are the effects driven by an improvement in girls' educational outcomes, or by a deterioration of that of boys?
5. Are impacts larger and do they persist for longer if exposure is longer (24 versus 12 weeks)?

### **3.4. ELIGIBILITY AND EXCLUSION CRITERIA**

Primary caregivers were screened at the desk-top level and through a phone-based subject enrollment call to determine their eligibility for the study. The desk-top screening was conducted to screen out primary caregivers without phone numbers. Thereafter, a phone-based subject enrollment call was conducted to (a) determine the eligibility of the households for the study, (b) inform them about the project, and (c) seek their consent to be enlisted into the study and to receive text messages. The subject enrollment call was conducted using screening questions to determine the eligibility of the primary caregivers. The eligibility criteria were as follows:

1. A household with at least one member owning a working mobile phone.
2. A household with an adult aged 18 years and above. This age criterion satisfies the age requirement as provided in the 2014 The Unsolicited Electronic Communications Code of Conduct by the National Communications Authority of Ghana. It also forms the basis for recruiting the primary caregiver, defined as the person who is primarily responsible for the care and education of the school-aged children in the household and could best talk about their experiences in school and at home.
3. A household that is willing to participate in the study and/or to receive text messages.
4. A household with more than one member including at least 1 school-aged child.

Primary caregivers that met the eligibility criteria and provided informed consent during the subject enrollment call were enrolled into the study and those in the treatment group were informed about their treatment status<sup>5</sup>. The subject enrollment call was also used to provide basic background information about selected primary caregivers and school-age children in the household.

### **3.5. SAMPLE SELECTION AND ENROLLMENT RATE**

The samples from the C4D and GUP projects formed the sampling frame, from which we determined the eligibility of households and then sampled from those eligible for the PNP. An initial desktop screening was conducted to screen out households without phone numbers. Households with phone numbers were then contacted through a subject enrollment call to determine their eligibility, seek their consent to participate in the study and their consent to receive the text messages.

The sample for this study considers the required sample size for the study based on the power calculations and possible attrition rates. Our initial target of 4500 households were screened to

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<sup>5</sup> Households were randomized into the intervention or control arm before participating in the subject enrollment call.

determine their eligibility to randomly assign 2,500 households or primary caregivers (and 2 children per household) into either one of the experimental groups. First, eligible 4500 households were identified in the dataset and randomization was conducted before households were recruited. Second, each of the 2500 eligible households was called to confirm eligibility and enroll them in the study. Finally, 5000 school-aged children were randomly sampled from each eligible household. Additionally, we sampled 128 households for the replacement of households who drop after the Subject Enrollment and Caregiver Survey. Finally, 10 households from each of the treatment groups (totaling 40 households) were sampled for the intervention piloting and process monitoring.

Table 5. Sample Balance for PNP

Experimental Group	Households	Caregivers	Children	Reserve	Pilot
Treatment 1	500	500	1000	13	10
Treatment 2	500	500	1000	27	10
Treatment 3	500	500	1000	40	10
Treatment 4	500	500	1000	18	10
Control group	500	500	1000	30	-
Total	2500	2500	5000	128	40

### 3.6. STUDY DESIGN

To assign households to treatment groups, we use a household-level randomized controlled trial, with households randomly assigned to one of five groups:

1. Standard messages: Primary caregivers receive messages encouraging involvement with children’s learning, their child’s social-emotional development, academic aspirations, and ensuring children return to school after schools have reopened (12 weeks).
2. Messages with “gender-parity nudges”: Primary caregivers of both boys and girls will receive messages, in which the content builds on that in the standard message treatment with some nudges including content promoting girls’ education and addressing some common stereotypes around gender roles (12 weeks).
3. Standard messages of longer duration: Primary caregivers will receive the same messages as group 1 but the program’s duration is 24 weeks - into the second term of the 2021 academic year.
4. Messages with “gender-parity nudges” of longer duration: Primary caregivers of both boys and girls will receive messages to parents, in which some of the nudges include content promoting girls’ education and addressing some common stereotypes around gender roles during the school closures (24 weeks, into the second term of the 2021 academic year).
5. Comparison group: No messages during the study period.

The randomization protocol was implemented through a STATA do-file to achieve a 1:1:1:1:1 ratio across the five experimental groups. The use of a STATA do-file ensured that the randomization is reproducible.

### **3.7. DATA COLLECTION AND DATA QUALITY SYSTEMS**

The core research team, together with IPA developed an evaluation plan, surveys, and guidelines to guide the implementation of the evaluation activities. The first evaluation activity combined the subject enrollment call with a caregiver survey – “Subject Enrollment and Caregiver Survey”. The caregiver survey portion explored children's educational activities since Covid-19, children's general time use, gender bias, educational aspirations for boys and girls, parental expectations on returns to education, parent engagement in education, and food security. The Caregiver Survey was developed using a mixture of adapted, adopted, and self-designed questions. The Subject Enrollment and Caregiver Survey was piloted on 43 households or primary caregivers within the catchment areas of the study. Experienced IPA staff piloted the Subject Enrollment and Caregiver Survey. Feedback from the piloting was used to modify the content of the Subject Enrollment and Caregiver Survey.

The Subject Enrollment and Caregiver Survey was programmed using SurveyCTO. The programmed survey was rigorously bench-tested and fine-tuned before it was finalized. The survey was programmed with quality checks including constraints, skip patterns, relevance commands to automate the administration process and automatically check inconsistencies or errors associated with the administration of the survey.

IPA recruited 35 remote enumerators through an internal competitive process involving experienced enumerators. The enumerators were trained remotely for the Subject Enrollment and Caregiver Survey through Google Meet. The training was conducted for four days starting from 2<sup>nd</sup> November 2020 to 5<sup>th</sup> November 2020. The training was designed using educational methods including presentations, questions and answers, group discussions, role-play, and practice. Following the training evaluation conducted at the end of the training, 34 enumerators were hired for the Subject Enrollment and Caregiver Survey.

The Subject Enrollment and Caregiver Survey was administered from 13th November 2020 to 25th January 2021. Data collection took 42 working days to complete instead of the 20 working days originally planned. The Subject Enrollment and Caregiver Survey was delayed because a considerable number of the households who were randomly selected from the C4D and GUP samples could not be located during the subject enrollment call. The phone numbers of those households were not locatable due to inactive phone numbers, wrong numbers, phone numbers switched off, and connectivity issues in the catchment areas. This affected the sample recruitment leading to the in-person tracking of respondents with not locatable numbers. The research team visited the catchment areas and tracked the households to update their phone numbers. The in-person tracking had helped the research team to update the records of over 150 primary caregivers. Weekly debriefing sessions were held to get feedback from the enumerators and provide updates and useful suggestions for improving the quality of data collection.

Data were collected via encrypted Samsung tab 7 with installed SurveyCTO Collect and administered via phone. Completed surveys were uploaded to the project's SurveyCTO server and exported to a secured IPA's institutional Box account with BoxCryptor encrypted folders and backup on an encrypted folder on the project computer. Raw data were run through IPA's data management system daily to conduct validation checks and provide feedback to the enumerators on the completed surveys.

### **3.8. DATA PROCESSING AND ANALYTICAL PROCEDURE**

Data processing was done using STATA 16.1. The primary outcome measures will include parent involvement in education, parent expectations and aspirations for their child's learning and schooling, parent beliefs about gender norms, and children's school enrollment, attendance (as measured by parent's survey). Secondary outcome measures consist of children's literacy and numeracy skills, child Social-emotional skills, educational aspirations, parent, and child time use. Both primary and secondary outcome measures will be collected midline (3-months post intervention start) and endline (6 months post intervention start) through a phone-based and in-person survey of primary caregivers and children by the research team.

### **3.9. ETHICAL CONSIDERATIONS**

The study protocol for PNP received approval from IPA's Institutional Review Board. Before participating in the PNP and the Subject Enrollment and Caregiver Survey as well as the receipt of the text messages, primary caregivers were informed about the project and gave their consent to participate. Caregivers who declined consent were withdrawn from the study.

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## **4 BASELINE DATA ANALYSIS**

### **4.1. BASELINE EQUIVALENCY TEST**

Baseline equivalency analysis (Table 6) was conducted to ensure that the randomization produced control and treatment groups that were all statistically equivalent. The mean values of various household and child characteristic variables were gathered for each treatment group and then tested using ANOVA tests to examine if the mean values differed. The resulting F-statistics and p-values indicate that there is no statistically significant variation among the control and treatment groups, indicating that randomization was successful.

### **4.2. CORRELATIONS**

We conducted a set of bivariate correlations to examine the associations between parent education, children's educational time use, gender bias, and parents' educational expectations for their sons and daughters (Table 7).

The results indicate that parent education level was not correlated with the number of hours children of any age spent on educational activities. Caregiver education was negatively correlated

Table 6. Baseline Equivalency by Group

	Control	T1	T2	T3	T4	F statistic	p value
Sample size	530	513	527	540	518		
Household characteristics						Mean or %	
Household size	9.68	9.56	9.41	9.71	9.91	0.73	0.40
Average number of school-aged children in the household	3.07	3.06	3	3.1	3.1	0.06	0.81
Girls	45%	46%	48%	45%	47%	0.84	0.36
Average number of 5-9 year olds per household	1.59	1.51	1.54	1.45	1.53	1.39	0.24
Average number of 10-17 year olds per household	1.48	1.55	1.46	1.62	1.56	2.54	0.11
Primary caregiver characteristics							
Female	51%	51%	57%	53%	50%	0.009	0.93
Age	44.8	48.8	47.7	44.4	48.8	0.06	0.82
Attended school (yes)	35%	35%	36%	35%	35%	0.07	0.80
Educational activities since covid-19							
% 5-9 year olds spending more than 2 hours per day on school work (n=1387)	15%	13%	14%	12%	14%	0.36	0.55
% of 5-9 year olds spending no time on education since school closures (n=2170)	31%	28%	27%	30%	30%	0.55	0.46
% of 10-17 year olds spending more than 2 hours per day on school work (n=1605)	24%	20%	23%	20%	21%	2.61	0.11
% of 10-17 year olds spending no time on education since school closures (n=2160)	21%	22%	18%	21%	19%	0.01	0.93
Gender bias							
Gender bias score	0.30	0.31	0.31	0.31	0.30	0.16	0.69
Highest level of education expected for girls	6.51	6.47	6.39	6.4	6.54	0.12	0.73
Highest level of education expected for boys	6.69	6.66	6.61	6.69	6.68	0.43	0.49

Table 7. Correlations

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Parent Education Level	1										
2. Are 5-9 year olds spending time on education?	0.013	1									
3. Are 10-17 year olds spending time on education?	-0.007	0.731***	1								
4. Hours 5-9 year olds spend on education	0.004	-0.212***	-0.147***	1							
5. Hours 10-17 year olds spend on education	0.048	-0.212***	-0.301***	0.712***	1						
6. Are children in your household participating in remote learning?	0.056	0.220***	0.174***	-0.078**	-0.089***	1					
7. Gender bias score	-0.227***	-0.03	0.054*	-0.049	-0.110***	-0.063*	1				
8. Wish for girls' education	0.207***	0.067**	0.032	0.078*	0.132***	0.032	-0.114***	1			
9. Wish for boys education	0.224***	0.100***	0.078***	0.071*	0.112***	0.038	-0.233***	0.737***	1		
10. Girls education expectations	0.178***	0.071**	0.015	0.098**	0.131***	0.013	-0.283***	0.726***	0.580***	1	
11. Boys education expectations	0.151***	0.112***	0.085***	0.101***	0.111***	0.017	-0.203***	0.612***	0.725***	0.778***	1

with gender bias (i.e., parents with higher education levels reported less gender bias;  $r = -0.32, p < .001$ ), and positively correlated with educational wishes for both sons ( $r = 0.22, p < .001$ ) and daughters ( $r = 0.21, p < .001$ ) and educational expectations for both sons ( $r = 0.15, p < .001$ ) and daughters ( $r = 0.18, p < .001$ ).

Caregivers who reported higher education expectations and aspirations for their sons and daughters reported that their children spent more hours on education. Specifically, having higher aspirations for daughters' educational attainment were both positively correlated to hours spent in education for both younger ( $r = 0.078, p < .05$ ) and older children ( $r = 0.132, p < .05$ ). Similar patterns were observed for expectations of daughters' educational attainment, as well as for aspirations and expectations for sons.

Finally, caregiver gender bias was negatively associated with the number of hours younger and older children spent on education ( $r = -0.10, p < .001$  for 5-9 year-olds,  $r = -0.19, p < .001$  for 10-17 year-olds). Further, caregiver gender bias was negatively associated with educational expectations for both boys and girls. Specifically, higher gender bias was related to lower wishes for daughters' educational attainment ( $r = -0.271, p < .001$ ) and lower expectations ( $r = -0.149, p < .001$ ). For sons, gender bias was also related to lower wishes for educational attainment ( $r = -0.243, p < .001$ ) and expectations ( $r = -0.109, p < .05$ ).

### **4.3. LESSONS LEARNED AND NEXT STEPS**

#### **4.3.1. LESSONS LEARNED**

The key lessons learned from the baseline and intervention piloting include:

1. Household members play critical roles in engaging children to learn. Involving multiple household members with diverse skills and capabilities such as literacy and ability to use technology when providing nudges to caregivers would enhance the efficiency of text message interventions. This is so for two reasons: (a) different household members interact and support children's learning at different times and (b) household members who are not responsive to information delivered through text messages may rely on household members with the requisite skills of using technology.
2. Knowledge of caregivers' preferred time of text message delivery can help busy caregivers adjust to the delivery of the content of the text message in a convenient way.
3. Mobile phone users often receive lots of spam in their SMS inboxes and would not bother to read before deleting unsolicited messages. Informing caregivers before sending text messages would help them to selectively delete unsolicited messages, while keeping specific messages on the intervention.
4. Contextualizing the language of the messages to both the geographical location of the caregivers as well as their reading level was an important part of making the content more accessible to the clients. An example was changing the word "hitting" to "beating".

### **4.3.2. NEXT STEPS**

The next steps of the project include ongoing intervention implementation till June 2021 and data collection to examine treatment impacts at two time points following implementation.

Importantly, our baseline phone surveys with this population have revealed that there many participants had issues trusting the intentions of the research project, given that we were not able to establish physical contact with the respondent before and all contact has been through the phone. In addition, network challenges and major activities (e.g., farming associated with catchment areas) have led to the need to conduct in-person tracking for hard-to-reach respondents. We based this decision also on the basis that preliminary studies including the Quality Preschool for Ghana study, where we recently conducted phone survey with children and their parents. All these studies have found that using phone-based assessments is not the optimal way to measure children's learning outcomes, and that in-person assessments provide much superior data.

As a result, we have decided to shift our follow-up data collection to in-person, assuming it is safe to do so. With co-funding from Jacobs Foundation and EdTech Hub, we will conduct two rounds of in-person interviews on the full sample of 2500 primary caregivers and 5,000 school-aged children. The first round of the in-person interviews will be conducted in April/May 2021 and the second round will be conducted in August/September 2021. Data analysis and reporting will be done October-December 2021.

## REFERENCES

Egger, Dennis, Edward Miguel, Shana S. Warren, Ashish Shenoy, Elliott Collins, Dean Karlan, Doug Parkerson et al. 2021. "Falling living standards during the COVID-19 crisis: Quantitative evidence from nine developing countries." *Science Advances* 7, no. 6.