

## CASE STUDY 3: EXTRA TEACHER PROGRAM IN KENYA

Randomization Design



This case study is based on: Duflo, Esther, Pascaline Dupas, and Michael Kremer. 2011. “Peer Effects, Teacher Incentives, and the Impact of Tracking: Evidence from a Randomized Evaluation in Kenya.” *American Economic Review* 101 (5): 1739-74. It also draws on: Duflo, Esther, Pascaline Dupas, and Michael Kremer. 2014. “School Governance, Teacher Incentives, and Pupil-teacher Ratios: Experimental Evidence from Kenyan Primary Schools.” *Journal of Public Economics* 123 (15): 92-110.

J-PAL thanks the authors for allowing us to use their papers as a teaching tool.

## KEY VOCABULARY

<b>Unit of randomization</b>	The level of observation (e.g., individual, household, school, village) at which treatment and comparison groups are randomly assigned.
<b>Random assignment</b>	Randomly assigning units of observation to treatment or comparison group.
<b>Random selection</b>	Drawing a random sample from an area or population of interest.

## LEARNING OBJECTIVE

This case study explores how an experimental design can be used to answer multiple research questions by employing an appropriate randomization strategy.

## SUBJECTS COVERED

Evaluation design, randomization design

# BACKGROUND ON THE EXTRA TEACHER PROGRAM

## INTRODUCTION

Confronted with overcrowded schools and a shortage of teachers, in 2005 the NGO International Child Support Africa (ICS) offered to help the school system of Western Kenya by introducing contract teachers in 120 primary schools. Under the program, ICS provided funds to these schools to hire one extra teacher per school. This allowed schools to split the students in a grade into two smaller classes. For example, one large first-grade class with 100 students became two classes of 50 students each: one taught by a contract teacher and one taught by a government teacher.

In contrast to the civil servants hired by the Ministry of Education, contract teachers were hired locally by school committees. These contract teachers did not serve as teachers' assistants or teacher aides, but rather as independent teachers. ICS expected this program to improve student learning by, among other things, decreasing class size and using teachers who were more directly accountable to the communities they served. The program also introduced the opportunity to split students between classrooms based on their ability. However, contract teachers tended to have less training and receive a lower monthly salary than their civil servant counterparts. Thus, there was concern about whether these teachers had sufficient motivation given their compensation, or strong enough qualifications given their credentials. This situation is similar to other contexts where NGOs supplement government-provided services such as health care using local staff who tend to have less training and receive lower pay.

This raised two important questions:

- Which experimental designs could test the impact of this program on educational achievement?
- Given that the introduction of contract teachers introduces a number of new factors (smaller classes, the ability to group students by ability, and a new type of teacher with different training),

which of these changes in the school landscape is/are primarily responsible for improved student performance?

### THE CHALLENGE: MANY MORE STUDENTS WITH UNCHANGED RESOURCES

Like many other developing countries prompted by the Millennium Development Goal of universal primary education, Kenya took concerted action to increase school enrollment. Following the elimination of school fees in 2003, primary school enrollment rose nearly 30 percent between 2002 and 2005, from 5.9 million to 7.6 million students (Duflo, Dupas, and Kremer 2009). Without accompanying government funding to meet this higher demand, however, this progress created its own set of new challenges:

1. **Large class sizes:** Due to budget constraints, the rise in primary school enrollment has not been matched by proportional increases in the number of teachers. (Teacher salaries already account for the largest component of educational spending.) The result has been very large class sizes, particularly in lower grades. In a sample of schools in Western Kenya, for example, the average first grade class in 2005 had 83 students (Duflo, Dupas, and Kremer 2014). This is concerning because it is believed that small classes are most important for the youngest students, who are still acclimating to the school environment. The Kenyan National Union of Teachers estimates that in addition to the existing 175,000 primary school teachers, the country needs 60,000 more teachers in order to reach all primary students and meaningfully decrease class sizes (Wax 2003).
2. **Teacher absenteeism:** Further exacerbating the problem of high student-teacher ratios, teacher attendance is low, with teacher absentee rates of nearly 30 percent in some areas of Kenya (Patrinos 2013). That's the equivalent of teachers missing one and a half school days *each week*.

There are typically no substitutes for absent teachers, so students simply mill around, go home, or join another class, often in a different grade. Small schools, which are prevalent in rural areas of developing countries, may be closed entirely as a result of teacher absences. On any given day, families have to consider whether school will be open when deciding whether to send their children. An obvious result is low student attendance—even on days when the school is open.

3. **Mixed skill levels in classes:** Classes in Kenya are very heterogeneous, meaning students of the same age vary widely in terms of school preparedness, support from home, and academic ability.
4. **Scarce school materials:** Because of the high costs of educational inputs and the rising number of students, teachers are not the only scarce resource. In some cases, up to four students must share one textbook. An already overburdened infrastructure deteriorates faster when serving many more children.

Although primary school enrollment rates have increased, without additional resources these overlapping issues present challenges for completion rates, student learning, and performance. Many primary school students do not continue on to secondary school, where enrollment rates were roughly 50 percent in 2009 (World Bank 2019).

## POTENTIAL SOLUTIONS: HOW CAN WE IMPROVE LEARNING OUTCOMES?

### ARE CONTRACT TEACHERS EFFECTIVE (RELATIVE TO GOVERNMENT TEACHERS)?

Governments in several developing countries have responded to similar challenges by staffing unfilled teaching positions with locally hired contract teachers. There are four main characteristics of contract teachers: they are (1) appointed on annual renewable contracts with no guarantee of renewed employment (unlike regular civil service teachers); (2) often less qualified than regular teachers and much less likely to have a formal teacher training certificate or degree; (3) paid lower salaries than those of regular teachers (typically receiving less than one-fifth of the salaries paid to regular teachers); and (4) more likely to be from the area where the school is located.

The increasing use of contract teachers has been one of the most significant policy innovations for providing primary education in developing countries, but it has also been highly controversial.

Supporters say that using contract teachers is an efficient way of expanding education access and quality to a large number of first-generation learners. Additionally, contract teachers may be motivated to try harder than their tenured government counterparts, knowing that the school committee's decision to rehire them the following year may hinge on performance. Contract teachers may also be more similar to their students geographically, culturally, and socioeconomically.

Opponents argue that using underqualified and untrained teachers may staff classrooms but will not produce adequate learning outcomes. Furthermore, the use of contract teachers de-professionalizes teaching, reduces the prestige of the entire profession, and reduces motivation of all teachers. Even if it helps in the short term, it may hurt efforts to recruit highly qualified teachers in the future.

While the use of contract teachers has generated much controversy, there is little rigorous evidence regarding the effectiveness of contract teachers in improving student learning outcomes.<sup>1</sup>

### ARE CLASS SIZE REDUCTIONS EFFECTIVE?

Reduced class size is a similarly debated topic. While there is evidence suggesting that smaller class sizes lead to improved student performance (Angrist and Lavy 1999; Krueger and Whitmore 2002), there is debate over whether these findings apply to different contexts. There is also a lack of consensus on optimal class size and whether class size must be reduced below a certain threshold in order to see learning gains (Rockoff 2009). In order to reduce class sizes, schools need the resources to hire more teachers and provide additional classroom space.

<sup>1</sup> Following the Duflo, Dupas, and Kremer (2011) study discussed here, Bold et al. (2018) found evidence that the effects of contract teachers in Kenya depend on whether program implementation is led by an NGO or the government.

## IS TRACKING BY ABILITY EFFECTIVE?

Tracking, or grouping students into classes sorted by ability, is controversial among academics and policymakers. On one hand, if teachers find it easier to teach a homogeneous group of students, tracking could improve school effectiveness and test scores. On the other hand, if students learn in part from their peers, tracking could disproportionately disadvantage low-achieving students while benefiting high-achieving students, thereby exacerbating inequality.

## THE EXTRA TEACHER PROGRAM RANDOMIZED EVALUATION

In January 2005, ICS Africa initiated its two-year extra teacher program in Kenya. For the 190 primary schools in the study sample, ICS provided funds for 120 schools to hire one extra contract teacher.<sup>2</sup> The purpose of this program was to address three challenges: teacher accountability, class size, and heterogeneity of student ability.

We will now design a randomized evaluation to measure the impact of the extra teacher program on student performance along three dimensions: (1) the relative effectiveness of contract teachers (compared to government teachers), (2) the effectiveness of class-size reductions, and (3) the effectiveness of grouping students by ability. In the next section, you will consider how to design a randomized evaluation to measure these three possible channels of impact (first taken individually and then all together in one study design). What items can we vary in our design to answer our research question(s) of interest? For example, which schools and which grades will get extra contract teachers? How will classes be split for schools who receive contract teachers?

# ADDRESSING MULTIPLE RESEARCH QUESTIONS THROUGH EXPERIMENTAL DESIGN

## DISCUSSION TOPIC 1

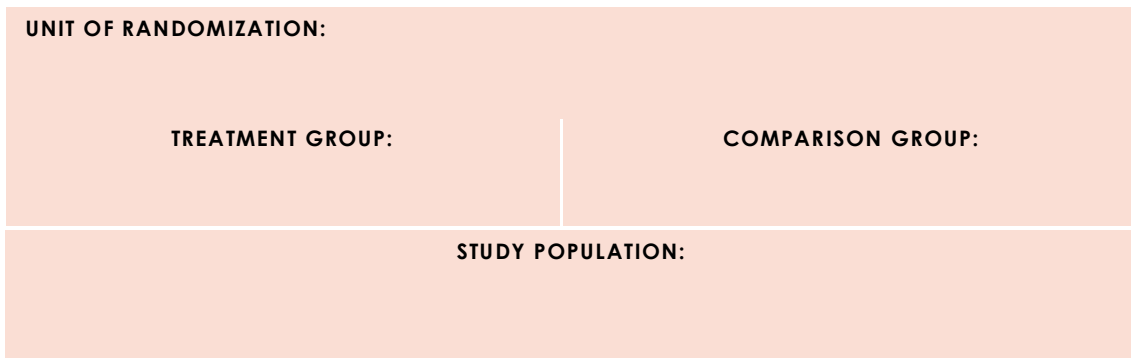
### **Different randomization strategies may be used to answer different questions.**

The Extra Teacher Program effectively combined three treatment interventions into one program. For each of these interventions—contract teachers (versus government teachers), tracking by ability, and smaller class size—we want to randomize in a way that creates treatment and comparison groups where the only systematic difference between the two is the intervention of interest. In this discussion topic, we start by considering three separate research designs to answer each question. In the next discussion topic, we will explore whether and how all three research questions could be answered simultaneously using a single randomized evaluation.

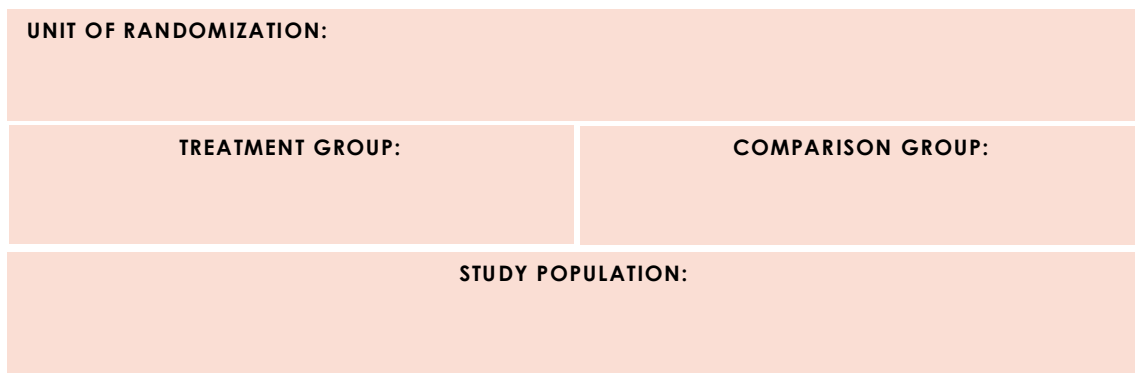
<sup>2</sup> There were 210 primary schools in the study sample, with 70 schools serving as true control schools with no additional teacher. For the 140 treatment schools, 19 had more than one classroom per grade before the program. For this case study, we only consider the 121 schools with one class and one teacher per grade before the program, and we round this to 120 for simplicity.

- What strategies could be used to evaluate the research questions listed below? For each of the research questions below, consider:
  - How would you design the study? Specifically, what is the appropriate unit of randomization?
  - Who would be in the treatment and comparison groups, and how would grades/classes, students, and/or teachers be randomly assigned to these groups? Consider in particular if there are any classes, grades, or schools that should not be included in the comparison because they differ from the treatment group in a way that could introduce selection bias.

1. Research question 1: What is the relative effectiveness of contract teachers versus regular government teachers with regard to student performance?



2. Research question 2: What is the effect of smaller class sizes on student performance?



3. Research question 3: What is the effect of grouping students by ability on student performance?

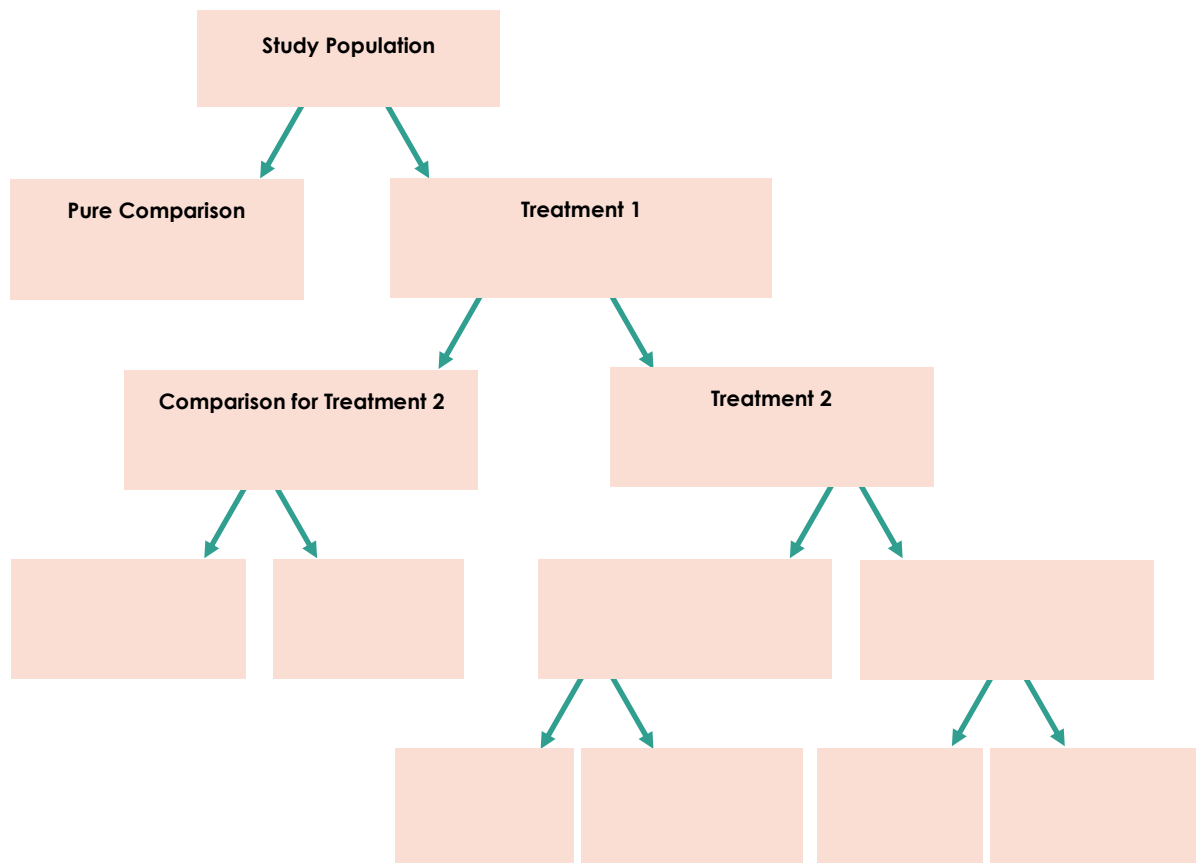
<b>UNIT OF RANDOMIZATION:</b>	
<b>TREATMENT GROUP:</b>	<b>COMPARISON GROUP:</b>
<b>STUDY POPULATION:</b>	

## DISCUSSION TOPIC 2

### Addressing all questions with a single evaluation

1. Could a single evaluation explore all of three research questions at once?
2. What randomization strategy could do so?

FIGURE 1: EXTRA TEACHER PROVISION





## REFERENCES AND FURTHER READING

- Angrist, Joshua D., and Victor Lavy. 1999. "Using Maimonides' Rule to Estimate the Effect of Class Size on Scholastic Achievement." *Quarterly Journal of Economics* 114 (2): 533–75, <https://www.jstor.org/stable/2587016>.
- Bold, Tessa, Mwangi Kimenyi, Germano Mwabu, Alice Ng'ang'a, and Justin Sandefur. 2018. "Experimental Evidence on Scaling Up Education Reforms in Kenya." *Journal of Public Economics* 168: 1-20, <https://doi.org/10.1016/j.jpubeco.2018.08.007>.
- Duflo, Esther, Pascaline Dupas, and Michael Kremer. 2009. "Can Tracking Improve Learning?" *Education Next* 9 (3): 64-70, <https://www.educationnext.org/tracking-improve-learning/>.
- Duflo, Esther, Pascaline Dupas, and Michael Kremer. 2011. "Peer Effects, Teacher Incentives, and the Impact of Tracking: Evidence from a Randomized Evaluation in Kenya." *American Economic Review* 101 (5): 1739-74, <https://doi.org/10.1257/aer.101.5.1739>.
- Duflo, Esther, Pascaline Dupas, and Michael Kremer. 2014. "School Governance, Teacher Incentives, and Pupil-teacher Ratios: Experimental Evidence from Kenyan Primary Schools." *Journal of Public Economics* 123 (15): 92-110, <https://doi.org/10.1016/J.JPUBECO.2014.11.008>.
- Krueger, Alan, and Diane Whitmore. 2002. "Would Smaller Classes Help Close the Black-White Achievement Gap?" In *Bridging the Achievement Gap*, edited by John E. Chubb and Tom Loveless, 11–46. Washington DC: Brookings Institution Press.
- Patrinos, Harry A. 2013. "The Hidden Costs of Corruption: Teacher Absenteeism and Loss in Schools". World Bank, Education for Global Development (blog), <https://blogs.worldbank.org/education/hidden-cost-corruption-teacher-absenteeism-and-loss-schools>.
- Rockoff, Jonah E. 2009. "Field Experiments in Class Size from the Early Twentieth Century". *Journal of Economic Perspectives* 23 (4): 211-30, <https://www.aeaweb.org/articles?id=10.1257/jep.23.4.211>.
- Wax, Emily. 2003. "'Too Many Brains' Pack Kenya's Free Schools." *Washington Post*. 9 October. [https://www.washingtonpost.com/archive/politics/2003/10/09/too-many-brains-pack-kenyas-free-schools/c99c6e7e-7d52-43e1-b49f-f80066b9bb34/?noredirect=on&utm\\_term=.80a82daf5a66](https://www.washingtonpost.com/archive/politics/2003/10/09/too-many-brains-pack-kenyas-free-schools/c99c6e7e-7d52-43e1-b49f-f80066b9bb34/?noredirect=on&utm_term=.80a82daf5a66).
- World Bank. 2019. EdStats Database, <http://go.worldbank.org/ITABCOGIV1>.

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J-PAL. 2019. "Case Study: Extra Teacher Program: How to Randomize." Abdul Latif Jameel Poverty Action Lab. 2019. Cambridge, MA.

To reference the original studies by Duflo et al., please cite as:

Duflo, Esther, Pascaline Dupas, and Michael Kremer. 2011. "Peer Effects, Teacher Incentives, and the

Impact of Tracking: Evidence from a Randomized Evaluation in Kenya.” *American Economic Review* 101 (5): 1739-74, <https://doi.org/10.1257/aer.101.5.1739>.

Duflo, Esther, Pascaline Dupas, and Michael Kremer. 2014. “School Governance, Teacher Incentives, and Pupil-teacher Ratios: Experimental Evidence from Kenyan Primary Schools.” *Journal of Public Economics* 123 (15): 92-110, <https://doi.org/10.1016/J.JPUBECO.2014.11.008>.