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Case 2: Remedial Education in India

Evaluating the Balsakhi Program

Incorporating random assignment into the program

This case study is based on "Remedying Education: Evidence from Two Randomized Experiments in India," by Abhijit Banerjee, Shawn Cole, Esther Duflo, and Leigh Linden (2007), *Quarterly Journal of Economics*, 122(3):1235-1264, 2007

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Incorporating Random Assignment into the Research Design

In 2000 the NGO Pratham was expanding its Balsakhi Program, a remedial education initiative, to 123 municipal primary schools in the city of Vadodara in western India. The program had been running in Mumbai since 1994, and Pratham wanted to take advantage of the expansion to conduct a randomized impact evaluation. The need for remedial education was general in the 123 Vadodara schools and, after an initial pilot, Pratham had enough resources to expand the program to all schools immediately, so there was a general sense that all eligible schools should receive program assistance. But how could Pratham have the program in all schools and, at the same time, keep the comparison group it needed for a randomized impact evaluation? How could random assignment be integrated into the program?

Children are in school but not learning

India has made much progress toward the Millennium Development Goal of universal primary education by 2015. Access to primary school has expanded, and more and more children are now participating: Net primary enrollment in 2005 was 89 percent. For many children, however, being enrolled does not necessarily mean learning much because the quality of schooling is often too low.

There are many reasons for low school quality.

Schools do not have enough resources and often have inappropriate curricula. There are too few teachers and some are poorly trained. There are also too few classrooms, teaching materials, textbooks, notebooks, and pencils. The curricula are often not adapted to the lack of resources or to the local context. Schools, therefore, fail to give basic academic education and the skills and knowledge students ultimately need to navigate their particular environment.

Teachers are often absent or make little effort when present. A countrywide survey found that one quarter of all public primary school teachers were absent from school on any given day and that only half of those present were teaching.¹

Class size is often large. As more children enroll, pupil-teacher ratios worsen and teachers cannot give extra attention to pupils who may need it to follow the lesson. What's more, when the class size is larger, more of the teacher's attention has to be spent on ancillary classroom issues, such as discipline and simply getting the pupils coordinated and focused.

Not only are the classes large, but they also often include students of varying achievement or even grade levels. This makes it even more difficult to adapt the material and the pace to the learning needs of the pupils. The less-prepared pupils may need different instruction or a slower pace or even remedial education. But if the teacher focuses on their needs, the more-prepared students would be learning less.

Low school quality often translates into poor learning. In Mumbai, 25 percent of children in grades 3 and 4 in public schools cannot recognize letters, and 35 percent cannot recognize basic numbers; in Vadodara, only 19.5 percent of grade 3 students can correctly answer questions testing grade 1 math competencies. And a nationwide survey found that 44 percent of the in-school children aged 7 to 12 cannot read a basic paragraph and 50 percent cannot do simple subtraction.

¹ Part of a multinational survey that included 6 countries in different regions: Bangladesh, Ecuador, India, Indonesia, Peru, and Uganda.

Schools are failing to ensure that children are actually learning. Many who fall behind are promoted to upper grades before they have mastered the lower grade skills. Unprepared, they cannot follow the lessons and fall behind even further. Improving general school quality may not necessarily help these children if they don't have the basic skills they need to profit from the improvements—having your own grade 4 math textbook is little help if you can't do grade 1 math. But targeted initiatives that increase the basic skills children need to learn effectively could ensure that all children in school are also learning.

The Balsakhi Program provided remedial education

Pratham is an educational organization based in Mumbai whose motto is “Every child in school...and learning well.”

In 1994 Pratham launched the Balsakhi Program to help at-risk children acquire the basic skills they need to participate fully in the classroom. The program provided tutors for at-risk children in government schools. The tutor, called a balsakhi, or “child’s friend,” was typically a young woman hired from the local community. Balsakhis were paid between 500 and 750 rupees (US\$10-15) a month. All the balsakhis had completed at least secondary school, and they were given two weeks’ training at the beginning of the school year.

The program targeted children who had reached grades 3 and 4 without mastering grades 1 and 2 reading and math competencies, including spelling simple words, reading simple paragraphs, recognizing numbers, counting up to 20, and subtracting or adding single-digit numbers. Children who were lagging behind—identified as such by the teacher—were pulled out of the regular class in groups of 20 and sent for remedial tutoring, spending half the school day with the tutor.

Tutoring followed a curriculum designed by Pratham to help the children acquire the grades 1 and 2 skills they needed to follow their regular lessons. But because the 20 pupils are pulled out of the regular classroom, the program could have two other potential effects. Pulling out the children created two classes, each smaller than the original. So for half of the school day, the class size was reduced. Pulling out the *weakest* children created two streams, each with children of comparable achievement. This amounted to tracking: For half the school day, a child in the regular class (the higher-ability track) temporarily had peers at an equal or more advanced learning level.

Therefore the impact of the program, if any, could come through one or more of the following channels: the remedial instruction delivered by the balsakhi, the reduction in class size, and the ability tracking.

Evaluation questions and designs

The opportunity to evaluate came when Pratham was expanding to Vadodara in 2000, six years after the program was launched in Mumbai. The objective of the program was to improve basic math and reading competence. In particular, Pratham wanted to make sure the program led to improvements in basic number recognition, counting, ordering one- and two-digit numbers, and solving basic word problems. Pratham also wanted to learn as much as possible about the channels through which the program achieves its impact.

Your team is invited to the very first evaluation planning session. The objective of the session is to decide on possible evaluation questions and corresponding designs. It has not emerged yet that all schools must get program assistance, so you can have some schools that do not receive balsakhis. Your task is to determine what you can learn from the different possible evaluation designs.

Discussion Topic 1: Possible evaluation questions and designs	
For each of the following designs, say what comparisons you can make and what you can learn from them for each of the channels through which the program could have an impact.	
1.	Randomize at the school level. Half the schools receive balsakhis, and half the schools do not receive balsakhis.
2.	Randomize at grade (cohort) level. Half the schools receive balsakhis in grade 3, and half the schools receive balsakhis in grade 4.
3.	Randomize at individual level. Identify the weak students, and randomly select half of them to go to the balsakhi for half a day while the remaining weak students remain in the regular class.

Designing the evaluation considering the opportunities and the constraints

The pilot had shown that the need for remedial education was general in the municipal schools, so a general consensus emerged among the stakeholders that all schools had to receive balsakhis during the evaluation period. The decision to take part in the evaluation had been left to the schools. There was also some concern that schools would only be willing to take part in the evaluation—for example, allow Pratham to conduct achievement tests in the school—if they received some program assistance.

Whatever evaluation design was adopted, it had to ensure that all schools in the sample received the program and that somehow half the sample would be a comparison group not receiving the program.

Discussion Topic 2: Designing the evaluation to take advantage of the opportunities and resolve the most constraints	
1.	A crucial step in designing a randomized evaluation is to decide on the level to randomize. Choosing a particular level not only resolves constraints, it can also make the difference in what we can learn from an evaluation. This intervention is school-based, so you can randomize at the individual student, grade (cohort), or school level. a. At what level is the program targeted? b. What are the advantages and disadvantages of each of the possible levels?
2.	Each of the following questions may represent a constraint you will face when deciding on the level of randomization. For each possible level of randomization, discuss the following: a. Are there potential spillovers: does providing balsakhis potentially affect those who are not treated? b. Would randomizing at this level compromise the ethical, political, and practical feasibility? c. Would there be enough units at this level for the design to have statistical power?
3.	Pratham was particularly interested in learning the overall effects of the program on children in grades 3 and 4. Given the constraints and knowing what Pratham wanted to learn, at what level would you randomize?
4.	If Pratham wanted to learn about the effects on the children sent to the balsakhi, what groups would you compare?
5.	If Pratham wanted to learn about the effects on the children that remain in the regular class, what groups would you compare?
6.	Synthesize your answers into a randomized design that you would use to take advantage of the opportunities and resolve the most constraints. Create a chart that shows your randomization design and evaluation strategy.

The mechanics of simple random assignment

Now that you have a randomized evaluation design, you must do the actual random assignment. You need to have a list of units in your sample and the number of groups you will be assigning them to before you start. Once you have that, follow the procedure below to do a simple random assignment:

Step 1: Determine your allocation fraction. This is the proportion of units you will be assigning to the treatment group. The allocation fraction partly depends on your budget constraint.

Step 2: Order your sample randomly. Ordering the list randomly ensures that the position a school takes on the list is completely independent of any of its characteristics. This can be very easily done using a computer.

Step 3: Choose units from the randomly ordered list according to your allocation fraction. For example, if your allocation fraction is one-half you can take the top half of the entries or the bottom half and assign them to treatment.

Step 4: Check if your groups are equivalent for documentation purposes. If you have baseline data you can check if the groups are balanced on important characteristics. This involves comparing the averages of these characteristics across the groups. The test has to be based on data collected before the evaluation. And the characteristics have to be potential confounding factors, either observable intrinsic differences (gender, caste) or initial outcomes (income, level of education) that you think may factor into the final outcomes.

Discussion Topic 3: Simple random assignment	
<p>In Vadodara, the program was extended to 123 schools. Schools varied by language of instruction (Gujarati, Marathi, and Hindi), and by gender (schools were boys-only, girls-only, and co-educational). The evaluation was over two years. The problem was to ensure that all schools got balsakhis while also keeping a comparison group. So, every school got a balsakhi but for a specific cohort. Half the schools got balsakhis for grade 3 and half for grade 4. So, there were two groups. In Year 1, Group A got balsakhis for grade 3, and Group B got balsakhi for grade 4. In the following year, the schools switched; Group A got balsakhis for grade 4 and Group B for grade 3. That way, Group A children received the program for two years. Random assignment determined which schools got balsakhi for grade 3 or for grade 4 in the first year.</p>	
1.	<p>Use procedure outlined in Excel Exercise 2A and the data provided to randomly order the schools.</p> <p>Can you predict any of the school's characteristics—for example, the area it is located in—based on its position in the sorted list?</p>
2.	<p>Given the outcome of interest, what characteristics would you use to check the randomization? In what ways could these characteristics be confounding?</p>
3.	<p>Are the groups balanced on these characteristics?</p>
<p>Some of the schools are boys-only (labeled "kumar"), some girls-only (labeled "kanya"), and some co-ed (labeled "mishra"). You want to ensure the treatment and comparison groups have the same proportions of boys' and girls' schools as the sample.</p>	
4.	<p>What would you change about simple random assignment to get a procedure that—for certain—yields groups are balanced?</p>

The mechanics of stratified random assignment

With stratification, you first divide the sample into subgroups, or strata. All that is meant by “stratified random assignment” or “block random assignment” is that the sample was first divided into identifiable subgroups and then units were assigned randomly from those subgroups.

Besides balancing the groups by potential confounding factors, you may also want to stratify if you want to learn about program effects on particular subgroups, such as ethnic minorities, and there are very few in your sample. To ensure that there are some minorities in both the treatment and control groups, you should stratify. Stratification may also help with statistical power.

Here is the procedure for stratified random sampling.

- Step 1: Divide the list into subgroups, or strata.**
- Step 2: Determine your allocation fractions for each subgroup, stratum.**
- Step 3: Order each list randomly.**
- Step 4: Choose from each list according to your allocation fraction.**
- Step 5: Document the averages for analysis.**

In other words, divide the list into subgroups and then apply the simple random allocation procedure to each subgroup.

Discussion Topic 4: Stratified random assignment	
1.	Use procedure outlined above and the data provided in Excel Exercise 2B to do a stratified random assignment of the schools. Choose the characteristic you want to stratify on.
2.	Are the groups balanced on these characteristics?

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