

Evaluation Summaries by J-PAL of Pratham's Education Programs

2001 - 2016

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Pricing of Private Education in Urban India: Demand, Use and Impact

James Berry, Priya Mukherjee

Location: India

Sample: 5437 students

Timeline: 2014 to 2015

Research Initiative: Post-Primary Education Initiative

Policy Issue: [Increasing Test Score Performance](#)

AEA RCT Registration Number: [AEARCTR-0000652](#)

Research Papers: [Pricing of Private Education Services in India: Demand, Use, and Impact](#)

Partners:



In India, there is a particularly large market for private tutoring services, and yet, little is known about how prices influence demand, attendance, and performance among low-income households. Researchers conducted a randomized evaluation to measure the demand for private tutoring services, estimate how pricing can influence take-up and enrollment in these services, and examine how enrollment and performance differs by gender and age. Researchers found that demand for tutoring services decreases with increased prices, but that higher initial prices could help identify students who are more likely to utilize the services.

Policy Issue

In India and other developing countries, a growing number of fee-charging private schools are catering to the poor. This growth is taking place in spite of increasing government spending on public education and near-universal access to free public schooling. Many parents use scarce resources to send their children to private schools, and some policymakers have proposed giving government-funded vouchers to disadvantaged students who want to enroll in private schools. In India, there is a particularly large market for private tutoring services, and yet, little is known about how prices influence demand, attendance, and performance among low-income households. In addition, it remains unclear whether these private services may impact genders and age groups differently.

Context of the Evaluation

India has the largest educational system in the world, with over 200 million children. Over 96 percent of primary-school-age children are enrolled in school, but less than 40 percent of these children are able to read at a second-grade level. Faced with a low-quality public school system, more and more parents choose to send their children to private schools. An estimated 28 percent of students in rural areas and 65 percent of students in urban areas attend private schools.

This study took place in Delhi, India's largest metropolitan area and home to a very active private market for education services for the urban poor. Researchers partnered with Pratham, a large education NGO in India that runs regular group-based, after-school tutoring services for children between the ages of 3 and 14 in the slum areas in Delhi. The target population of this evaluation consisted of children from low-income households aged 9 to 14. Given the gender bias prevalent in educational attainment in India especially among older children, researchers explored how pricing policy could affect children based on their age and gender.

Details of the Intervention

Researchers conducted a randomized evaluation to measure the demand for private tutoring services, estimate how and whether pricing can influence take-up and attendance of these services, and examine how enrollment and performance differs by gender and age.

The sample for this study consists of 5,437 children and their parents that were chosen randomly from households in the neighborhoods of Pratham's tuition centers. Roughly 16 percent of the sample (891 students) consisted of households who already pay for tutoring at Pratham, and the other 84 percent (4,547 students) consisted of households that had not previously paid for or attended Pratham classes. Households were offered tutoring services at prices ranging from 0 to 250 rupees per month (around US\$4) through a two-part pricing design.

Households were first offered tutoring services for their children at randomly assigned prices (the "first price"). If a household accepted the offer price, the household received a randomly assigned discount of up to the amount of the offer price, resulting in a lower price paid (the "second price").

Researchers measured the impact of different pricing schemes on enrollment and attendance by varying the first price and the second price. Because take-up was based on the offer price, this helped identify how much different households valued the tutoring services. However, households were required to pay the second price, which was varied randomly. This helped identify whether prices screen out those who are less likely to use these services, and whether paying higher prices could increase attendance.

Children were tracked throughout the school year, and researchers collected data on baseline characteristics of the households, take-up, enrollment and attendance in the classes, and child test scores.

Results and Policy Lessons

Project ongoing, results forthcoming.

Berry, Jim, and Priya Mukherjee. "Pricing of Private Education Services in India: Demand, Use, and Impact." Preliminary Results, April 2016.

Improving Learning Outcomes through the Government School System in India

James Berry, Esther Duflo, Shobhini Mukerji, Marc Shotland

Location: Haryana, India

Sample: 400 primary schools and 100 upper primary schools in Mahendragarh and Kurukshetra districts

Timeline: 2012 to 2013

Policy Issue: [Increasing Test Score Performance](#)

AEA RCT Registration Number: [AEARCTR-0000008](#)

Research Papers: [Mainstreaming an Effective Intervention: Evidence from Randomized Evaluations of “Teaching at the Right Level” in India](#)

Partners:



Learning levels of primary school children have not kept pace with increased enrollment. Researchers evaluated the impact on student learning outcomes of two programs introduced by the Government of Haryana. While the Continuous and Comprehensive Evaluation (CCE) program did not have any effect on test scores, the Learning Enhancement Program (LEP), which focused on basic literacy and numeracy, significantly improved Hindi test scores, especially for students with initially low learning levels.

Policy Issue

Primary school enrollment has increased significantly around the world in recent decades, while learning levels have remained stubbornly low. Even though children are moving up from one grade to the next, few actually master the grade-level competencies expected of them. This could be attributed to a number of factors, including large class sizes, a shortage of qualified teachers, unsuitable pedagogy and curriculum, and pressure on teachers to complete the prescribed syllabus. Targeting lessons to the learning levels of students is one pedagogical approach to addressing the challenge of low learning levels. Teaching at the Right Level (TaRL), which encourages teachers to focus on basic literacy and numeracy by targeting lessons to the actual learning levels of their students rather than focusing on completing a standard curriculum, has been rigorously tested in several contexts and found to be effective when implemented by [community volunteers](#), [contract teachers](#), or by [government teachers supported by volunteers during the summer holidays](#). To date, however, there has been no evidence that this methodology is similarly effective when implemented by government teachers within the formal schooling system.

It is also unclear how TaRL compares to other types of pedagogical changes, such as one introduced by the Government of India, the Continuous and Comprehensive Evaluation (CCE) framework, which focuses on restructuring teaching-learning and testing practices. The CCE framework replaces “high-stakes” year-end exams with more frequent evaluation of student performance across academic and non-academic dimensions. By monitoring students’ progress at regular intervals, the program is expected to help teachers customize their lessons based on current learning levels. The program is also believed to reduce pressure on students by giving them several opportunities to demonstrate their skills and improve performance. However, there has been no rigorous evaluation of the impact of CCE on student learning outcomes, and it is unclear if this system helps students achieve grade-level competencies.

Context of the Evaluation

Under India’s 2009 Right to Education (RtE) Act, every child up to the age of fourteen is guaranteed free and compulsory education, and no child can be held back, expelled, or required to pass a board examination until grade 10. This has in part contributed to primary school enrollment rates of over 95 percent, but few students actually master basic reading and math. A 2012 ASER survey found that only 47 percent of students in grade 5 could read a grade two-level text proficiently, while only about 25 percent of grade 5

students were able to solve questions involving division, a grade 4 level competency. This learning gap in the early years tends to build over time, and as a result 76 percent of grade 8 students read at the grade 2 level.

While learning levels in Haryana, a state in northwest India, are higher than the national average, test scores in Kurukshetra and Mahendragarh, the two districts chosen for the evaluation, were quite low. Prior to the start of the evaluation, almost 84 percent of students in the study sample were unable to read a simple story, and more than 55 percent were unable to recognize two-digit numbers.



Student at work in classroom (Arvind Eyunni | Pratham)

across grades 1 through 8 to regularly assess student performance across a range of competencies and provide frequent feedback on performance.

Four hundred government primary schools across two districts, Mahendragarh and Kurukshetra, were randomly assigned to four groups of 100 schools each during the 2012-13 academic year: (1) CCE only, (2) LEP only, (3) both CCE and LEP, and (4) a comparison group that received neither program. A cohort of around 12,500 students in grades 1-4 were tested in Hindi and math before the programs were implemented (end of the 2011-12 school year) and after one year (end of the 2012-13 school year).

An additional 100 upper primary schools were included in the evaluation to assess the impact of CCE on older students in grade 7. Forty-seven of these schools had the CCE program and the remaining 53 served as the comparison group.

Field-level school monitors were trained to provide academic support to teachers and monitor the implementation of both programs.

Results and Policy Lessons

Students in CCE schools (primary and upper primary) did no better than students in the comparison group on either oral or written tests for Hindi or math. Being in an LEP school, in contrast, had a large and statistically significant effect on students' Hindi scores. Relative to the comparison group, students in LEP schools scored 0.15 standard deviations higher on the Hindi reading test and 0.135 standard deviations higher on the Hindi written test. The largest gains were concentrated among students who could only recognize letters at baseline. The improvement in both oral and written Hindi was also higher for girls compared to boys. The LEP program, which focused exclusively on Hindi, did not have any effect on math scores, which suggests an absence of learning spillovers across subjects.

The LEP's large effect on students' basic Hindi skills indicates that programs emphasizing TaRL can play a role in improving poor learning outcomes in developing countries and can be successfully integrated into the formal school system. Researchers note that part of the success of the LEP may be attributable to careful monitoring and mentoring support for teachers. The CCE, on the other hand, faced implementation challenges, indicating that the design of the scheme may need to be reviewed and made less complex.

Details of the Intervention

Researchers partnered with the Government of Haryana and Pratham, India's largest education NGO, to conduct a randomized evaluation of the impact of both CCE and TaRL pedagogies on student achievement in Hindi and math in primary and upper primary schools.

Pratham's Learning Enhancement Program (LEP), based on the idea of TaRL, grouped children according to their initial reading levels, irrespective of grade or age. For one hour during the school day, students were taught Hindi using level-appropriate learning materials and activities.

The CCE program involved training government teachers across grades 1 through 8 to regularly assess student performance across a range of competencies and provide frequent feedback on performance.

Duflo, Esther, James Berry, Shobhini Mukerji and Marc Shotland. "A Wide Angle View of Learning: Evaluation of the CCE and LEP Programmes in Haryana." Draft Final Report, 3ie, May 2014.

Banerjee, Abhijit, Rukmini Banerji, James Berry, Esther Duflo, Harini Kannan, Shobhini Mukerji, Marc Shotland, and Michael Walton. "Mainstreaming an Effective Intervention: Evidence from Randomized Evaluations of "Teaching at the Right Level" in India." Working Paper August 2016.

The Impact of Mother Literacy and Participation Programs on Child Learning in India

Rukmini Banerji, James Berry, Marc Shotland

Location: Indian states of Bihar and Rajasthan

Sample: around 9,000 households in 480 villages

Timeline: 2010 to 2012

Policy Issue: [Increasing Test Score Performance](#)

AEA RCT Registration Number: [AEARCTR-0000065](#)

Data: [Download from Dataverse](#)

Research Papers: [The Impact of Mother Literacy and Participation Programs on Child Learning: Evidence from a Randomized Evaluation in India](#)

Partners:

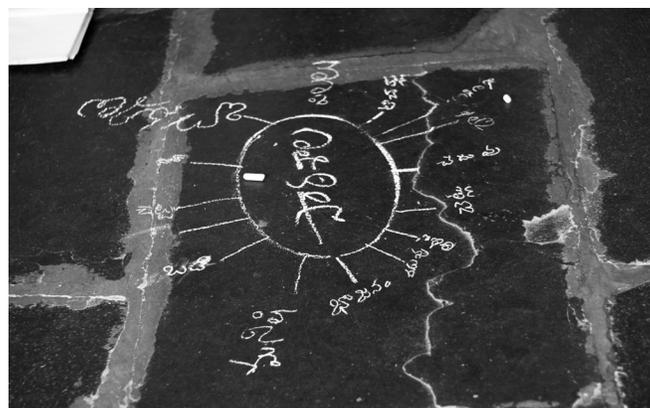


Policy Issue

There is a growing body of evidence which suggests that parents' education, particularly mothers' education, significantly impacts children's academic performance. Observationally, more educated parents tend to be more involved in their child's education, have higher expectations, allocate more resources to education, and have more educational materials at home, all of which could potentially support a child's learning. But what happens in places like rural India, where most mothers have few, if any, years of schooling, and the majority of mothers are illiterate? Can a more beneficial home environment be cultivated through a simple community-based literacy program? Can teaching mothers who have no formal education how to read or how to support their children's education improve child learning outcomes?

Context of the Evaluation

Following the passage of the Right to Education (RTE) Act, which guarantees free and compulsory education for all children up to age fourteen, India has achieved almost universal enrollment. According to the 2011 Annual Status of Education Report (ASER), only 3.3 percent of children between 6-14 years are currently not enrolled in school. However, most children showing up for class are learning very little. In 2011, 65 percent of children in Standard III could not read a Standard I level text, and this number has actually increased 10 percentage points in the last three years. One possible remedy could be promotion of parental involvement, but this is often difficult when parents have little formal education themselves. According to ASER 2011, 46 percent of mothers of children in school have not been to school themselves.¹



Details of the Intervention

Together with Pratham, one of the largest NGOs in India, researchers evaluated whether a mothers' literacy program could encourage parental involvement and subsequently improve children's learning outcomes. Mothers of first- and second-grade children who were enrolled in another Pratham program were assigned to either one of the following three treatment groups or a comparison group, which received no additional services.



Practicing literacy skills in India (Arvind Eyunni | Pratham)

1. **Mothers' Literacy Classes (ML)** were held for two hours every day. The classes used Pratham's accelerated learning techniques, which have been proven to improve children's reading levels in just a few months (See related [evaluation](#)).
2. **Child's Home Activities and Materials Packet (CHAMP)** were intended to help illiterate mothers interact with their children to enrich the learning environment at home. Children were given workbooks with a specific activity assigned for each day. Each activity included a visual description of each activity (e.g. a picture of a book for "reading," a pen for "writing," etc.) so that illiterate mothers could participate. Before the intervention began, the goal of the booklet was explained to each mother and they were encouraged to make their child use the workbooks to practice.
3. **ML and CHAMP** combined the first two interventions. However, since mothers theoretically would be learning to read at the same time, the activities component was more elaborate. Every day, the first half of class was dedicated to teaching mothers structured learning activities they could do with their children, while using the workbook as a general guide. Mothers were also trained to identify their child's current learning level and to monitor any progress.

Both mothers and their children were tested at the start of the intervention and again one year later. This data was complemented by a detailed household survey that focused on mothers' outcomes, children's outcomes, and mother-child interactions.

Results and Policy Lessons

Results forthcoming.

Banerji, Rukmini, James Berry, and Marc Shotland. "The Impact of Mother Literacy and Participation Programs on Child Learning: Evidence from a Randomized Evaluation in India." Working Paper, February 2017.

Read India: Helping Primary School Students in India Acquire Basic Reading and Math Skills

Abhijit Banerjee, Rukmini Banerji, Esther Duflo, Michael Walton

Location: Uttarakhand and Bihar, India

Sample: 122 schools in Uttarakhand and 264 schools in Bihar

Timeline: 2008 to 2010

Policy Issue: Increasing Test Score Performance

Research Papers: [What Helps Children to Learn? Evaluation of Pratham's Read India Program](#), [Mainstreaming an Effective Intervention: Evidence from Randomized Evaluations of "Teaching at the Right Level" in India](#)

Partners:



Though there has been steady progress in improving school enrollment, learning levels remain low. In 2008, 45 percent of children in rural India in standards three to five could not do subtraction and 33 percent could not read a standard one text. Researchers partnered with Pratham, an educational NGO, to evaluate the impact of their "Read India" program and its components, which include teacher training, monitoring, learning materials, and village volunteers, on educational attainment. Preliminary results suggest the program had a modest impact on overall reading levels in the villages where camps were held, but a much larger impact on the subgroup of children that actually attended the camps.

Policy Issue

Though there has been steady progress in enrollment, including girls and members of poorer groups, problems of intermittent school attendance and school quality remain pervasive in the developing world. Previous studies showed that volunteers trained in remedial learning and NGO supported remedial teachers were effective in improving learning levels. But the potential to scale the results would be expanded if the same approach could be delivered through government schools using existing teachers. However, it is not clear whether, given a teacher who is unmotivated and lacking incentives and accountability, this approach will work.

Context of the Evaluation

The ills of India's educational system are felt most acutely by the poor, especially in rural areas, where the vast majority still attend government-run public schools. Pratham, an educational NGO, has since 2005 produced an Annual Status of Education Report (ASER), which involves a short educational test administered to a large and representative sample of rural children in India. The report has shown large deficits in basic reading and math capabilities. For example, according to ASER 2008, 45 percent of children in standards three to five cannot do subtraction and 33 percent cannot read a standard one text.

There have been a variety of responses to this problem. The Central government began a major initiative, the Sarva Shiksha Abhiyan (SSA), in 2001 to provide additional resources and support to state-level education systems to push for universal elementary education by 2010. Complementing this push, Pratham has been developing new reading materials and teaching methods that are designed to be more accessible and effective in current conditions in India's education system. These methods lie at the center of its nation-wide effort, Read India, whose objective is to teach children basic reading and math skills, thus improving learning levels.



Father helping his son with his homework, India.

Details of the Intervention

Pratham, together with researchers, has evaluated the Read India program over several years in Bihar and Uttarakhand, where they have partnered with the local governments.

This evaluation examines three major elements: (1) Pratham's training and academic support to government school teachers, (2) Pratham's specially designed learning materials that are used in schools and in the villages, and (3) village volunteers' supplementary effort to support children who need extra help. The training and monitoring is done in collaboration with the state governments, and the materials have been created using input from teachers and others in

the field.

The interventions differ between the two states:

- Bihar: There are three intervention groups and one comparison group in Bihar. In the first intervention, a randomly selected subset of schools receive teacher training, monitoring, academic support and materials. In the catchment area of these schools, Pratham also recruits village volunteers (who are not paid) to assist in providing extra instruction to children who need extra help. The second intervention involves another randomly selected subset of schools where the teachers are given training, monitoring, academic support and materials but there are no volunteers. In the third intervention, the schools only receive materials. All of these are compared to a comparison group, which receives nothing.
- Uttarakhand: This intervention differs from the one in Bihar in that there will be no teachers or schools receiving only materials, so that those villages selected to receive the treatment will receive both the materials and teacher training. Similarly to Bihar, of the schools receiving the treatment, about half will also have volunteers. The nature of the volunteer activity also differs between the two states. In Bihar, the volunteers work in the community outside of school hours but in Uttarakhand, volunteers work in the schools during school hours.

The interventions are administered jointly by Pratham and the state government over two school years (2008-2009 and 2009-2010). Three large scale surveys are planned, one baseline, a midline after one school year and an endline survey after two school years. In addition, a special survey of about half the children was undertaken in Bihar to evaluate a summer camp that was implemented at the beginning of the first school year. The camp targeted girls and low-performing children in standards three to five and aimed to help children who had fallen behind academically to catch up before the regular school year began in July. These surveys are being complemented by ongoing monitoring of the intervention's implementation within the schools. The learning levels will be measured using testing tools that include the ASER testing tools and other instruments that have been specially developed for the project.

Results and Policy Lessons

The Read India evaluation is currently in its final academic year so it is not yet possible to measure the impacts of the intervention. Preliminary analysis from the summer camps held in Bihar suggests there was a modest, significant impact on overall reading levels in the villages, but a much larger impact on the subgroup of children that actually attended the camps. This indicates that if the targeting of low-performing students had been more effective, the measured impact of the summer camp on all children would likely have been greater. But given that the summer camps were organized quickly and in one of the poorest states of India, the positive impact of the summer camps is judged to be noteworthy.

Banerjee, Abhijit, Rukmini Banerji, James Berry, Esther Duflo, Harini Kannan, Shobhini Mukerji, Marc Shotland, and Michael Walton. "Mainstreaming an Effective Intervention: Evidence from Randomized Evaluations of "Teaching at the Right Level" in India." Working Paper August 2016.

Bridge Classes and Peer Networks Among Out-of-School Children in India

James Berry, Leigh Linden

Location: Gurgaon, India

Sample: 1,303 out-of-school children

Timeline: 2006 to 2007

Policy Issue: [Improving Student Participation](#)

Research Papers: [Bridge Classes and Peer Networks among Out-of-school Children in India](#)

Partners:



Despite a global decline in unenrolled children, the United Nations estimates that 73 million primary school-age children were out of school in 2008. Researchers, in partnership with the Indian NGO Pratham, evaluated the effect of peer networks on the enrollment and attendance of out-of-school children in informal classes intended to transition them into formal schooling. They found that an out-of-school child was more likely to attend the informal class when a friend or sibling also attended.

Policy Issue

Between 1999 and 2006, the United Nations estimates that the number of un-enrolled primary-aged children fell by 30 million. However, 73 million children still do not attend a formal education program, and almost a quarter of these children are in South Asia.¹ There are many potential reasons why children may not attend school. In places where educational resources are scarce, children may have to travel far distances to attend school, and school fees may prevent low-income families from enrolling their children in school. It is also possible that extended families and peer networks influence a child's education actions, however more research is needed to understand the casual effects of peer relationships on the choice to participate or enroll in school.

Context of the Evaluation

Gurgaon, where this study takes place, is a small city just outside of Delhi that has experienced large growth over the past 10 years due to Delhi's urban sprawl. Though school enrollment rates in India are above 90 percent, in Gurgaon 47 percent of the children surveyed were not enrolled. Almost all of these children were from migrant families. Of the un-enrolled children, 96 percent of their parents said they were willing to send them to school, and only 1.4 percent of the children were working outside of their house.



Indian children sitting on the floor of a classroom

Details of the Intervention

Researchers, in partnership with the Indian NGO Pratham, tested the effects of peer networks on the enrollment and attendance of a Bridge Course for out-of-school children. Pratham has implemented a Bridge Course program for a number of years in various areas in India. The Bridge Course is designed to give out-of-school children the opportunity to take informal classes for one year as a bridge into the formal school system. Pratham's approach centers on the involvement of locally hired teachers who are trained in an intensive two-week program. Unlike teachers in the formal schooling system who may not share a common background with their students, Pratham's model is designed so that the

teachers can relate to the situations of the children they teach. Children in the Bridge Course are taught in groups of 20-25 students for three hours per day, six days per week. At the end of the year, Pratham assists the children and their families in enrolling in a local public school.

To identify social network connections, children were given a friendship survey,' which sought to identify relationships between peers and siblings. The survey allowed children to list their friends; it also asked children if they were friends with a list of pre-selected children. Attendance at the classes was measured through a team of monitors who visited the classes twice weekly.

Out-of-school children were identified through a community census in 17 different communities. One class was assigned to every 60 children in the 17 communities. The treatment consisted of actively recruiting 25 randomly selected children out of every 60 to attend the bridge program. Before the classes, the treated children were notified about when and where the class would be held. In addition, class teachers periodically re-visited the homes of treated children who were not attending to remind them of class and even walk them to class if necessary. Children not assigned to the treatment group were free to attend the classes as they wished, but they did not have the benefit of active recruitment.

Results and Policy Lessons

Attendance: Being in the treatment group and experiencing active recruitment to the program made a child 31 percent more likely to attend classes at all and 13 percent more likely to attend the class on a given day than a child who did not receive active recruitment. While boys and girls attended the classes in equal numbers, younger children were significantly more likely to attend.

Peer Networks Effects: Children who had a friend receiving the active recruitment treatment were 6.3 percentage points more likely to attend the classes. This effect is even stronger for children who have a sibling or a mutual friend' in the program, where mutual friendship is defined by both children identifying the other as a friend on the survey. Similarly, the amount that a peer or sibling participated in the program (defined as the number of days attended as a fraction of the total classes) has positive effects on a child's own participation. A 10 percentage point increase in participation by a mutual friend increases a child's participation by 4.2 percentage points, and a 10 percent increase in participation by a sibling increases a child's participation by 6.1 percentage points.

Berry, James, and Leigh Linden. "Bridge Classes and Peer Networks among Out-of-school Children in India." Working Paper, MIT, March 2009.

How to Teach English in India: Testing the Relative Productivity of Instruction Methods within the Pratham English Language Education Program

Fang He, Leigh Linden, Margaret McLeod

Location: Maharashtra, India

Sample: 5,317 students in Thane; 9,745 students in Mangaon, Raigad

Timeline: 2005 to 2007

Policy Issue: [Increasing Test Score Performance](#)

Research Papers: [How to Teach English in India: Testing the Relative Productivity of Instruction Methods within the Pratham English Language Education Program](#)¹

Partners:



In many developing countries, the official language of government and business is either French or English rather than the native language spoken by the population at large. While the curricula of many countries do indeed require students to learn official languages, the quality of instruction may be particularly poor. Researchers partnered with the Indian NGO Pratham to evaluate whether different technologies and implementation methods can increase students' English test scores. Overall, the interventions were effective at increasing students' knowledge of English.

Policy Issue

In many developing countries, the official language of government and business is either French or English rather than the native language spoken by the population at large. The returns to knowing the official language can be quite high, and proper instruction is of importance. While the curricula of many countries do indeed require students to learn such languages, the quality of instruction may be particularly poor. This study evaluates a project that focuses on improving students' acquisition of this crucial second language. In this regard, this research fits squarely within the branch of education which does not solely seek to understand how to get children into school, but also what it takes to cost-effectively improve school quality. Many schools rely on rote learning and memorization, but it may be more effective to take an interactive approach which is tailored to a child's level of learning. How do different types of technologies and implementation methods affect students' learning outcomes?

Context of the Evaluation

Despite the fact that English is part of the normal curriculum, only 10 percent of second and third grade students in this study were able to correctly identify pictures of simple objects when given the object's English name. In government schools, teachers generally train children to recite the English alphabet and memorize vocabulary lists, yet conversational skills are rarely introduced. Many teachers skip reading the source text altogether, and teach only in preparation for exams. Therefore, the Indian public primary school system often fails to teach a language that is of crucial importance to a child's subsequent employment opportunities, and in addition foregoes the "critical period" in which a child is able to acquire a second language up to native-like levels.



J-PAL staff help a young girl solve a maze exercise in India.

Details of the Intervention

Researchers evaluated the effectiveness of a unique English language training program developed by the Indian NGO Pratham on increasing students' English test scores. The program, called PicTalk, has two components: first, an electronic machine called the PicTalk is designed to be used individually by the student; the second is a set of specially tailored flashcards and teaching manuals designed to promote oral communication with the help of a teacher. Both methods aim to teach equivalent curricula to its students, yet through the use of differential teaching methods.

To evaluate the effectiveness of this program, two randomized evaluations were conducted with over 15,000 children in

grades 1-5 in both rural and urban areas of India. The research design varied both the implementation technology and whether the intervention was delivered through externally hired tutors or the public schools' own teachers and assistants.

Externally Hired Tutors: In the first study year, 97 schools in Thane were assigned to one of two research groups: (1) PicTalk class in second grade but not in third, or (2) PicTalk class in third grade but not in second. Therefore, every school served as both a treatment and a comparison group. English tutors were hired and trained by Pratham, and attended the schools daily to implement the program.

Teacher Implementation: In the second year, 242 schools in Mangaon were assigned to one of four research groups: (1) PicTalk machine classes only, (2) activities classes only, (3) both PicTalk machine and activities classes (as in the first year), or (4) neither PicTalk machine nor activities classes. All classes were taught by normal classroom teachers.

Results and Policy Lessons

Effects on Learning: On average, the machines and the student activities were similarly effective at improving students' English scores. The externally implemented program increased students' scores by 0.26 standard deviations while students subjected to the teacher implemented interventions improved their test scores by 0.36 standard deviations. Thus, each implementation method seemed to be similarly effective, regardless of the technology used by the instructor or whether the instructor was a local teacher or from an external agency. When implemented by local teachers and teaching assistants, however, the interventions increased not only English scores, but also math scores. This seemed to be due to the discretion teachers had over the intensity with which the program was implemented: when the program made teaching English more efficient, teachers were able to spend more time on other subjects. The results demonstrated improvements in math scores of similar magnitude as the improvements in English for those students in the teacher implemented interventions.

Differences resulting from technological choice: In comparing the flashcard-/teacher-based intervention versus the self-paced computerized implementation, the study found interesting differences between the benefits to subgroups from such interventions. Specifically, lower performing students benefited more from interventions that included teacher implemented activities, while higher performing students gained more from the relatively self-paced machine-only intervention. This is notable, since the norm in Indian classes is to focus on the better performing students. These results also suggest that significant gains could be achieved by targeting different approaches to individual children

He, Fang, Leigh L. Linden, and Margaret MacLeod. "How to Teach English in India: Testing the Relative Productivity of Instruction Methods within the Pratham English Language Education Program." Working Paper, Columbia University, July 1, 2008.

Can Informational Campaigns Raise Awareness and Local Participation in Primary Education in India?

Abhijit Banerjee, Rukmini Banerji, Esther Duflo, Rachel Glennerster, Stuti Khemani

Location: Jaunpur district in eastern Uttar Pradesh, India

Sample: Households and government schools in 280 villages

Timeline: 2005 to 2006

Policy Issue: [Community Participation, Increasing Test Score Performance](#)

AEA RCT Registration Number: [AEARCTR-0001702](#)

Data: [Download from Dataverse](#)

Research Papers: [Pitfalls of Participatory Programs: Evidence from a Randomized Evaluation in Education in India](#)

Partners:



While primary school enrollment has risen sharply around the world, the quality of education remains low in many countries. Researchers examined whether increasing community oversight and participation could improve education outcomes in Uttar Pradesh, India. Mobilizing community members to monitor local schools through Village Education Committees did not increase participation in school governance or improve education outcomes, but training local volunteers to teach basic reading outside school had a positive impact on student learning.

Policy Issue

While primary school enrollment rates have risen sharply in much of the world, the quality of education remains low in many countries. Many children who attend school regularly are still unable to read or do basic arithmetic. For instance, a 2008 survey found that in rural India only 56 percent of children in grade 5 could read at the grade 2 level, and nearly 20 percent could not read beyond a single word. Community oversight and participation has been advocated to increase education quality. Does this strategy work, and if so how can community participation be encouraged? Is more direct action by communities to teach their children to read more effective?

Context of the Evaluation

In Uttar Pradesh, India's most populous state, only 43.5 percent of children in grade 5 can read at the grade 2 level. In response to this problem, the government established Village Education Committees (VECs) in every village in 2001. VECs consist of the elected head of the village government, the head teacher of the local school, and three parents who are nominated by their community. These committees are responsible for monitoring school performance, allocating school resources, and hiring additional contract teachers in the event of overcrowding.

Despite the promising aspects of this program, a survey conducted in 2005 indicated that 38 percent of VEC members did not readily identify as being part of the committee, and 25 percent did not even know they had this role. Only 3.6 percent of all VEC members knew they had the ability to request funds to hire additional teachers, which is one of the main prerogatives and responsibilities of the VEC.



Training volunteers to hold after-school reading classes improved educational outcomes (Photo by Arvind Eyunni | Pratham)

Details of the Intervention

Working jointly with Pratham (a local NGO) and the World Bank, researchers designed three interventions that were randomly assigned in 280 villages in four rural blocks in Jaunpur district, eastern Uttar Pradesh, a populous and educationally struggling area in India. These interventions served to determine if more information and encouragement to use the channels available to them would cause VECs and community members to demand and receive better services. They contrasted this with direct action to improve learning outside the official channels.

Intervention 1: In 65 villages, Pratham staff started a series of conversations about education in small groups throughout

the community. These conversations covered the current status of schools in the village, the quality of local schools, state mandated provisions for schools, mid-day meals, and local funds available for education. People were asked if they knew about the VEC and its membership and responsibilities. After two days of meetings in small groups, a community-wide meeting was held where people were encouraged to discuss and ask for information about the VEC, with information gaps filled in by Pratham's field workers. VEC members also received a pamphlet on their roles and responsibilities from the Pratham staff.

Intervention 2: In addition to all the steps outlined above, communities in another 65 villages were trained and encouraged to conduct testing to see if children could read simple text and solve basic arithmetic problems. Volunteers put together a "report card" for each community, which was presented at the community-wide meeting.

Intervention 3: In addition to the above two steps, Pratham officers taught volunteers in another 65 villages a simple technique for helping children learn to read. Volunteers were encouraged to start after-school reading classes—they were invited to attend training sessions which lasted for four days, and staff returned an average of seven times to provide in-service training. The objective was to use Pratham-designed materials and local volunteers to supplement the normal curriculum, and improve literacy among village children.

Comparison: Eighty-five villages received no treatment, serving as a comparison.

Results and Policy Lessons

Impact on Information Gaps: The average effect of all three treatments was an increase of 7.8 percentage points in VEC members who knew they could access public funds, and a 13 percentage point increase of members who had been properly trained. Parents were also 2.9 percentage points more likely to know that a VEC existed in their community.

Impact on Engagement: Despite these improvements in awareness, there was little difference between the VECs' performance in treatment and comparison villages. The only significant difference was that 20 percent more contract teachers were hired in Intervention 2 villages (although not in Intervention 3 villages). Also, the intervention did not increase the level of engagement of parents with schools. Parents were no more likely to have visited the school or to have volunteered time or money in the treatment villages than in the comparison villages.

Impact on Reading: In 55 of the 65 Intervention 3 villages, volunteers ran more than 400 reading courses. The average child in an Intervention 3 village who could not read anything at baseline was 7.9 percent more likely to be able to read at least letters. Those who could read only letters at baseline were 3.5 percent more likely to read at least paragraphs or words, and 3.3 percent more likely to read stories if they were in an Intervention 3 village. These changes in average literacy across the village came despite the fact that only 8 percent of children, including 13 percent of those who could not recognize letters prior to the intervention, attended the classes. Provided that the effects of Intervention 3 are channeled entirely through attendance at the reading classes, comparing the

endline reading levels of the comparison group with the Intervention 3 treatment effects described above reveals just how large these effects are: all children who could not read at baseline but attended classes ended up being able to read letters at endline, and 98 percent of children who could read at the word or paragraph level was able to read at the story level.

Intervention 3 was the only intervention which actually improved educational outcomes, by empowering individuals to improve teaching in their own communities. This suggests that enabling local action which does not depend upon large-group participation may be a means of directly affecting educational outcomes.

Banerjee, Abhijit, Rukmini Banerji, Esther Duflo, Rachel Glennerster, and Stuti Khemani. 2010. "Pitfalls of Participatory Programs: Evidence from a Randomized Evaluation in Education in India." American Economic Journal: Economic Policy 2(1): 1-30.

Searching for a Better Way to Teach Children to Read in India

Fang He, Leigh Linden, Margaret McLeod

Location: India

Sample: 2,679 students (experiment 1), 4,757 students (experiment 2), 3,858 (experiment 3)

Timeline: 2004 to 2007

Policy Issue: [Increasing Test Score Performance](#)

Research Papers: [A Better Way to Teach Children to Read? Evidence from a Randomized Controlled Trial](#)

Partners:



Policy Issue

The Millennium Development Goals and the Education for All initiatives have placed strong emphasis on the promotion of universal primary education. Yet simply enrolling children is only a first step in educating children in developing countries; the quality of education matters as well. It is well-known that educational quality differs significantly across countries. Since it is especially low in developing countries, programs to improve education quality are crucial in closing the gap between developed and developing countries. Effective methods to teach reading skills are particularly important because there is much evidence showing a strong persistence in reading abilities starting from a young age. Moreover, existing research strongly suggests that learning to read at an early age lays a strong foundation for future academic skills development, suggesting that improvements in early reading programs could yield significant long-term returns. These connections have strong implications for low-income children in particular, because they tend to have home and school environments which are less conducive to early reading development relative to those of higher income children. Therefore, low-income children often develop lower pre-reading abilities which then have strong implications for later reading abilities.

Context of the Evaluation

Although enrollment rates have increased significantly in India, a recent countrywide survey of rural children (ASER, 2007) found that only 58.3 percent of children in fifth grade could read at the second grade level. This study aims to give further insights into this policy issue by analyzing a particular education program that seeks to improve the quality of language instruction for early learners in the slum communities of Mumbai, India. In this particular setting, the quality of language instruction is generally poor and the need to improve existing education models is critical, especially at an early age. The main purpose of the curriculum is to provide basic literacy training to pre-school children, hence laying a foundation for their matriculation to regular primary schools. The pre-school *Schishuvachan* program is, moreover, a departure from regular Indian teaching styles in that it focuses on comprehension instead of rote memorization and repetition. This is facilitated by teacher-student interaction centered on storytelling and classroom games.



A young child reads among onlookers in India.

Details of the Intervention

The *Shishuvachan* program was originally designed to supplement *balwadi* (daycare) programs run by Pratham, the government school system, and other organizations. The program's main goal is to develop reading and comprehension skills among children aged four to five in preparation for primary school matriculation. In class, teachers engage in seven different activities: pre-reading, story-telling, story-reading, word recognition, letter recognition, *barakhadi* chart (phonetic chart that helps children associate consonants with vowel sounds in the Devanagari alphabet), and unfamiliar text reading.

Recent studies have suggested that the efficacy of educational strategies may vary by educational institution and by type of child. As a result, three separate experiments were conducted over three years designed to evaluate the effects of the program on three different student populations in three different types of institutions:

Experiment 1: 67 Mumbai schools were divided in three research groups. Schools were assigned to receive *Shishuvachan* methodology training for their instructors, to have a *Shishuvachan* program implemented on an out-of-school basis in the feeder community, or to receive no intervention at all. In all cases the *Shishuvachan* program was conducted for one hour a day.

Experiment 2: The second experiment involved testing the techniques in specially designed *Shishuvachan* classes, independent of any other educational infrastructure. Random assignment was done at the community level. A baseline assessment was conducted amongst students in 138 slum communities in which Pratham operated preschools which had not received the *Shishuvachan* program. Seventy schools were selected for the treatment group and 68 for the control. The *Shishuvachan* classes operated independently of existing preschools even in separate locations.

Experiment 3: Finally, in the third year experiment, the effects of implementing the *Shishuvachan* program on the children for which it was originally designed – preschool children in the Pratham preschool classes – was evaluated. Besides the context, the experiment also differed in the type of information collected – collecting information on parents reaching scores as well as those of the students enrolled in the classes.

Results and Policy Lessons

The results of this experiment suggest that Pratham's *Shishuvachan* early literacy skills development curriculum is a viable strategy for improving the reading skills of pre-school and first grade children in India. In the three experiments used for the evaluation, the program proves robust to several delivery mechanisms, delivering gains of 0.12 to 0.70 standard deviations over the respective control groups. The intervention seems to have proved most effective in the setting for which it was originally intended – pre-schools. The treatment effect in these institutions is 0.7 standard deviations overall, an effect that is larger than in either of the other institutions. Comparing the different implementation strategies, this study shows the greatest gains when the program is a supplement to existing language training and among children with the lowest initial performance or whose parents are least able to supplement their classroom studies. The in-school intervention of year one demonstrated a gain of 0.26 standard deviations compared to a 0.55 standard deviation gain of the out-of-school intervention. Providing *Shishuvachan* as a complement to school curricula rather than as a substitute has a significantly more positive effect on student scores. The community based intervention of year two generated an insignificant increase in normalized score: 0.12 standard deviations for the entire community, 0.44 to 0.53 standard deviations for participating students.

Computer-Assisted Learning Project with Pratham in India

Abhijit Banerjee, Esther Duflo, Leigh Linden

Location: Vadodara, India

Sample: Grade 4 classes in 111 primary schools

Timeline: 2002 to 2004

Policy Issue: [Increasing Test Score Performance](#)

AEA RCT Registration Number: [AEARCTR-0001701](#)

Research Papers: [Remedying Education: Evidence from Two Randomized Experiments in India](#)

Partners:



MacArthur
Foundation



There are major concerns about the quality of public education in developing countries—with achievement surveys indicating low levels of learning even for children who have attended school regularly for many years. In Vadodara, India, researchers studied the impact of supplementing classroom instruction with computer-assisted learning (CAL) in primary schools. CAL significantly improved student’s math scores, but was less cost-effective than the remedial tutor-based program, Balsakhi.

Policy Issue

Over the past decade many developing countries have expanded primary school access, energized by initiatives such as the United Nations Millennium Development Goals, which call for achieving universal primary education by 2015. However, there are major concerns about the quality of public education in developing countries with achievement surveys indicating low levels of learning even for children who have attended school regularly for many years. While much is now known about how to get children into school, much less is known about how to improve school quality in a cost-effective way. While many schools rely on rote learning and memorization, how realistic is it to introduce more interactive learning approaches? How important is a pedagogical approach that adapts to the level of the child? Can technology help achieve these goals in a cost-effective way?

Context of the Evaluation

In India 44 percent of children aged 7 to 12 could not read a basic paragraph and 50 percent could not do simple subtraction in 2005, although most were enrolled in school. Even in urban India, the learning levels are very low. In Vadodara, a major city in the Indian state of Gujarat, only 19.5 percent of the students enrolled in grade 3 could correctly answer questions testing grade 1 math competencies. Computer-assisted learning (CAL) could be an effective supplement to regular instruction, as good education software can be reproduced at a nominal cost, and well-designed educational games can sustain interest and curiosity as well as adapt to the learning level of the child. Excitement over CAL is particularly strong in India, where the high-tech sector is successful, but schools have little guidance about if or how they should use computer based educational assistance.



Students play educational computer game in Vadodara, India

Details of the Intervention

Taking advantage of a government program that placed four computers each in 80 percent of primary schools in Vadodara, education-oriented NGO Pratham designed a program that supplemented classroom instruction with CAL. The study asked if CAL improves students' skill levels, if the effects would persist over time, and how cost-effective the program would be compared to alternatives.

Pratham introduced the CAL program over two years. Fifty-five schools were randomly assigned to receive the intervention while 56 served as a comparison. Students in treatment schools received basic instruction on how to use the computers, and then spent two hours per week of shared

time (two students per computer) working independently with educational software. This software consisted of self-paced games in the local language, designed to improve basic math skills. The students were tested at the beginning, middle, and end of the school year, in both math and language skills. The experiment was repeated the following year by providing the CAL program to the schools that had served as a comparison group in the first year.

Results and Policy Lessons

Impact on Education: Students who participated in the CAL program had higher math scores on average compared to the comparison group. In the first year math scores increased by approximately 0.35 standard deviations, and in the second year, by 0.47 standard deviations, a substantial achievement when compared to other education interventions. There was no measurable impact on language scores, suggesting that the introduction of computers did not have spillover effects on learning in other subjects. The improvement in math scores persisted to some extent after one year, but further research is needed to fully assess long-run impacts.

Comparative Cost-Effectiveness: The CAL program was tested at the same time as a remedial tutor-based program, Balsakhi. The CAL program was shown to be highly effective in raising students' skill levels in math, but was less cost-effective than the tutor-based Balsakhi program. The Balsakhi program cost about US\$2.25 per student per year, whereas the CAL program cost about US\$15.18 per student per year.

Banerjee, Abhijit, Shawn Cole, Esther Duflo, and Leigh Linden. 2007. "Remedying Education: Evidence From Randomized Experiments in India." The Quarterly Journal of Economics 122(3): 1235-1264.

Balsakhi Remedial Tutoring in Vadodara and Mumbai, India

Abhijit Banerjee, Shawn Cole, Esther Duflo, Leigh Linden

Location: India

Sample: 122 primary schools in Vadodara, 77 primary schools in Mumbai

Timeline: 2001 to 2004

Policy Issue: [Increasing Test Score Performance](#)

AEA RCT Registration Number: [AEARCTR-0001701](#)

Data: [Download from Dataverse](#)

Research Papers: [Remedying Education: Evidence from Two Randomized Experiments in India](#)

Partners:



Over the past decade, many developing countries have expanded primary school access, but improvements in school access and enrollment may not always translate into improved learning outcomes for all students if the quality of education is poor.

Researchers evaluated the impact of the Balsakhi Program, a remedial tutoring education intervention implemented in schools in Vadodara and Mumbai, India, on student learning. The program significantly improved student test scores in both locations.

Policy Issue

Over the past decade many developing countries have expanded primary school access, energized by initiatives such as the United Nations Millennium Development Goals, which call for achieving universal primary education by 2015. However, improvements in school access and enrollment may not always translate into improved learning outcomes for all students if the quality of education is poor. Current research has identified several cost-effective ways to increase student attendance, but much less is known about how to improve education quality and student learning in a cost-effective way. Many schools rely on rote learning and memorization, but can lessons which are more tailored to children's learning level improve achievement? How important is a pedagogical approach which adapts to the level of the child?

Context of the Evaluation

A 2005 survey found that 44 percent of Indian children age 7 to 12 could not read a basic paragraph and 50 percent could not do simple subtraction even though most were enrolled in school. Even in urban India, the learning levels are very low in Vadodara, a major city in the Indian State of Gujarat, only 19.5 percent of the students enrolled in grade 3 could correctly answer questions testing grade 1 math competencies. Ironically, the difficulty in improving the quality of education may be complicated by success in getting more children to attend school, as in many cases neither the pedagogy nor the curriculum has been adapted to take into account the quantity and characteristics of the influx of new children.



Tutors supervise students in India

the four-hour school day each day. Instruction focused on the core competencies the children should have learned in the first and second grades, primarily basic numeracy and literacy skills. The instructors were provided with two weeks of initial training and a standardized curriculum that was developed by Pratham.

In the 2001 school year in Vadodara, approximately half of the schools were given a tutor for grade 3, and the other half were given a tutor for grade 4, while in Mumbai during that same year, approximately half of the schools received a tutor for grade 3, and the other half received a tutor for grade 2 in both cities, which school received which tutor was randomized. In 2002, the schools were given a tutor for the previously untreated grade. In determining program impact, grade 3 students in schools that only received a tutor for grade 4 were compared to grade 3 students in schools that had tutors for grade 3, and so on. Academic achievement was measured through two annual tests, administered at the start and end of the academic term.

Results and Policy Lessons

Impact on Education: The program had substantial positive impacts on children's academic achievement. In both Vadodara and Mumbai, the Balsakhi program significantly improved overall test scores; by 0.14 standard deviations in the first year and 0.28 standard deviations in the second year, with the largest gains in math. Moreover, the weakest students, who were the primary target of the program, gained the most. Researchers estimate that the entire effect of the program was due to a very large (0.6 standard deviations) improvement in average test scores among the children who were sent for remedial education. In contrast, there was no measurable impact for their classroom peers, who did not receive remedial tutoring, but were "treated" with smaller class sizes and a more homogenous classroom.

Balsakhi Turnover: There was rapid turnover among the balsakhi tutors, with each tutor staying on average for just one year, typically until they got married or got another job. Despite the high turnover among tutors, the program still resulted in significant gains in student learning, which suggests that the success of the program did not depend on a handful of very determined and enthusiastic individuals.

Cost-Effectiveness: The Balsakhi program was very inexpensive, since the main cost of the program was the tutors' relatively small salaries. Overall, the Balsakhi program cost approximately US\$2.25 per child per year, significantly less than the cost per child of a Computer Assisted Learning program, evaluated by Pratham at the same time. In terms of cost per improvement in test scores, researchers estimate an attractive cost-effectiveness of about US\$0.67 per standard deviation increase in test scores. The Balsakhi program has since been adapted, re-evaluated, and scaled up across India.

*Banerjee, Abhijit, Shawn Cole, Esther Duflo, and Leigh Lindon. 2007. "Remedying Education: Evidence From Randomized Experiments in India." *The Quarterly Journal of Economics* 122(3): 1235-1264.*

Balwadi Deworming in India

Gustavo Bobonis, Edward Miguel, Charu Puri Sharma

Location: Slums of Delhi, India

Sample: 200 preschools with 2,392 children, aged 2-6 years old

Timeline: 2001 to 2002

Policy Issue: [Improving Student Participation](#)

AEA RCT Registration Number: [AEARCTR-0001157](#)

Research Papers: [Anemia and School Participation](#)

Partners: **Berkeley Center for Health Research**



Nearly 40 percent of children in Africa and Asia suffer from iron deficiency anemia, which can impair cognitive development and delay psychomotor development. This study evaluated the impact of a preschool nutrition and health project that targeted anemia in the slums of Delhi, India on child health and school attendance. Results showed the program positively impacted weight-gain and school attendance, particularly for groups with high base-line rates of anemia.

Policy Issue

Nearly 40 percent of children in Africa and Asia suffer from iron deficiency anemia (IDA), which can result in weakness, stunted physical growth, and a compromised immune system. Anemia is also thought to impair cognitive development and delay psychomotor development. These problems can be further exasperated by intestinal helminths (worms), which are prevalent among children in developing countries. Worms cause chronic intestinal blood loss which contributes to iron deficiency anemia. Estimates suggest that the impact of iron deficiency anemia through both physical and cognitive channels could be as large as 4 percent of GDP on average in less developed countries, yet there is little rigorous work by economists on the effects of anemia on economic development.

Context of the Evaluation

Like other developing nations in the region, iron and Vitamin A deficiency affect many of India's children. Prior to the start of the study, over 69 percent of the sample of preschool aged children in urban Delhi was anemic and 30 percent suffered from intestinal worms, contributing to the high prevalence of malnutrition. Furthermore, 30 percent of the sample was underweight and 24 percent had stunted growth. Children in the study typically came from families of poor migrant laborers, and have a particularly high risk of anemia and other nutritional deficiencies.



Teacher distributes medications to students in Delhi

Details of the Intervention

This study evaluated the impact of the NGO Pratham's preschool nutrition and health project in the slums of Delhi, India. The program delivered a package consisting of iron and Vitamin A supplementation and deworming drugs to 2-6 year old children through an existing preschool network.

Two hundred preschools with a total of 2,392 children were randomly divided into three treatment groups, which were gradually phased into the program over two years. The iron supplementation and deworming drugs were administered during "health camps" conducted three times a year in each preschool. Preschool teachers in treatment schools were instructed to administer daily iron doses for three school days

following each health camp. Children in both treatment and comparison groups were also administered Vitamin A supplements, which in addition to other health benefits, promotes the absorption of iron.

A household survey was administered to a random 30 percent of the child population from each preschool both at the baseline and then again before the final group was phased into the program. Hemoglobin (Hb) tests (to measure anemia) and parasitological tests (to measure the presence of worms) were administered in conjunction with the household survey. Child height and weight were measured during each health camp, and participation data was collected during monthly, unannounced visits to each preschool.

Results and Policy Lessons

Child Weight Gain: Large gains in child weight roughly 0.5 kg on average were found in the treatment schools relative to comparison schools during the first five months of the project. No gains in average child height were found, but this pattern makes sense from a clinical standpoint: iron supplementation is thought to reduce acute malnutrition in the short-run by improving the absorption of micronutrients and increasing appetite, but improvements in chronic malnutrition are not expected over short periods.

Impact on School Attendance: Average preschool participation rates increased sharply by 5.8 percentage points among treated children, reducing preschool absenteeism by roughly one fifth.

Bobonis, Gustavo, Edward Miguel, and Charu Puri-Sharma. 2006. "Anemia and School Participation." The Journal of Human Resources 41(4): 692-721.
