Journal of African Economies, 2021, Vol. 30, number 1, 13–54
doi: 10.1093/jae/ejaa009
Advance Access Publication Date: 24 November 2020
Article

OXFORD

Education in Africa: What Are We Learning?

David K. Evans* and Amina Mendez Acosta

Center for Global Development, Washington DC, USA

*Corresponding author: David K. Evans. E-mail: devans@cgdev.org

Abstract

Countries across Africa continue to face major challenges in education. In this review, we examine 145 recent empirical studies (from 2014 onward) on how to increase access to and improve the quality of education across the continent, specifically examining how these studies update previous research findings. We find that 64% of the studies evaluate government-implemented programs, 36% include detailed cost analysis and 35% evaluate multiple treatment arms. We identify several areas where new studies provide rigorous evidence on topics that do not figure prominently in earlier evidence syntheses. New evidence shows promising impacts of structured pedagogy interventions (which typically provide a variety of inputs, such as lesson plans and training for teachers together with new materials for students) and of mother tongue instruction interventions, as well as from a range of teacher programs, including both remunerative (pay-for-performance of various designs) and non-remunerative (coaching and certain types of training) programs. School feeding delivers gains in both access and learning. New studies also show long-term positive impacts of eliminating school fees for primary school and positive impacts of eliminating fees in secondary school. Education technology interventions have decidedly mixed impacts, as do school grant programs and programs providing individual learning inputs (e.g., uniforms or textbooks).

Keywords: education, human capital, Sub-Saharan Africa
JEL classification: I20, I25, O12, O15

1. Introduction

Education has expanded dramatically in Sub-Saharan Africa over the past half century. From 1970 to 2010, the percentage of children across the region who complete primary school rose by almost 50% (from 46% of children to 68%). The proportion of children completing lower secondary school nearly doubled (from 22% to 40%).[1] Despite these massive gains,

1 These initial numbers are regional aggregates provided in the World Bank's World Development Indicators. One challenge in tracking and reporting these statistics is the availability of data: in 2010, only about two-thirds of the countries in the region reported primary completion rates. Figures 1 and 2 provide a more detailed distribution.

nearly one in three children still does not complete primary school. Efforts to measure the quality of that schooling have revealed high numbers of students who have limited literacy or numeracy skills even after several years of school (Bold *et al.*, 2017; Adeniran *et al.*, 2020). The international community has characterised this situation as a 'learning crisis' (World Bank, 2018a). The past two decades have seen a large rise in evidence on how to most effectively expand access and increase learning,[2] but actual changes in access and learning in that period have not shown dramatic improvements.[3]

In this paper, we synthesise recent research on how to expand access to education and improve the quality of learning in Africa.[4] Our analysis reveals two trends. First, we observe growing sophistication in evaluating education programs in Africa. An increasing number of studies not only examine whether a given intervention is effective but also test multiple permutations. For example, Mbiti *et al.* (2019b) test two alternative teacher incentive programs and Duflo *et al.* (2020) report on four alternative programs to target instruction to students' learning levels. Evaluations are also testing alternative combinations of interventions, such as teacher incentives, school grants or the combination of the two in Tanzania (Mbiti *et al.*, 2019a). Other studies compare alternative programs to achieve a common goal, as in education subsidies versus the government HIV curriculum to reduce sexually transmitted infections in Duflo *et al.* (2015b). Testing multiple treatments is certainly not unprecedented in African countries, but it is growing more common.[5] Second, we observe growth in evidence that previously was largely confined to other regions of the world, including early child development, mother tongue instruction and public–private partnerships.

In terms of substantive findings, we identify that certain multi-faceted programs deliver large gains in education quality: a program that includes teacher training, teacher coaching, semi-scripted lessons, learning materials and mother tongue instruction delivered sizeable gains in literacy both as a pilot and at-scale (Piper *et al.*, 2018a, 2018b); the average impacts for second-grade students in Kiswahili and English are both above the 99th percentile of education interventions (Evans and Yuan, 2020; Kraft, 2020). A literacy program providing a similar array of supports delivered literacy gains in Uganda (Brunette *et al.*, 2019). The combination of teacher incentives and school grants delivered higher learning gains than either on its own in Tanzania (Mbiti *et al.*, 2019a).

We also observe consistent gains across various other types of programs: mother tongue instruction seems to provide consistent learning gains across programs, eliminating school fees offers consistent gains in access, and school feeding offers consistent gains in access and learning. There are relatively few school construction studies, but they also tend to yield gains in both access and learning. Other inputs are inconsistent: cash transfers are reasonably consistent in increasing access to school but not at improving learning, which may be unsurprising given that the programs may relax an economic constraint to access for

2 The number of impact evaluations on the topic of education in development settings rose more in absolute numbers than in any other sector except health, both from 2000 to 2009 and from 2010 to 2015 (Sabet and Brown, 2018).

3 Section 2 provides evidence for these claims.

4 Most of our studies are from Sub-Saharan Africa, but a handful is from northern African countries.

5 Two earlier examples include Kremer and Miguel (2007) and Baird *et al.*, (2011).

the children but do not directly affect the learning process beyond that. Similarly, eliminating school fees has inconsistent impacts on the quality of education.

Our collection of evidence does not offer a single solution that will apply in every school system. Programs adapted to new contexts will often yield distinct impacts. In our discussion section, we elaborate on factors to consider when translating a program from one setting to another. Still, this accumulation of recent evidence offers promising areas for investment and wide avenues for further study.

This review updates findings from earlier reviews with results from new research. Evans and Popova (2016b) synthesise evidence from six reviews on how to improve learning outcomes from low- and middle-income countries, only one of which—Conn (2017)—focuses exclusively on evidence from Sub-Saharan Africa, while others include significant research from the region.[6] This review focuses on how research in Africa from the past 5 years updates our ideas on making education effective and accessible.

In Section 2, we briefly review the current state of education in Africa. In Section 3, we summarise earlier evidence on how to expand access to and improve the quality of education on the continent. In Section 4, we discuss our strategy for collecting and analysing new research. In Section 5, we synthesise the findings. In Section 6, we draw conclusions from our findings, highlight areas for needed future research and discuss implications for policy.

2. A brief review of the current state of education in Africa

Education in Africa has expanded dramatically in recent years (Figures 1 and 2). The median proportion of children completing primary school across countries has risen from 27% to 67% between 1971 and 2015 (World Bank, 2020). The median proportion of children completing lower secondary school across countries has also risen dramatically, from a mere 5% in 1971 to 40% in 2015.[7] These are enormous increases; they also demonstrate just how far there is to go. Nearly one in three children in the median country does not complete primary school, and three in five fail to complete lower secondary. Africa is the lowest performing region in the world in terms of school access by a significant margin (Figure 3): for primary completion, all other countries achieve higher than 90%. For lower secondary, the next lowest performing region has a completion rate of 75%, more than 70% higher than Africa's numbers. Median completion rates at both levels of education have been increasing at a roughly consistent rate between 2000 and 2015, between 1.2 (primary) and 1.1 (lower secondary) percentage points a year. With linear improvements at that same rate, Africa would achieve universal primary education in 28 years and universal lower secondary education in 56 years. Yet, access will likely not increase at a linear rate, given the increasing marginal cost of enroling the most difficult-to-reach children (the 'last mile' challenge), leading these to be underestimates.

At the same time, the education quality in Africa also suffers. Recent evidence across seven countries in Sub-Saharan Africa found that in third grade, less than two in three

6 Lacking access to time travel technology, Evans and Popova (2016b) actually review an earlier version of the work of Conn (2014) but the results of Conn's analysis do not change across the two versions.

7 We use the median rate across countries because education policy decisions are made at the country level. The World Development Indicators also provide a regional aggregate number with population weighting, which yields slightly higher completion rates (68% for primary and 43% for lower secondary).

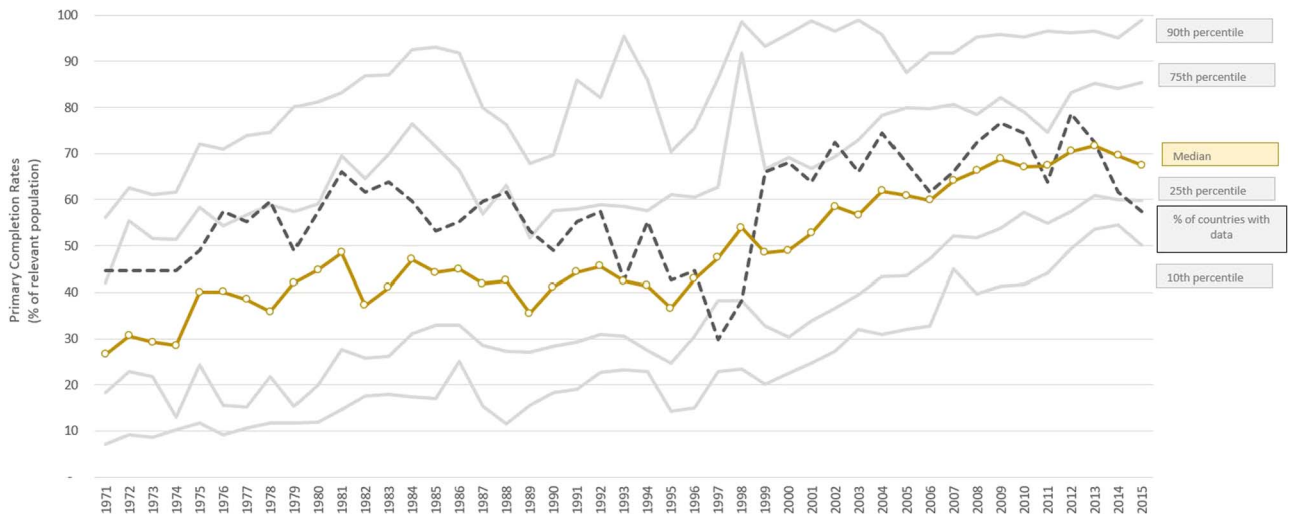

Figure 1: Primary Completion Rates in Sub-Saharan Africa, 1971–2015
Source: Author tabulations using data from World Development Indicators (2020).

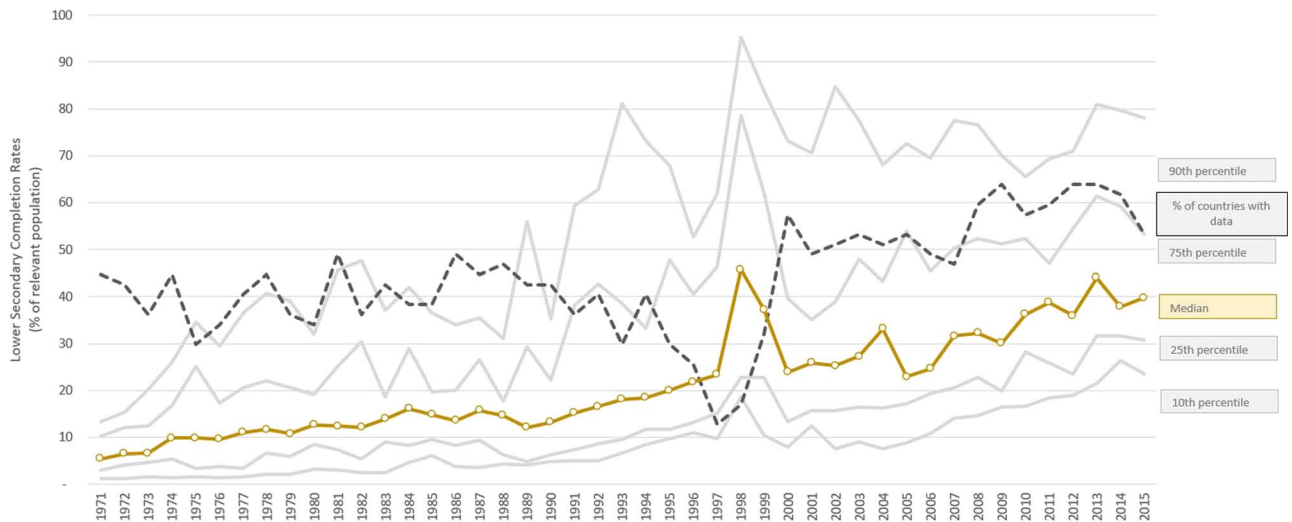

Figure 2: Lower Secondary Completion Rates in Sub-Saharan Africa, 1971–2015
Source: Author tabulations using data from World Development Indicators (2020).

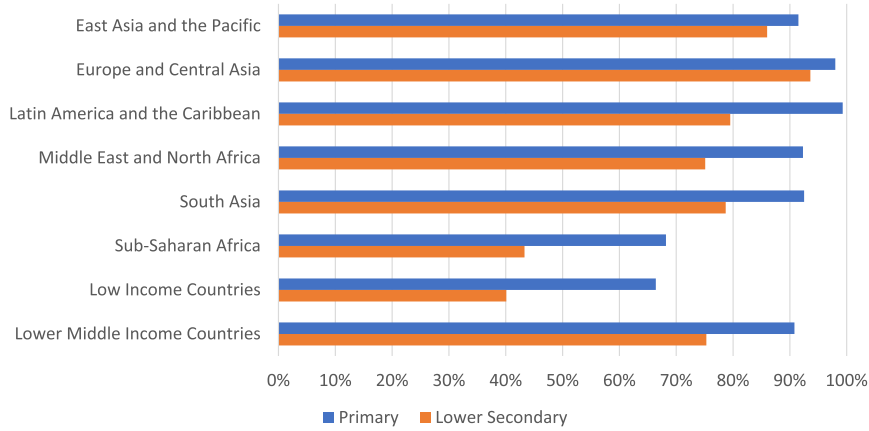

Figure 3: Primary and Lower Secondary Completion Rates across Regions in 2015
Source: Author tabulations using data from World Development Indicators (2020).

children could read a letter and only about half of the children could read a word or put numbers in order (Bold *et al.*, 2017; Table 1).[8] The harmonised learning outcomes, an effort by Patrinos and Angrist (2018) to combine data from different tests across regions, finds that learning outcomes for countries in Sub-Saharan Africa concentrated in the bottom half of the learning spectrum; although they are not substantively lower than what would be expected for Africa's income levels (Figure 4). A combined measure of schooling quantity and quality—the learning-adjusted years of schooling (Filmer *et al.*, 2020)—shows more African countries performing below what their income level would predict (Figure 5). Further, the quality of learning outcomes does not appear to be rising in recent years. Le Nestour *et al.* (2020) document steady increases in adult literacy rates between 1940 and 2000, mostly linked to increases in enrollment. However, the test score data from the World Bank's Human Capital Project show that for 35 African countries with two data points between 2000 and 2017, scores fell for 18 countries and rose for 17 countries (Table 1; Angrist *et al.*, 2019). Some of the inconsistent gains in learning may result from expanding access: as children with less preparation gain access to school and participate in tests, average scores could fall even while learning is rising. Despite weaknesses in education quality, recent studies demonstrate significant returns to education in Africa (Appendix Section 1, Supplementary Material).

3. What do earlier syntheses say about education in Africa?

This is not the first study to synthesise evidence on education, even in Africa. Bashir *et al.* (2018) provide a comprehensive descriptive analysis of the current state of education across the continent, highlighting that many children remain out of school, that learning levels are

8 An assessment of student test scores in Nigeria reports that only 17% of the students meet the minimum literacy competency benchmark and 31% meet the numeracy benchmark. Students from poor households, in rural areas and in government-owned schools are particularly worse off (Adeniran *et al.*, 2020).

Table 1: Change in Learning Outcomes in African Countries for Two Time Periods between 2000 and 2017

Country	Year of first data	Year of last data	Number of years between first and last data	Harmonised learning outcomes, earliest year	Harmonised learning outcomes, latest year	Difference
Average	2004	2014	10	385	376	−9
Burundi	2006	2014	8	425	423	−2
Benin	2006	2014	8	377	384	7
Burkina Faso	2006	2014	8	402	404	2
Botswana	2000	2015	15	397	391	−5
Côte d'Ivoire	2006	2014	8	377	373	−3
Cameroon	2006	2014	8	451	379	−72
Congo, Dem. Rep.	2006	2012	6	429	318	−112
Congo, Rep.	2006	2014	8	398	371	−28
Egypt, Arab Rep.	2003	2015	12	414	356	−58
Ghana	2003	2013	10	266	307	42
Gambia, The	2007	2011	4	356	338	−18
Kenya	2000	2013	13	426	455	29
Liberia	2011	2013	2	343	332	−12
Lesotho	2000	2013	13	345	393	48
Morocco	2003	2015	12	354	367	13
Madagascar	2006	2015	9	434	351	−83
Mali	2002	2015	13	387	307	−79
Mozambique	2000	2007	7	402	368	−33
Mauritius	2000	2013	13	430	473	43
Malawi	2000	2013	13	331	359	29
Namibia	2000	2013	13	337	407	69
Niger	2002	2014	12	370	305	−65
Rwanda	2015	2016	1	343	358	15
Senegal	2006	2014	8	415	412	−2
South Sudan	2016	2017	1	334	336	2
Eswatini	2000	2013	13	401	440	39
Seychelles	2000	2013	13	436	463	27
Chad	2006	2014	8	403	333	−70
Togo	2001	2014	13	423	384	−40
Tunisia	2003	2015	12	376	384	8
Tanzania	2000	2013	13	410	388	−21
Uganda	2000	2013	13	379	397	18
South Africa	2000	2015	15	375	343	−33
Zambia	2000	2013	13	336	358	22
Zimbabwe	2007	2013	6	394	396	2

Source: Authors' construction, using all African countries with at least two data points. For countries with more than two data points, we used the first and last data point. Data provided by Angrist *et al.* (2019).

low for those in school and that 'the problem of low learning emerges in the early grades'. In terms of priorities for improvement, Evans and Popova (2016b) review the following six syntheses of evidence on how to improve the quality of education in low- and middle-

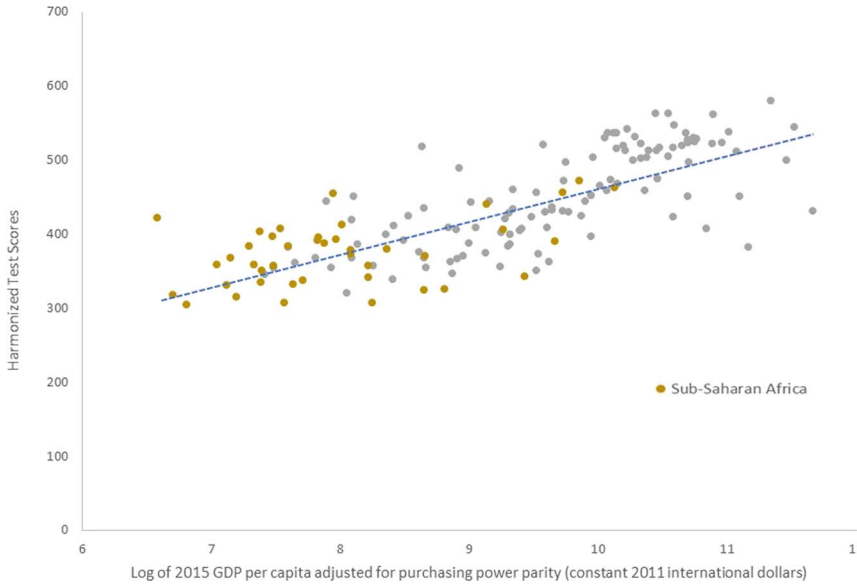

Figure 4: Test Scores for Countries at All Income Levels around the World Relative to Countries in Sub-Saharan Africa

Source: Authors' construction using the harmonised test scores from the Human Capital Project (World Bank, 2018b,c).

income countries: Conn (2017), Glewwe *et al.* (2014), Kremer *et al.* (2013), Krishnaratne *et al.* (2013), McEwan (2015) and Ganimian and Murnane (2016). Another review focused on learning, released slightly later, was Masino and Niño-Zarazúa (2016). Across the reviews that focused on boosting learning, the authors recommend many different interventions, but Evans and Popova (2016b) identify two classes of interventions that are recommended with some consistency: pedagogical interventions that help teachers to tailor instruction to student learning levels and individualised, repeated efforts to improve teacher's ability and practice.

Of these reviews, only Conn (2017) focuses exclusively on Sub-Saharan Africa, although several others draw heavily on evidence from the region. Based on a meta-analysis of 56 studies available through 2013, Conn finds the largest learning impacts for programs that 'alter teacher pedagogy or classroom instructional techniques'. Snilstveit *et al.* (2015) is the most comprehensive review, examining 238 studies focused on both access and learning across low- and middle-income countries (not exclusive to Sub-Saharan Africa).[9] They find the strongest, most consistent gains in access from cash transfer programs and the best gains to quality from 'structured pedagogy' programs; those that provide a variety of inputs to improve teaching, such as lesson plans and training for teachers together with new materials for students (similarly to Conn, 2017). They also find promising evidence that school feeding programs can increase both access and learning. Glewwe and Muralidharan (2016) also examine both access and learning, finding strong gains from improved pedagogy—especially

9 Snilstveit *et al.* (2016) provide a manageable summary of Snilstveit *et al.* (2015), which comes in at more than 850 pages.

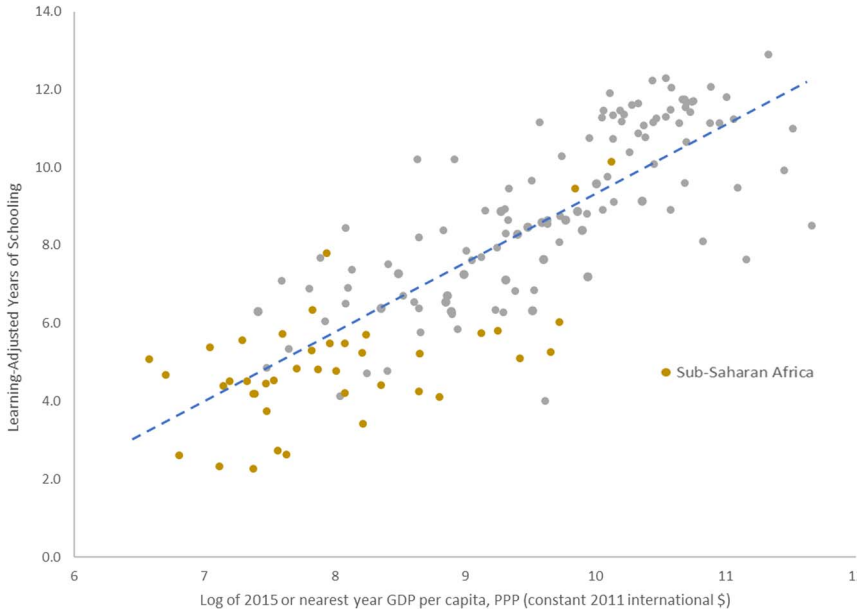

Figure 5: Learning-adjusted Years of Schooling for 158 Countries around the World Relative to Countries in Sub-Saharan Africa
Source: Authors' construction using the data from the Human Capital Project (World Bank, 2018b,c).

for foundational literacy and numeracy skills, improved governance—including teacher accountability and cost reductions.

In this review, we complement this previous work with evidence published in 2014 or later, most of which came out later than the scope of the searches conducted by previous reviews.

4. Methods

4.1. Inclusion criteria

For this paper, we limited our focus to research studies that (i) were published in 2014 or later, either as a journal article, a conference paper or a working paper; (ii) were conducted in or used data from at least one African country; and (iii) report on outcomes from education-related interventions. We included interventions that may not focus exclusively on education outcomes but do report them, such as cash transfers and school feeding programs. We also limited our search to papers that include a quantitative analysis of results that seeks to establish a counterfactual including a variety of estimation designs such as randomised controlled trial, difference-in-differences, matching, regression discontinuity and instrumental variable analysis. As a result, studies that report purely descriptive data or carried out a case study were not included in our primary analysis. Some descriptive studies are used to provide context to our discussion of results.

4.2. Search strategy

We began by compiling a database of papers that complied with the above criteria from published systematic reviews such as Conn (2014), Glewwe *et al.* (2014), Snilsveit *et al.* (2015), Evans and Popova (2016b) and Evans and Yuan (2019). We also reviewed papers from the National Bureau of Economic Research working paper series, the World Bank Policy Research Working Paper Series, the Centre for the Study of African Economies 2017–2020 conference papers and the North East Universities Development Consortium conference papers 2017–2019. We included papers identified in the African Education Research Database (Education Sub Saharan Africa, 2020). Finally, we searched Google Scholar and journal databases using variations of the search terms 'education', 'learning' and 'students' and confirmed the location of the intervention or the source of the data used. The journal databases searched included the American Economic Review, the Quarterly Journal of Economics, the Journal of Political Economy, the Journal of African Economies, World Development, the Economics of Education Review, the Journal of Development Effectiveness, the International Journal of Educational Development and the International Journal of Educational Research. We included studies from other journals as turned up by our database searches. We also added studies known to the authors that are eligible but did not come up in the original search. We conducted the search between September 2019 and May 2020 and compiled a list of 195 papers eligible for review. See Appendix Table 2 for the breakdown of the papers by provenance. In this study, we review 145 of those papers on topics of current interest in education (excluding, for example, a study on the historical impact of Christian missions on education performance in later generations).

4.3. Analytical strategy

The purpose of this review is to understand the direction and scope of recent education research in Africa, including the choice of topics and interventions studied, the countries where these studies are being conducted and the key trends and messages in their findings.

In order to answer these questions, we reviewed the title, abstract and full text of the papers to extract and code the following data: country of intervention, year of publication, type of intervention (if there is one), type of intervention target (student, teacher, household, school or system), type of outcomes reported (learning, access or both), education level of intervention (pre-primary, primary, secondary, tertiary, vocational or adult learning), education level of outcomes reported, research method, scale (i.e., number of treatment arms and the size of the treatment sample) and key findings. We also encoded the choice of implementation partner (government agencies, non-government organisations, other partners or researchers only) and any cost-effectiveness data provided in the paper.

We grouped the studies according to common themes and interventions and present a narrative review of the findings. We avoid the other two main types of review (meta-analysis and vote counting) because of large variation in the design of interventions within categories: an average effect of a teacher training intervention—for example—is not informative when one is averaging across programs as varied as a one-time half-day lecture for teachers and a full-year program of classroom observations with feedback.[10] This narrative approach is

10 Evans and Popova (2016b) provide a detailed description of the advantages and disadvantages of different review methodologies.

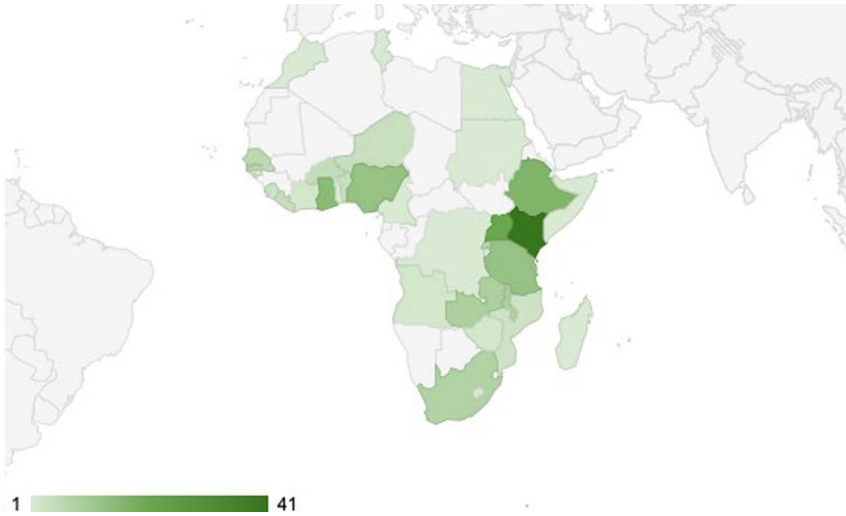

Figure 6: Distribution of Identified Education Studies (2014–2020) across Countries in Africa. The countries with the most studies are Kenya (41), Uganda (21), Ethiopia (17), Ghana (15), Nigeria (13) and Tanzania (13). This figure includes the 195 studies that passed the eligibility criteria of our search. In the Results section, we restrict the sample to 145 studies on topics that are of current interest in education

more helpful for solving some problems and less helpful for solving others. Our approach is intended to help readers to update their prior beliefs within key classes of educational interventions that are commonly—and in many cases—increasingly used across the continent. It can guide the design of educational interventions within categories: for example, many countries have cash transfer programs or school feeding programs and this analysis can guide decisions about the optimal design of those programs. On the other hand, not providing meta-analytic results means that this review will not answer the question, should a given country implement a cash transfer program or a school feeding program (i.e., is the expected impact of one class of program greater than the other)? While there is certainly insight to be gleaned from that approach (and other reviews have used it, including McEwan, 2015; Snilstveit *et al.*, 2015; and Conn, 2017), the wide variety of designs and effect sizes within categories incline us—in this review—to focus on characterising the range of evidence within groups and encouraging researchers and policymakers to dig deeper into individual studies that may be most relevant to a context and class of program that they are considering.

4.4. The studies

The collection of studies reveals interesting findings on what is studied and where. We identify a high concentration of studies in Kenya (41) and Uganda (21) with fewer but still significant numbers of studies in Ethiopia (17), Ghana (15), Nigeria (13) and Tanzania (13) (Figure 6). Most studies we identify focus on primary education (61%) and almost a quarter of studies examine secondary education (24%). Fewer studies examine pre-primary (8%), with just a handful examining tertiary, adult education or technical-vocational training (6% and under each) (Figure 7).

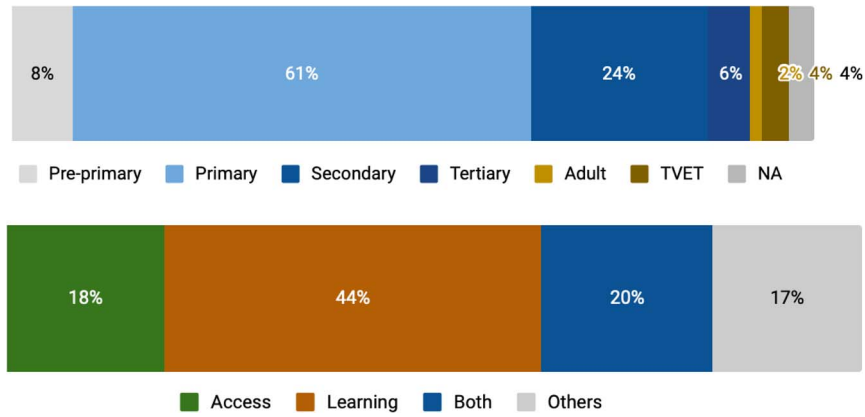

Figure 7: Distribution of Identified Education Studies (2014–2020) across Levels of Education and Classes of Outcomes. Access includes all outcomes related to students staying in school such as rates of enrollment, attendance and drop-out. Sum of values may exceed 100% since interventions can be implemented in more than one phase of education. Other outcomes include labour market outcomes and other life outcomes. This figure includes the 195 studies that passed the eligibility criteria of our search. In the Results section, we restrict the sample to 145 studies on topics that are of current interest in education

The majority of the interventions (72%) evaluated by the studies are administered through the school system, including interventions targeting teachers, school management and students, while only about 38% of the studies are targeted at the household level (Figure 8). School-system interventions usually aim to increase students' enrollment and retention and improve the quality of the learning environment. These interventions are (i) teacher- and teaching-targeted programs such as pedagogy, mother tongue instruction, education technology, teacher incentives and trainings and hiring practices; (ii) student-level interventions including health and nutrition programs (e.g., school feeding), incentives for students and individual inputs such as uniforms, solar lamps or bicycles; and (iii) school-level interventions such as school construction, school grants, public–private partnerships and other non-government school provision and community-based monitoring. The household-level interventions usually aim to reduce the economic and social barriers that keep households from sending their children to school—providing cash transfers, low-cost early child development care centres and learning and attendance information to parents.

A significant number of studies were implemented through government channels (Table 2). In addition to the 19% of the studies that examined national policy reforms (such as free primary education), 46% of the 145 studies partnered with government agencies, most often the ministry of education for school construction, teacher trainings or incentive policies; the ministry of health for school feeding; or the relevant government agency for cash transfers. In total, 40% of the studies in our sample worked with non-government organisations such as the BRAC, the World Food Programme, the Aga Khan Foundation or the Twaweza. A smaller number (17 studies) worked with private partners such as for-profit schools, clinics or educational companies. About 15% of the studies did not employ any implementing partner aside from the research teams themselves. Some of these researcher-only studies evaluated smaller, less intensive interventions (e.g., a specific pedagogical technique). More than half of the interventions were evaluated using randomised controlled trials (58% of

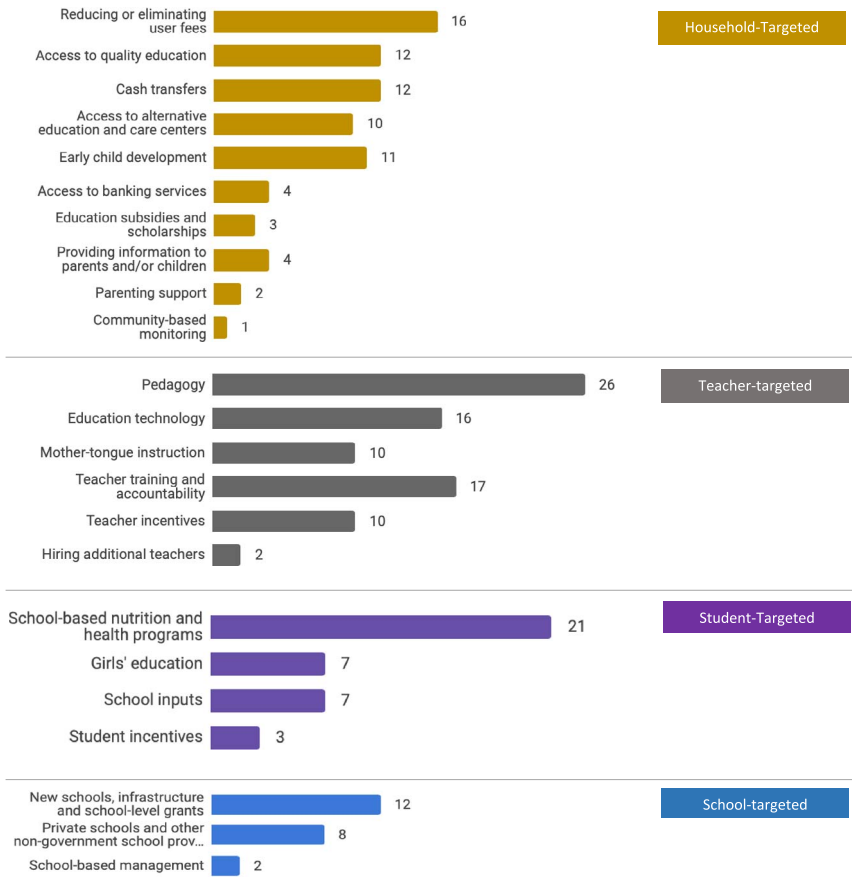

Figure 8: Distribution of the Studies by Targeting the Level and Class of Intervention. Our sample includes household-targeted interventions (75 studies, 38%), teacher-targeted (81 studies, 42%), student-targeted (38 studies, 19%) and school-targeted (22 studies, 11%). The sum of the percentages is more than 100 since each intervention may target more than one group. This figure includes the 195 studies that passed the eligibility criteria of our search. In the Results section, we restrict the sample to 145 studies on topics that are of current interest in education.

the studies); the next most common empirical method was difference-in-differences (25%), which was the most common method for evaluating national policies.

A limited number of studies offer cost information (Table 3). Two out of five studies in our sample have no cost analysis at all. About one-quarter provide a full cost-effectiveness analysis, and the others provide limited information on costs, usually only the cost of one specific input, such as a stipend for the trainer or the value of a voucher provided to students. A handful of studies make claims such as an intervention being a 'cost-effective measure' or 'scalable (low-cost)' without providing any cost details.

In terms of scale, 27 of our 145 studies evaluate national reform policies. For studies that are not national in scale and that report schools as treatment units, we find an average treatment group size of 96 schools (median: 66 schools). There are some larger studies: the

Table 2: Studies According to the Implementing Partner. Private partners include for-profit schools, clinics and educational companies. Some studies have multiple implementing partners (e.g., public–private partnerships that are implemented by both government and private partners)

	Count of studies	%
Government	66	46%
Non-government organisations	58	40%
Private partners	17	12%
Researchers only	22	15%
National policies	27	19%
Total studies	145	100%

Source: Authors' calculations based on underlying studies.

Table 3: Distribution of Cost Analyses within Studies

	Count of studies	%
Studies with cost-effectiveness analysis	41	28%
Studies with quantitative discussion of costs (but not cost-effectiveness) - total program cost	11	8%
Studies with quantitative discussion of costs (but not cost-effectiveness) - costs of specific inputs but not the total program cost	31	21%
Studies with other claims regarding cost (low-cost, affordable, etc.) but no substantiating data	7	5%
Studies with no cost analysis or claims	55	38%
Total studies	145	100%

Source: Authors' calculations based on underlying studies.

Table 4: Studies Reporting the Size of the Treatment Group. Other treatment units reported are households (two studies) and classrooms (one study)

Unit	Number of studies	Mean of treated units	Median of treated units
National scale	27		
Schools	88	96	66
Districts/clusters	7	39	19
Communities	8	105	114
Individuals	12	5,637	338
Others	3	845	1008
Total studies	145		

Source: Author calculations based on underlying studies.

90th percentile includes 211 treated schools (Carneiro *et al.*, 2020). Table 4 shows the average treatment group size for studies reporting other treatment units such as districts, communities or individuals.

In addition to the 19% of the studies that evaluate national policies, almost half of the studies evaluate the impact of a single treatment. The other 35% have multiple treatment arms (Table 5). Twenty-eight studies evaluate two treatment arms, seventeen studies test three treatment arms and six studies test four or more treatment arms. One outlier, Haushofer and

Table 5: Studies Reporting the Number of Treatment Arms

Number of treatment arms	Count of studies	%
1	67	46%
2	28	19%
3	17	12%
4	4	3%
≥5	2	1%
National policies	27	19%
Total studies	145	100%

Source: Authors' calculations based on underlying studies.

Shapiro (2016), randomised cash transfers to gender of the recipient, frequency of instalment and size of instalment, in addition to the spill-over group (nine treatment arms in total).

5. Results

We review the studies in four broad categories. Studies in the first group focus on what happens in the classroom and on policies around the person who manages the classroom—the teacher. These include studies on mother tongue instruction, structured pedagogy and policies around teacher pay and teacher professional development and accountability. Studies in the second group focus on a variety of inputs: school feeding, education technology, school construction and other inputs. Studies in the third group focus on financing: cash transfers, school grants and the elimination of school fees. Studies in the fourth and final group focus on three other topics: early child education, for which there has been little experimental or quasi-experimental evidence in Africa in the past, but for which that literature is growing; girls' education; and public–private partnerships.

5.1. Teachers and pedagogy

5.1.1. Mother tongue instruction

Mother tongue instruction usually refers to teaching students basic skills in a language that they already know when they arrive at school. In many African countries, the historical norm has been to teach children in a colonial language (e.g., English, French or Portuguese), even though most children arrive at school with little or no ability in that language.[11] Most earlier syntheses have little or nothing to say about mother tongue instruction, but evidence has grown dramatically in recent years (Appendix Table 3). Teaching children to read in a language they speak at home increased the rate at which children learn to read in Cameroon (Laitin *et al.*, 2019), Kenya (Piper *et al.*, 2016c) and Uganda (Brunette *et al.*, 2019; Kerwin and Thornton, 2020).[12]

11 Mother tongue instruction can also be used to refer to teaching children their mother tongue (e.g., formalising knowledge of a language spoken from childhood). That is not how we use the term here.

12 Brunette *et al.* (2019) examined interventions in 12 different mother tongues and found positive, significant impacts for three quarters of them.

While impacts on initial reading ability in the mother tongue are promising, the objective of many parents is for their children to be literate in the colonial language, which may explain some of the resistance that parents have posed to mother tongue instruction reforms, as in Kenya (Piper *et al.*, 2016c). Several recent studies suggest that mother tongue instruction has positive impacts on children's ability to subsequently learn a second language in Cameroon (Laitin *et al.*, 2019), Ethiopia (Seid, 2019) and South Africa (Taylor and von Fintel, 2016). However, Piper *et al.* (2018c) find the effect is not as strong: students taught in mother tongue do not perform any better in English and perform worse in mathematics compared with students taught in a non-mother tongue.

Finally, there is some evidence of impact beyond literacy. In Ethiopia, where mother tongue instruction reforms took place in 1994, researchers have identified long-term impacts on educational attainment and civic engagement (Ramachandran, 2017; Seid, 2017).

5.1.2. Structured pedagogy

Recent years have also shown growing rigorous evidence for approaches to improve literacy that incorporate a range of elements (Appendix Table 4). Piper *et al.* (2014, 2015) used a randomised controlled trial to evaluate a literacy program in Kenya that included teacher professional development, the provision of textbooks for students (including textbooks in Kiswahili), the provision of structured teacher guides for teachers and classroom observation and feedback to teachers, among other elements. The program led to sizeable literacy gains. Seeking to isolate the most important elements of the program, Piper *et al.* (2018b) find that structured teacher guides are the most cost-effective element of the program. The program was effective at boosting literacy for low-income students (Piper *et al.*, 2015). The program was subsequently scaled up nationally and continued to demonstrate literacy gains (Piper *et al.*, 2018a). Similarly, a mathematics-focused version of the program provided teacher guides and teacher professional development training and yielded statistically significant improvements in test scores (Piper *et al.*, 2016a).

A combination of training principals and teachers as well as mentoring for teachers and new instructional materials was effective in boosting literacy in Uganda but not in Kenya, potentially because the language of testing was different from the language used in instruction in Kenya, despite national policy (Lucas *et al.*, 2014). Brunette *et al.* (2019), already discussed in the section on mother tongue instruction, evaluated a program that not only encouraged mother tongue instruction in 12 different mother tongue languages but also provided teacher training, detailed teachers' guides, textbooks for pupils and feedback from school leaders, resulting in sizeable literacy gains.

Beyond these literacy interventions, many interventions seek to improve the quality of teaching particular skills using a particular method, such as using graphics (e.g., Venn diagrams) in teaching to improve prose comprehension among secondary school students in Nigeria (Uba *et al.*, 2017). These studies are of value mostly to those seeking to improve the teaching of these specific skills; as such, they are summarised in the appendix but not discussed at length here.

5.1.3. Teacher policies

Teacher remuneration and accountability

Because teachers play such an instrumental role in students' education, recent evidence on high rates of absenteeism and low levels of pedagogical and content knowledge suggests

that better teacher policies may be useful to boost education outcomes (Mbiti, 2016; Bold *et al.*, 2017). There is no general pattern in the level of teacher pay relative to comparable professions across Africa (Evans *et al.*, 2020). There is evidence of a premium to civil service teachers relative to private school teachers (Barton *et al.*, 2017). A new generation of evidence has arisen on bonus payments for teachers based on student performance. Earlier evidence on performance pay for teachers in Africa was limited and mixed: a randomised trial in Kenya showed that performance bonuses for students increased test scores on the exams directly linked to the incentives, but not on general exams (Glewwe *et al.*, 2010).

A new generation of studies adds much more to our knowledge base (Appendix Table 5). All these new pay-for-performance programs take place in primary schools. In one study in Tanzania, performance-based bonuses to teachers had positive impacts on student learning in only one of the two tests administered, but when those bonuses were coupled with school grants, students performed consistently better in both tests and across all subjects (Mbiti *et al.*, 2019a). Schools that received grants alone showed no performance gains. Teachers also support these programs in Tanzania, both in theory and in practice, reporting higher levels of satisfaction in schools that have performance pay (Mbiti and Schipper, this issue). In Rwanda, a novel experimental design separates the impact of performance pay on recruitment and on effort and finds favourable effects on both, with a significant net increase in student test scores (Leaver *et al.*, 2019). A pay-for-performance program in Uganda had test score impacts only for the subset of students who attended schools that had books; although it did reduce dropout rates, which were not directly incentivized by the program (Gilligan *et al.*, 2019). In Kenya, using contracts that are renewable based on performance to hire teachers also boosted student learning (Duflo *et al.*, 2015a); although an effort to scale up those contracts nationwide did not result in learning gains, potentially due to a combination of political opposition, reduced monitoring and delayed salaries (Bold *et al.*, 2018).

New studies are exploring the nuances of how to implement these programs. In Tanzania, researchers tested two alternative incentive designs: one, a pay-for-percentile system where a teacher's bonus is based on students' ranks against other students with similar baseline scores; and the other program, where a teacher's bonus is based on students achieving benchmark proficiency levels, which the authors argue is easier to implement and gives teachers clearer targets. Both designs boosted test scores, but the latter program had larger impacts at a lower cost (Mbiti *et al.*, 2019b).

Recent evaluations have also shown impacts from non-remunerative accountability interventions. In Côte d'Ivoire, providing twice-a-week text messages to either parents or teachers reduced dropout by between 2 and 2.5 percentage points (about 50% of the dropout rate in control schools). Texting both parents and teachers resulted in a much smaller, statistically insignificant impact. For low-attendance teachers, all three treatments had positive impacts (Lichand and Wolf, 2020). In Tanzania, a nationwide program that simply published school performance on primary school leaving exams led to more students passing the exam among schools that initially performed poorly. However, in an example of how even a low-stakes intervention can also adversely affect behaviours, the program also increased dropouts (Cilliers *et al.*, 2020c). In Niger, a low-stakes, randomised intervention that complemented regular class inspections with phone calls to the village chief, the teacher and two randomly selected students to check on whether adult education classes were being held and how they were going led to improved student learning (Aker and Ksoll, 2019).

Beyond improving performance and accountability, dozens of countries have designed incentive programs to recruit and retain teachers in less attractive teaching posts, and these have had little rigourous evaluation in the past (Pugatch and Schroeder, 2014). Teacher turnover is high in Africa, especially in low-performing schools (Zeitlin, this issue), making teacher retention a policy priority. In Zambia, salary increases of 20% for rural teachers show at least some impact on an increased stock of teachers in beneficiary areas, albeit no impacts on student test scores (Chelwa *et al.*, 2019). In the Gambia, a salary premium of 30%–40% significantly increased the share of trained teachers in remote areas (Pugatch and Schroeder, 2014).[13] Ultimately, the impact of all of these teacher remuneration interventions—and their relevance to other settings—likely hinge both on existing teacher remuneration relative to other professions and on other aspects of the labour market.

Teacher professional development

Another class of teacher intervention seeks to boost their content and pedagogical skills. Earlier reviews showed promising evidence on pedagogical interventions (Conn, 2017), but that is not to say that most teacher professional development programs are effective. On the contrary, the vast majority of at-scale teacher professional development programs in Africa (and elsewhere) go unevaluated in any serious way and many among those do not have the characteristics common to programs that have been shown to be effective (Popova *et al.*, 2018). Still, recent evidence bolsters the view that teacher professional development—particularly coaching programs—can be effective at boosting student learning outcomes.[14] Importantly, most multi-faceted literacy programs highlighted earlier include teacher training as one aspect of the intervention.

In Ghana, training teachers to target instruction to children's learning levels by dividing the class by ability group for part of the day increased student learning (Duflo *et al.*, 2020). In another study in Ghana, training teachers to do targeted instruction (including by dividing students by learning level rather than grade level) increased student scores on a combined Math and English test (Beg *et al.*, 2020). Adding training for school principals and school inspectors had no additional impact. In South Africa, the government tested traditional, centralised training for teachers versus in-class coaching, with the impact of coaching more than double of that of the centralised training (Cilliers *et al.*, 2019). In the subsequent cohort of students, only those with teachers who benefitted from coaching show learning gains, although even those are half the size of effects for the first cohort (Cilliers *et al.*, 2020a).

Another teacher training program, combined with partially scripted lesson plans and weekly text message support for teachers, improved teacher practice and children's literacy (Jukes *et al.*, 2017). Four trials invested in boosting teacher skills focus on pre-primary education. In Ghana, teacher training for preschool teachers led to small increases in children's school readiness. When that training was coupled with parental awareness meetings, the

13 The Gambian program also had no clear impact on student test scores (Pugatch and Schroeder, 2018).

14 Many teacher professional development interventions report impacts on participant knowledge and even practice—as do McDermott and Allen (2015) in Sierra Leone—but it cannot be assumed that teachers will be able to translate that knowledge into increased student learning.

outcomes were reversed, potentially because parents preferred traditional teaching over age-appropriate play-based learning in preschool (Wolf *et al.*, 2019). Attanasio *et al.* (2019) evaluate a program—also in Ghana—that trained volunteer mothers and kindergarten teachers in stimulation and play curriculum; the intervention improved kindergarten children's cognitive and socio-emotional skills. In Kenya, a combined package of teacher coaching and training, along with instructional materials, boosted learning in early child education centres (Donfouet *et al.*, 2018). In Malawi, teacher training only boosted outcomes in informal preschools when combined with parent training (Özler *et al.*, 2018). Finally, a teacher training program in Rwanda designed to complement a new entrepreneurship curriculum in secondary schools did not improve student test scores, although it did boost student participation in school business clubs (Blimpo and Pugatch, 2020).

An alternative strategy is to train teaching assistants to assist teachers. In Ghana, schools were randomly assigned to hire teaching assistants from among the country's youth employment program to either work with students who had fallen behind during school, work with students who had fallen behind after school or just work with half of the class, thereby reducing class size (Duflo *et al.*, 2020). All three interventions improved student learning, although the first two had the largest impacts. Interestingly, relative to the Ghana-based, teacher-led targeted instruction intervention mentioned above, the remedially targeted teaching assistant interventions not only doubled the impact on student test scores but also doubled the cost, so cost-effectiveness was comparable.

5.2. Inputs

5.2.1. School feeding

Just one earlier review highlights school feeding as a possibility for boosting both access and learning (Snilstveit *et al.*, 2015), and most of the evidence behind that recommendation stems from other regions in the world. Recent evidence from Africa supports that finding (Appendix Table 6). From a randomised evaluation of Ghana's nationwide school feeding program, Aurino *et al.* (2019) find gains in test scores as a result of school feeding, with particularly large gains for girls and for children from the poorest households. In rural Senegal, Azomahou *et al.* (2019) use a randomised design to find gains in both enrollment and test scores from the provision of school meals, as do Diagne *et al.* (2014) in an earlier evaluation of the same program. Mensah and Nsabimana (2020) exploit staggered implementation of a school feeding program in Rwanda and find small (less than 0.03 standard deviations) but significant impacts on student test scores. Nikiema (2019) uses a difference-in-differences strategy to show that providing take-home rations in Burkina Faso increases school attendance for both boys and girls and increases enrollment for girls in particular. Parker *et al.* (2015) measure only health outcomes (haemoglobin and anaemia) in a cluster randomised trial of school feeding in rural Burundi and find no clear impacts.

In addition to evaluating the impact of providing school meals, studies are venturing into the details of the meals themselves. Hulett *et al.* (2014) examine the impact of introducing animal protein into school meals in Kenya with a randomised trial and find that the 'meat group' showed higher test score gains than other groups.

These results greatly strengthen earlier global evidence that school feeding is a promising strategy for boosting cognitive outcomes as well as access to school, particularly in food-insecure areas and especially for girls.

5.2.2. *Education technology*

A previous synthesis that highlighted the promise of education technology (McEwan 2015) draws on evidence from 32 different treatments in five different countries, none of them on the African continent. Recent years have shown a rapid increase in evidence in this area with a mixed track record (Appendix Table 7).[15] In some cases, technology complements existing inputs. In Kenya, researchers experimented with different technology complements (e-readers for students, tablets for teachers or tablets for instructional supervisors): none boosted literacy scores significantly relative to a non-technology-based intervention (Piper *et al.*, 2016b). In South Africa, a randomised trial comparing on-site teacher coaches with virtual teacher coaches (i.e., coaches who communicated with teachers by tablet) led to comparable outcomes in the first year, but over time, the gains from in-person coaches translated to other skills, whereas the gains from virtual coaches did not (Kotze *et al.*, 2019; Cilliers *et al.*, 2020b). A quasi-experimental evaluation of the impact of introducing interactive whiteboards—a complement to teachers—found higher test scores for urban students in Senegal (Lehrer *et al.*, 2019). De Hoop *et al.* (2020) evaluate a program in Zambia where teachers receive tablets (and projectors) with lesson plans for teachers and interactive lessons for students. Complemented with weekly teacher professional development, the program shows gains for first graders in both reading and math.

In Angola, a randomised controlled trial of learning software together with the technological equipment needed to use the software had no consistent impact on primary school student learning, although it did boost teacher and student familiarity with technology (Cardim *et al.*, 2019). An experimental evaluation that provided secondary school students in Malawi with access to Wikipedia—the students otherwise had little to no internet access—had small, positive impacts in two subjects but not in others (Derksen *et al.*, 2020). Also in Zambia, a phone-based literacy game provided to a few hundred randomly selected first-grade students boosted their spelling ability relative to a control group (Jere-Folotiya *et al.*, 2014). In Kenyan primary schools, interactive literacy software coupled with a library of digital books and stories boosted reading scores (Lysenko *et al.*, 2019).

In other cases, technology seeks to substitute for other inputs. Providing e-readers to secondary school students in urban Nigeria only increased learning if they included curricular content and were distributed in areas with limited textbook access, essentially substituting e-readers for traditional textbooks (Habyarimana and Sabarwal, 2018). In Ghana, broadcasting live instruction—where students can interact with the instructors—from teachers in the capital to students in rural areas improved literacy and numeracy scores, essentially substituting for teacher ability (Johnston and Ksoll, 2017). Alternatively, technology can fill an input gap in terms of role models: Riley (2019) finds that showing secondary students in Uganda a film featuring a low-income adolescent Ugandan girl succeeding at chess improved student test scores and closed the gender gap in enrollment in subsequent years.

15 Some studies provide proof of concept of technological interventions in very small samples. These studies should not inform large-scale policies yet, but they can point to promising directions for future testing. In a very small pilot study in Kenya, primary school teachers and students had access to an 'interactive, multimedia literacy software' for 90 minutes per week, resulting in gains in end-of-year subject exams (Abrami *et al.*, 2016). Another small pilot provided electronic career guidance for secondary school students in Nigeria, with promising results (John *et al.*, 2016).

While the findings are certainly not universally positive, they suggest that technology in education can effectively complement or substitute for existing inputs when the infrastructure is in place to support it. This pattern is consistent with earlier evidence (Bulman and Fairlie, 2016). However, most of the technologies evaluated in the studies are used in school settings, with more stable access to electricity and internet connectivity (with the exception of e-readers that students can take home). There is still limited evidence for technology that allows for distance learning where access to school is not available.

5.2.3. School construction

School construction rarely features in reviews of the best investments, but when there are few schools, construction is essential to achieve the last mile (or last 20 miles) of enrollment. Recent studies bolster this (Appendix Table 8). In Burkina Faso, a program to construct schools improved enrollment, attendance and student learning both 7 and 10 years after the program (Ingwersen *et al.*, 2019; Kazianga *et al.*, 2019).[16] A similar program in Niger also boosted enrollment and learning (Bagby *et al.*, 2016). These programs of course will be most effective when there are few schools: a school construction program in Benin boosted enrollment principally in rural areas (Deschênes and Hotte, 2019). Furthermore, the Burkina Faso program led young women to put off marriage and childbearing (Ingwersen *et al.*, 2019) and the Benin program reduced tolerance of domestic violence (Deschênes and Hotte, 2019). Ashraf *et al.* (2020b) find that school construction benefitted girls' education in Zambia only among ethnic groups with a bride price tradition. Ultimately, construction is likely a necessary condition for other interventions to work when there are insufficient schools.

5.2.4. Other inputs

Fewer recent studies evaluate the impact of providing simple, non-technological in-kind inputs for schooling (although a previous generation of evaluations yielded several of those), but recent studies still provide some insight into this area (Appendix Table 9). Two studies in Kenya provided free school uniforms: one provided them to girls in upper primary grades and found reductions in school dropout, pregnancy and marriage; another provided them to children in lower primary grades and found significant reductions in absenteeism in early years, but no evidence of enduring effects several years later (Duflo *et al.*, 2015b; Evans and Ngatia, 2020)

Previous studies examining the simple provision of additional textbooks to schools found either no impacts or selective impacts in Kenya and Sierra Leone (Glewwe *et al.*, 2009; Sabarwal *et al.*, 2014), but a new randomised trial providing textbooks together with a combination of financial and non-financial incentives to simply take the books home increased both language scores and the likelihood of students taking the end-of-year exam in the Democratic Republic of the Congo (Falisse *et al.*, 2019).

In Kenya, randomly selected seventh-grade students who lived in rural areas off the electrical grid received solar-powered lamps. In some classes, a higher proportion of students

16 That program also seems to have increased children's participation in household chores (de Hoop and Rosati, 2014).

received solar lamps and the authors use that variation to estimate the externalities on non-recipient students. The program found significant gains in math scores for students who received lamps and smaller additional gains for students who did not receive lamps in classrooms where many students did (Hassan and Lucchino, 2016)

5.3. Financing

5.3.1. Cash transfers

Cash transfers are a richly studied area of analysis, with the first generation of evidence coming out of Latin America and the Caribbean (Fiszbein *et al.*, 2009). Early evidence from Africa showed promising results in that setting as well (Davis *et al.*, 2016). The most recent evidence shows impacts not only of giving transfers but also of testing a variety of designs (Appendix Table 10). In terms of simple impacts, a randomised trial of unconditional transfers in Malawi showed an increase in school enrollment and reduced dropout rates (Kilburn *et al.*, 2017). In Kenya, unconditional transfers did not translate to improved educational outcomes after 9 months (Haushofer and Shapiro, 2016). In Lesotho, unconditional child grants boosted primary enrollment but not completion or the transition to secondary (Pellerano *et al.*, 2014). Conditional cash transfers in Tanzania boosted primary school completion (Evans *et al.*, 2014). Baird *et al.* (2016a) compare conditional cash transfers for already enrolled and unenrolled adolescent girls in Malawi: they find enrollment gains for both groups and mixed effects on test scores. Eyal and Woodard (2014) find that expanding a child support grant in South Africa increased educational enrollment in South Africa but that higher enrollment does not translate into higher levels of attained education. An unconditional cash transfer program in Rwanda increased educational investments (more children had school uniforms) but did not affect school attendance (Sabates *et al.*, 2019).

Other evaluations inform the design of cash transfer programs. De Walque and Valente (2019) compare cash transfers directly to children and to parents as well as simply providing information (with no cash) about their children's attendance to parents. Providing attendance information delivered 75% of the gains of cash in terms of children's attendance. Transfers to children and to parents performed comparably. Akresh *et al.* (2016) compare a variety of transfer designs and find positive impacts on children's education outcomes across designs in Burkina Faso, with larger impacts on school attendance for older children from conditional transfers relative to unconditional transfers. Benhassine *et al.* (2015) found that unconditional transfers labelled as education support in Morocco increased both school participation and parent views of the value of education investments; adding explicit conditions and targeting a particular parent (mothers versus fathers) had no additional impact. In Malawi, conditional cash transfers had larger impacts on school attainment, but unconditional cash transfers had larger gains on other outcomes (Baird *et al.*, 2019).

On the whole, these findings are consistent with earlier work that suggests that cash transfers—especially, but not limited to, conditional transfers—can be an effective way to boost school enrollment but may not by themselves translate into broader educational gains. We also observe significant variation in cash transfer performance.[17] Evaluations on this topic, among others, signal a maturing literature in testing alternative designs.

17 Evans and Yuan (2019) find cash transfers among both the most and the least effective interventions to increase girls' access to schooling worldwide.

5.3.2. *School grants*

Grants to schools can be an effective way to distribute resources, and there is evidence from other regions of the world that they can boost enrollment: in Haiti, grants to schools conditional on not charging fees to students boosted enrollment and reduced grade repetition (Adelman *et al.*, 2017). Recent evidence in Africa confirms that grants are not a silver bullet but can yield benefits, mostly when complemented with other programs (Appendix Table 11). In Senegal, school grants led to improved test scores for younger students, particularly in schools that used the grants for training teachers and school administrators (Carneiro *et al.*, 2020). Grants to school committees in Niger increased enrollment for young children but did not affect learning (Beasley and Huillery, 2017).

School grants alone had no impact on student learning in Tanzania; although when they were coupled with teacher incentives, outcomes improved (Mbiti *et al.*, 2019a). School grants alone in the Gambia had no impact on student attendance or on learning outcomes, but in concert with management training, the program did boost attendance and—in some communities—even learning (Blimpo *et al.*, 2015). Grants alone do not consistently solve access or learning problems, but when attached to conditions or complementary programs that relax other constraints, they can boost both access and learning.

5.3.3. *Eliminating school fees*

An obvious constraint to education is the cost, including both formal school fees and myriad other fees that schools charge (Williams *et al.*, 2015). An array of recent papers seeks to quantify the impact of reducing those costs, mostly at the primary level (Appendix Table 12). İşcan *et al.* (2015) use regression analysis to show that the introduction of school fees reduced enrollment and subsequent completion of primary school across seven African countries. Moussa and Omoeva (2020) use a fuzzy regression discontinuity design to examine the impact of universal primary education policies in Ethiopia, Malawi and Uganda: they find an increase in educational attainment, as well as a decrease in adolescent pregnancy and marriage. They do not observe impacts on labour force participation or employment. In Kenya, free primary education—rolled out in 2003—increased educational attainment as well as subsequent employment and income (Ajayi and Ross, 2020). There is some evidence that the expansion of access led to a fall in quality (Atuhurra, 2016). Free basic education increased girls' attainment and reduced adolescent fertility and marriage in Ghana and Uganda (Boahen and Yamauchi, 2018; Masuda and Yamauchi, 2018). The elimination of primary school fees in Ethiopia led to more schooling for men and women, along with reduced fertility (Chicoine, 2019, 2020). In Tanzania, free primary education increased access and had positive returns across sectors, even in the agricultural sector (Delesalle, 2019; Valente, 2019). Lesotho also saw dramatic gains in access with the elimination of fees (Moshoeshoe *et al.*, 2019). Informal fees in public primary schools continue to keep students—especially poor, rural students—away from school (Sakaue, 2018).

As countries expand secondary education, more studies examine impacts at that level. In Uganda, free secondary education significantly but not completely reduced expenditures (Omoeva and Gale, 2016), consistent with earlier work showing that school fees are not the only out-of-pocket expense. In the Gambia, eliminating secondary school fees for girls increased the number of girls taking the high school exit exam by more than 50%. Test scores also rose, despite the increase in access coming mostly from poorer areas (Blimpo *et al.*, 2019b). An earlier evaluation found increased female enrollment for both secondary and

primary schools (Gajigo, 2016). Similarly, a study in Kenya found that the abolition of tuition in public secondary schools increased access, delayed childbirth and did not reduce test scores (Brudevold-Newman, 2019). In Uganda, eliminating secondary school fees via public funds to private schools increased the number of students taking the exit exam by 16%, with no fall in test scores (Masuda and Yamauchi, 2018). Finally, a randomised controlled trial of scholarships for students in Ghana who had already passed the entrance exam but lacked financing increased secondary and tertiary attainment and—10 years later—reduced fertility and improved labour market outcomes (Duflo *et al.*, 2019).

5.4. Other topics

5.4.1. Early child education

Earlier syntheses have little to say about early child education in Africa, largely because of a paucity of studies. Martinez *et al.* (2017) highlight that most evidence from low- and middle-income countries stems from Latin America and do not identify a single paper that predates 2015 in Africa. Since then, several studies have come out, most of which examine the impact of access to early child education (Appendix Table 13). Martinez *et al.* (2017) use a randomised controlled trial to estimate the impact of community-based preschools in Mozambique and find that enroled children are much more likely to be in primary school at the right age and that their test scores are higher, with larger effects for children from poorer households. Bietenbeck *et al.* (2019) take advantage of the expansion of pre-primary education in Kenya and Tanzania to compare siblings with access with siblings without; they find that children with access to preschool education are more likely to be in primary school, more likely to have advanced, and have moderately higher scores on cognitive tests (0.10 standard deviations). Aunio *et al.* (2019)—with a simple cross-sectional regression approach and the selection challenges that entails—find a significant, positive correlation between kindergarten attendance and later numeracy skill in South Africa, even when controlling for other current skills (language and executive function). Krafft (2015) compares siblings with and without access to early child education in Egypt and finds that access translates to an additional year of total schooling. Woldehanna and Araya (2017) use an instrumental variables approach with Young Lives data in Ethiopia and find that preschool attendees in urban areas are 25% more likely to have completed secondary education than non-attendees. Finally, Blimpo *et al.* (2019a) evaluate random assignment of community-based early child development centres in the Gambia and find that children from less-disadvantaged families do worse, consistent with some evidence from high-income countries (Baker *et al.*, 2019).

Five studies examine the quality of early child education services. Blimpo *et al.* (2019a) find that children who attended preschools that were randomly assigned to receive intensive teacher training had much higher language skills than children who attended other preschools. Morabito *et al.* (2018) evaluate children randomly assigned to high-quality versus low-quality preschools: they find no average effect on test scores, although there is evidence that high-quality preschool has a positive impact for children with poorly educated fathers (compensating for inequality) and a negative impact for children with poorly educated mothers (reinforcing inequality). Four other interventions trained early child education providers—in Ghana, Kenya and Malawi—and were discussed in Section 5.1.

Finally, at least one study examines a home-based program to strengthen children's emergent literacy skills before they even begin school. In Kenya, randomly selected parents

of young children received either children's storybooks or storybooks with training on how to read the storybooks with children (Knauer *et al.*, 2020). Children whose parents received both books and training demonstrated increased vocabulary.

This new generation of early child education evidence suggests that there is value in these investments and capacity of governments and others to provide them on the African continent.

5.4.2. Education for girls

Education for girls has long been cited as a potential high-value investment, by both researchers and policy makers (Evans *et al.*, 2020). Discussing girls' education as a separate category can be problematic, since earlier sections covered studies that reported impacts on girls. For example, the elimination of school fees for secondary school has shown consistent impacts in reducing adolescent marriage and fertility, and school construction in several countries has focused on ensuring that girls' needs are met and have improved outcomes for girls. In this section, we discuss work on girls' education that does not fit naturally into our other categories. A recent synthesis, not restricted to Africa but drawing heavily on research from the continent, suggests that the most effective investments to improve girls' educational outcomes may be a mix of targeted and non-targeted investments (Evans and Yuan, 2019). Recent work in Africa backs that up: Duflo *et al.* (2020), in their evaluation of targeted instruction interventions in Ghana, find larger impacts for girls despite the fact that girls are not specifically targeted by the intervention.

Among targeted interventions not discussed earlier, providing negotiation training to secondary school girls in Zambia—including teaching them to advocate for their own education—improved educational outcomes over the subsequent several years (Ashraf *et al.*, 2020a). Providing sanitary pads to schoolgirls in Kenya reduced absenteeism significantly (Benshaul-Tolonen *et al.*, 2019). A program that provided bicycles to schoolgirls in Zambia reduced girls' commute time and their absenteeism from school, with modest impacts on mathematics learning (Fiala *et al.*, 2020). Unlike a similar program in India, the program had no impact on dropout rates or grade advancement (Muralidharan and Prakash, 2017).

Several recent studies look beyond educational outcomes to examine the impact of school-based programs to improve other outcomes for girls (Appendix Table 14). Bandiera *et al.* (2020) find—using a randomised controlled trial in Uganda—that simultaneously providing vocational training as well as information about reproductive health to adolescent girls increased self-employment and reduced adolescent pregnancy and sexual violence 4 years later. A similar program in Tanzania had no impacts (Buehren *et al.*, 2017). In Sierra Leone, a program provided similar services in the context of girls-only after-school clubs but was interrupted by the 2014 Ebola outbreak. Girls in participating communities were protected from the significant school dropout and adolescent pregnancy effects of the outbreak (Bandiera *et al.*, 2019). A mentoring program intended to develop social and emotional life skills in Liberia increased primary school completion and the transition to secondary school (Koroknay-Palicz and Montalvao, 2019). Another girls-only safe space program—this one in Ethiopia—used longitudinal analysis and found gains in both literacy and the likelihood of accessing health services (Medhin and Erulkar, 2017). The findings demonstrate significant variation in impacts across settings.

5.4.3. Private schools and other non-government school provision

Private schools are an important part of the education landscape in Sub-Saharan Africa. On average across countries, 14% of primary school students and 19% of secondary school students were enroled in secondary schools as of 2014, and that number had grown since the year 2000 (Baum *et al.*, 2018). Private schools are perceived by many parents to be of higher quality: in Kenya, even poor families were willing to undergo financial hardship to pay for so-called low-cost private schools (Zuilkowski *et al.*, 2018). Distinguishing the impact of private schools on student learning is generally difficult because of student selection effects: often, students with better off parents or parents more invested in education may be more likely to attend private schools. Beyond purely private schools, many African governments are entering into agreements with private school chains where they receive public resources to educate students at no charge. These public–private partnerships often seek to leverage the physical and human capital of private schools to increase access and learning. The past several years have seen some new work on private schools and public–private partnerships in Sub-Saharan Africa (Appendix Table 15). Most previous work on private schools has taken place in other regions, and to our knowledge, this topic is not covered in previous reviews focused on Africa.

Recent studies seek to compare student outcomes in private and public schools in African countries. Wamalwa and Burns (2018) compare public school versus private school attending siblings within the same household (i.e., household fixed effects) in Kenya and identify literacy and numeracy gains in attending private schools. Despite efforts to gauge the potential extent of bias, the challenge remains of unobserved child characteristics determining whether a child is sent to private or public school. Also in Kenya, Zuilkowski *et al.* (2020) compare student scores over two academic years in low-cost private schools and government schools in Nairobi and find that, in general, the low-cost private schools do not produce better student outcomes over time. However, private schools yielded more learning gains when they received an instructional improvement intervention than did public schools. Lipcan *et al.* (2018) compare test scores, costs and management practices across public and private schools in Lagos, Nigeria, and find that one international chain of private schools has higher student test scores relative to other private schools and public schools in literacy and relative to public schools only in mathematics. Adjusting for a set of observed student characteristics reduces the gains by a small amount. The authors make no claim to causality, as unobserved characteristics of students may still play a role in the results. A third study does not find any differences in management practices between public and private schools in Uganda; although it does find a significant association between the quality of management and student performance overall (Crawfurd, 2017).

Two randomised controlled trials examine the impact of public–private partnerships, one for primary schools in Liberia and another for secondary schools in Uganda. In Liberia, the management of 93 randomly selected schools was delegated to one of eight different private organisations (Romero *et al.*, 2020). Government teachers taught in both publicly and privately managed schools, but privately managed schools received more funding, and some raised additional funding independently. Ultimately, the privately managed schools achieved significantly higher test scores but at a significantly higher cost per student. In general, management of teachers was better at privately managed schools, but one chain kicked out students when their enrollment cap was reached and transferred less effective teachers to non-evaluated schools. Three years after implementation, the learning gains in

privately managed schools failed to compound over time (Romero and Sandefur, 2019). Ultimately, private management of public schools proved to be a mixed bag.

In Uganda, a program randomised which private secondary schools participated in the public–private partnership and so documented the impact on private school performance (Barrera-Osorio *et al*., 2020). Participation in the partnerships boosted both enrollment and student performance. There is evidence of both an increase in inputs at the partnership schools and changes in student composition, favouring students with more educational advantage. The evaluation did not measure the impact relative to public schools.

Non-profit school providers are another option, especially in the context of extreme poverty and poor state provision of schooling. In Guinea-Bissau, a non-profit organisation randomly selected villages to provide 4-year primary schools to substitute for existing government education (Fazzio *et al*. 2020). The schools had a custom-made structured pedagogy program and frequent monitoring and assessment of teachers and students. Students in intervention schools performed dramatically better on early grade reading and math tests.

The private school and other non-government school evaluation literature is still nascent in Africa. While there is no compelling evidence that private schools or private management of schools deliver more learning than public schools, the revealed preference of many parents and demonstrated improvement in private schools suggests merit in continuing to examine the issue.

6. Discussion

6.1. What we learn

The past several years of education and economics research in Africa demonstrate that there is a range of promising ways to continue to expand access to schools and to improve their quality. Earlier reviews of the evidence had little examination of mother tongue instruction programs and limited coverage of structured pedagogy programs, both of which show sizeable impacts on learning. Likewise, a range of teacher policies shows promising results, including both teacher pay-for-performance programs at the primary level and non-remunerative interventions, such as teacher coaching and training teaching assistants. School feeding programs appear to be beneficial for both access and learning outcomes.

As evidence on inputs—including education technology inputs—grows on the continent, its track record is decidedly mixed. Technology proves effective in some cases and not in others, paralleling the education technology findings in high-income countries and the fact that technology is a means to an end rather than an end in itself (Bulman and Fairlie, 2016). Public–private partnerships likewise are proving no panacea to education systems in Africa.

The past few years have provided several long-term studies on the elimination of primary school fees, showing positive results on later life outcomes. Likewise, a new generation of studies on reducing fees for secondary school shows gains in access, increased employment and reduced early fertility. Of course, the first step of constructing schools in places where there are no schools is likely an essential condition for further educational investments.

6.2. What we still need to learn

The weaknesses of this evidence base are the same weaknesses of economics of education research throughout low- and middle-income countries. The first is the duration of impacts. The vast majority of interventions measure outcomes within 12 months of the onset of

the intervention, with little information on the longer run time path of impacts (McEwan, 2015). There are recent exceptions to that in the region, with studies studying impacts of experimental interventions 2 years after implementation (Cilliers *et al.*, 2020a), 3 years after implementation (Bagby *et al.*, 2016), 7 years after implementation (Evans and Ngatia, 2020) and even 10 years after implementation (Baird *et al.*, 2016b; Ingwersen *et al.*, 2019). But most interventions still lack any long-term follow-up. Quasi-experimental studies that examine policy changes are showing much longer-term impacts, as in several of the fee elimination studies.

The second is scale. Many evaluations of interventions are at relatively small scale. Outside of the interventions evaluating national policies, the median number of treated schools is just 66 (Table 4), often implemented under the careful eye of a cautious researcher. Obviously, going to scale entails a host of challenges—both political and implementation—and sometimes those challenges ultimately undermine whatever worked well in the original evaluation (Bold *et al.*, 2018). Design elements in pilots can facilitate moving to scale by, for example, testing a variety of elements to increase confidence in the optimal policy design, drawing on government systems when possible and providing cost analysis (Gove *et al.*, 2017).

Interventions where scale requires a large increase in financial resources but not a proportional increase in human resources (e.g., cash transfers or fee elimination) present a distinct set of challenges than those where scale requires a corresponding increase in human resources (a structured pedagogy program, for example). In some ways, the financial resources are easier to come by at large scale than the human resources, especially in education systems that historically have had difficulty recruiting and training qualified workers.

A third challenge is cost-effectiveness. A natural response to the array of evidence we have presented would be to point out that the benefit is just half of the investment decision. Unfortunately, less than 30% of the studies report cost-effectiveness (Table 3), which may be an increase from a few years ago (McEwan, 2015).[18] Programs that provide consistent benefits in boosting access—including fee elimination, school construction and school meals—also tend to have high fixed or recurrent costs (or both). Cost-effectiveness analysis is essential for better policy decisions, and hopefully the new generation of studies will do more of that.

6.3. Applying research findings to policy

These findings can help policymakers to update their existing beliefs as to the best starting points for discussions about education policy. Every place and time is different, and so synthesising effective results is not intended to promote wholesale adoption of one program to another context. Achieving high-quality education in Africa will require a host of interventions at each education level—early child education, primary education, secondary education, etc. As a result, policymakers and the researchers who advise them can learn from successful interventions in two key ways. First, most simply, successful interventions in one context provide a starting point for discussions in another context (World Bank, 2018a).[19]

18 Even if one had those data, comparing costs across settings entails many of the same challenges that comparing effect sizes entails (Evans and Popova, 2016a).

19 Most immediately, evaluations can inform policy decisions in the same context, as demonstrated by the multifaceted use of evaluations by the Department of Basic Education in South Africa (Pophiwa *et al.*, 2020). This is less relevant to the present synthesis of evidence from many countries.

Would that work here? Why or why not? Second, we can examine the principles behind the success of interventions rather than focusing on specific point estimates (Muralidharan, 2017). Specifically, we can ask what the theory behind the program is: whether the required conditions in a new context hold for that theory to apply; whether the same behaviour change would be expected in the new context, based on existing evidence; and whether the program could be well implemented (Bates and Glennerster, 2017). In some cases, a different program design may be more effective at achieving the same change in teacher or student behaviour in a new country because of different contextual factors. Certain classes of programs that have been successful across several contexts—such as structured pedagogy programs, school feeding programs, school fee elimination programs or mother tongue instruction programs—may provide starting points for policy discussions in other areas.

The education impact evaluation evidence in Africa is shifting from simple tests of what works and what does not to what implementation design is the most effective in a given context. As Duflo (2017) writes, 'Our models give us very little theoretical guidance on what (and how) details will matter.' But the growing array of evidence can guide us in the path forward.

Funding

The authors are grateful for contributions from the Bill & Melinda Gates Foundation in support of this work.

Supplementary material

Supplementary material is available at *JAFECO* online.

References

Abrami, P. C., Wade, C. A., Lysenko, L., Marsh, J., and Gioko, A. (2016). Using Educational Technology to Develop Early Literacy Skills in Sub-Saharan Africa. *Education and Information Technologies*, 21(4), 945–64. https://doi.org/10.1007/s10639-014-9362-4.

Adelman, M., Holland, P., and Heidelk, T. (2017). Increasing Access by Waiving Tuition: Evidence from Haiti. *Comparative Education Review*, 61(4), 804–31. https://doi.org/10.1086/693904.

Adeniran A., Ishaku J., Akanni L. (2020) 'Is Nigeria Experiencing a Learning Crisis: Evidence from Curriculum-matched Learning Assessment', *Centre for the Study of the Economies of Africa*, Working paper. https://riseprogramme.org/sites/default/files/inline-files/Adeniran-Nigeria_learning_crisis.pdf.

Ajayi K., Ross P. (2020) 'The effects of education on financial outcomes: Evidence from Kenya', *Economic Development and Cultural Change*, 69(1). https://doi.org/10.1086/702996.

Aker J. C., Ksoll C. (2019) 'Call me educated: Evidence from a Mobile Phone Experiment in Niger', *Economics of Education Review*, 72: 239–57 https://doi.org/10.1016/j.econedurev.2019.05.001.

Akresh R., De Walque D. B. C. M., Kazianga H. (2016) 'Evidence from a Randomized Evaluation of the Household Welfare Impacts of Conditional and Unconditional Cash Transfers Given to Mothers or Fathers', *The World Bank*, 1–49 (no. WPS7730). http://documents.worldbank.org/curated/en/944741467047531083/Evidence-from-a-randomized-evaluation-of-the-household-welfare-impacts-of-conditional-and-unconditional-cash-transfers-given-to-mothers-or-fathers.

Angrist N., Djankov S., Goldberg P. K., Patrinos H. A. (2019) 'Measuring Human Capital', *The World Bank*, 1–46 (no. WPS8742). http://documents.worldbank.org/curated/en/540801550153933986/Measuring-Human-Capital.

Ashraf, N., Bau, N., Low, C., and McGinn, K. (2020a). Negotiating a Better Future: How Interpersonal Skills Facilitate Intergenerational Investment. *The Quarterly Journal of Economics*, 135(2), 1095–1151. https://doi.org/10.1093/qje/qjz039.

Ashraf, N., Bau, N., Nunn, N., and Voena, A. (2020b). Bride Price and Female Education. *Journal of Political Economy*, 128(2), 591–641. https://doi.org/10.1086/704572.

Atuhurra J. F. (2016) 'Does Community Involvement Affect Teacher Effort? Assessing Learning Impacts of Free Primary Education in Kenya', *International Journal of Educational Development*, 49: 234–46 https://doi.org/10.1016/j.ijedudev.2016.03.008.

Attanasio O., Caeyers B., Cattan S., Sosa L. C., Krutikova S., Leighton P. (2019) Improving Early Childhood Development in Rural Ghana Through Scalable Community-Run Play Schemes: Programme Impact Evaluation Report. Working paper. https://www.ifs.org.uk/uploads/Impact%20report_submitted.pdf.

Aunio P., Korhonen J., Ragpot L., Törmänen M., Mononen R., Henning E. (2019) 'Multifactorial Approach to Early Numeracy—The Effects of Cognitive Skills, Language Factors and Kindergarten Attendance on Early Numeracy Performance of South African First Graders', *International Journal of Educational Research*, 97: 65–76 https://doi.org/10.1016/j.ijer.2019.06.011.

Aurino E., Gelli A., Adamba C., Osei-Akoto I., Alderman H. (2019) 'Food for Thought? Experimental Evidence on the Learning Impacts of a Large-scale School Feeding Program'. Working paper. https://custom.cvent.com/4E741122FD8B4A1B97E483EC8BB51CC4/files/0e417a592b7f494abaa559eccf646ee3.pdf.

Azomahou, T. T., Diagne, A., and Diallo, F. L. (2019). Non-compliance and Non-response in Randomised School Meals Experiment: Evidence from Rural Senegal. *Journal of African Economies*, 28(5), 533–57. https://doi.org/10.1093/jae/ejz008.

Bagby E., Dumitrescu A., Orfield C., Sloan M. (2016) *Long-Term Evaluation of the IMAGINE Project in Niger (English version)*. Working Paper. Mathematica Policy Research, Washington, DC. https://www.mathematica.org/our-publications-and-findings/publications/imagine-report-english-june-2016.

Baird S., Chirwa E., de Hoop J., Özler B. (2016a) 'Girl power: cash transfers and adolescent welfare: evidence from a cluster-randomized experiment in Malawi', in S. Edwards, S. Johnson and D. Weil (eds), *African Successes, Volume II: Human Capital*, pp. 139–64. University of Chicago Press, Chicago IL. https://www.nber.org/chapters/c13380.

Baird, S., Hicks, J. H., Kremer, M., and Miguel, E. (2016b). Worms at Work: Long-run Impacts of a Child Health Investment. *The Quarterly Journal of Economics*, 131(4), 1637–80. https://doi.org/10.1093/qje/qjw022.

Baird, S., McIntosh, C., & Özler, B. (2011). Cash or Condition? Evidence from a Cash Transfer Experiment. *The Quarterly Journal of Economics*, 126(4), 1709–53. https://doi.org/10.1093/qje/qjr032.

Baird S., McIntosh C., Özler B. (2019) 'When the Money Runs Out: Do Cash Transfers Have Sustained Effects on Human Capital Accumulation?' *Journal of Development Economics*, 140: 169–85 https://doi.org/10.1016/j.jdeveco.2019.04.004.

Baker M., Gruber J., Milligan K. (2019) 'The Long-Run Impacts of a Universal Childcare Program', *American Economic Journal: Economic Policy*, 11(3), 1–26. https://www.aeaweb.org/articles?id=10.1257/pol.20170603.

Bandiera, O., Buehren, N., Burgess, R., Goldstein, M., Gulesci, S., Rasul, I., and Sulaiman, M. (2020). Womens Empowerment in Action: Evidence from a Randomized Control Trial in Africa.

American Economic Journal: Applied Economics, 12(1), 210–59. https://doi.org/10.1257/app.20170416.

Bandiera O., Buehren N., Goldstein M. P., Rasul I., Smurra A. (2019) 'The Economic Lives of Young Women in the Time of Ebola: Lessons from an Empowerment Program', *The World Bank*, 1–80 (no. WPS8760). http://documents.worldbank.org/curated/en/452451551361923106/The-Economic-Lives-of-Young-Women-in-the-Time-of-Ebola-Lessons-from-an-Empowerment-Program.

Barton N., Bold T., Sandefur J. (2017) Measuring Rents from Public Employment: Regression Discontinuity Evidence from Kenya, Center for Global Development Working Paper No. 457, Washington, DC. https://doi.org/10.2139/ssrn.3013390.

Bashir S., Lockheed M. E., Ninan E., Tan J.-P. (2018) 'Facing Forward: Schooling for Learning in Africa', *The World Bank*, 1–505 (no. 130473). http://documents.worldbank.org/curated/en/113581538650102794/Facing-Forward-Schooling-for-Learning-in-Africa.

Barrera-Osorio, F., Galbert, P. D., Habyarimana, J., & Sabarwal, S. (2020). The Impact of Public-Private Partnerships on Private School Performance: Evidence from a Randomized Controlled Trial in Uganda. *Economic Development and Cultural Change*, 68(2), 429–69. https://doi.org/10.1086/701229.

Bates M. A., Glennerster R. (2017) The Generalizability Puzzle. Standford Social Innovation Review. https://ssir.org/articles/entry/the_generalizability_puzzle.

Baum D. R., Cooper R., Lusk-Stover O. (2018) 'Regulating Market Entry of Low-cost Private Schools in Sub-Saharan Africa: Towards a Theory of Private Education Regulation', *International Journal of Educational Development*, 60: 100–12 https://doi.org/10.1016/j.ijedudev.2017.10.020.

Beasley, E., and Huillery, E. (2017). Willing but Unable? Short-term Experimental Evidence on Parent Empowerment and School Quality. *The World Bank Economic Review*, 31(2), 531–52. https://doi.org/10.1093/wber/lhv064.

Beg S., Fitzpatrick A., Lucas A. M., Tsinigo E., Atimone H. (2020). Strengthening Teaching Accountability to Reach All Students. IPA Ghana. Working Paper. http://documents1.worldbank.org/curated/en/184851585721598666/pdf/Strengthening-Teacher-Accountability-to-Reach-All-Students-STARS-Milestone-4-Impact-Analysis-Report.pdf.

Benhassine, N., Devoto, F., Duflo, E., Dupas, P., and Pouliquen, V. (2015). Turning a Shove into a Nudge? A "Labeled Cash Transfer" for Education. *American Economic Journal: Economic Policy*, 7(3), 86–125. https://doi.org/10.1257/pol.20130225.

Benshaul-Tolonen A., Zulaika G., Nyothach E., Oduor C., Mason L., Obor D., Alexander K. T., Laserson K. F., Phillips-Howard P. (2019). Pupil Absenteeism, Measurement, and Menstruation: Evidence from Western Kenya. CDEP-CGEG Working Paper Series No. 74'. https://anjatolonen.files.wordpress.com/2019/03/cdep_absenteeism.pdf.

Bietenbeck J., Ericsson S., Wamalwa F. M. (2019). Preschool Attendance, School Progression, and Cognitive Skills in East Africa. Working Paper. https://janbietenbeck.com/BEW_preschools_preprint_no_OA.pdf.

Blimpo M. P., Da Costa Luz A., Carneiro P. M., Jervis P., Pugatch T. (2019a) 'Improving Access and Quality in Early Childhood Development Programs: Experimental Evidence from The Gambia', *The World Bank*, 1–43 (no. WPS8737) http://documents.worldbank.org/curated/en/319421550087245992/Improving-Access-and-Quality-in-Early-Childhood-Development-Programs-Experimental-Evidence-from-The-Gambia.

Blimpo M. P., Evans D., Lahire N. (2015) 'Parental Human Capital and Effective School Management: Evidence from The Gambia', *The World Bank*, 1–56 (no. WPS7238). http://documents.worldbank.org/curated/en/923441468191341801/Parental-human-capital-and-effective-school-management-evidence-from-The-Gambia.

Blimpo, M. P., Gajigo, O., and Pugatch, T. (2019b). Financial Constraints and Girls Secondary Education: Evidence from School Fee Elimination in The Gambia. *The World Bank Economic Review*, 33(1), 185–208. https://doi.org/10.1093/wber/lhw051.

Blimpo M. P., Pugatch T. (2020) 'Entrepreneurship Education and Teacher Training in Rwanda'. Working paper. https://riseprogramme.org/sites/default/files/inline-files/PUGATCH.pdf.

Boahen, E. A., and Yamauchi, C. (2018). The Effect of Female Education on Adolescent Fertility and Early Marriage: Evidence from Free Compulsory Universal Basic Education in Ghana. *Journal of African Economies*, 27(2), 227–48. https://doi.org/10.1093/jae/ejx025.

Bold, T., Filmer, D., Martin, G., Molina, E., Stacy, B., Rockmore, C., Svensson, J., and Wane, W. (2017). Enrollment without Learning: Teacher Effort, Knowledge, and Skill in Primary Schools in Africa. *Journal of Economic Perspectives*, 31(4), 185–204. https://doi.org/10.1257/jep.31.4.185.

Bold T., Kimenyi M., Mwabu G., Ng'ang'a A., Sandefur J. (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.

Brudevold-Newman A. (2019) 'The Impacts of Free Secondary Education: Evidence from Kenya'. Working paper. https://drive.google.com/file/d/0BwWpbm7dAutoRjRpWUJ5alRtOERncV9oeng0UFBzRzUwSE1j/view.

Brunette, T., Piper, B., Jordan, R., King, S., and Nabacwa, R. (2019). The Impact of Mother Tongue Reading Instruction in Twelve Ugandan Languages and the Role of Language Complexity, Socioeconomic Factors, and Program Implementation. *Comparative Education Review*, 63(4), 591–612. https://doi.org/10.1086/705426.

Buehren N., Goldstein M. P., Gulesci S., Sulaiman M., Yam V. (2017) 'Evaluation of an Adolescent Development Program for Girls in Tanzania', *The World Bank*, 1–25 (no. WPS7961) http://documents.worldbank.org/curated/en/245071486474542369/Evaluation-of-an-adolescent-development-program-for-girls-in-Tanzania.

Bulman G., Fairlie R. W. (2016) 'Chapter 5: technology and education: computers, software, and the internet', in *Handbook of the Economics of Education*, vol. 5. Elsevier, North Holland. https://www.elsevier.com/books/handbook-of-the-economics-of-education/hanushek/978-0-444-51399-1.

Card D., Krueger A. B. (1992) 'Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the United States', *Journal of Political Economy*, 100(1), 1–40. JSTOR.

Cardim J., Molina Millán T., Vicente P. (2019) 'Technology-aided Instruction in Primary Education: Experimental Evidence from Angola'. Working paper. https://custom.cvent.com/4E741122FD8B4A1B97E483EC8BB51CC4/files/Event/ca4fa1845a194f7fa5fed5711b3c0a8f/ce84c22d75cd42748fd5feca3991f2a8.pdf.

Carneiro, P., Koussihouèdé, O., Lahire, N., Meghir, C., and Mommaerts, C. (2020). School Grants and Education Quality: Experimental Evidence from Senegal. *Economica*, 87(345), 28–51. https://doi.org/10.1111/ecca.12302.

Chelwa, G., Pellicer, M., and Maboshe, M. (2019). Teacher Pay and Educational Outcomes: Evidence from the Rural Hardship Allowance in Zambia. *South African Journal of Economics*, 87(3), 255–82. https://doi.org/10.1111/saje.12227.

Chicoine L. (2019) 'Schooling with Learning: The Effect of Free Primary Education and Mother Tongue Instruction Reforms in Ethiopia', *Economics of Education Review*, 69: 94–107 https://doi.org/10.1016/j.econedurev.2019.01.002.

Chicoine L. (2020) 'Free Primary Education, Fertility, and Womens Access to the Labor Market: Evidence from Ethiopia', *The World Bank Economic Review*, lhz042. doi: https://doi.org/10.1093/wber/lhz042.

Cilliers J., Fleisch B., Kotze J., Mohohlwane M., Taylor S. (2020a) 'The Challenge of Sustaining Effective Teaching: Spillovers, Fade-out, and the Cost-effectiveness of Teacher Development Programs'. Working paper. https://www.dropbox.com/s/6xmv7283oxoysj2/The%20Challenge%20of%20Sustaining%20Effective%20Teaching%20with%20appendix.pdf?dl=0.

Cilliers J., Fleisch B., Kotze J., Mohohlwane N., Taylor S., Thulare T. (2020b) 'Can Virtual Replace In-person Coaching? Experimental Evidence on Teacher Professional Development and Student Learning in South Africa', (unpublished working paper).

Cilliers J., Fleisch B., Prinsloo C., Taylor S. (2019) 'How to Improve Teaching Practice? An Experimental Comparison of Centralized Training and In-classroom Coaching', *Journal of Human Resources*, 55(3): 926–962https://doi.org/10.3368/jhr.55.3.0618-9538R1.

Cilliers J., Mbiti I. M., Zeitlin A. (2020c) 'Can Public Rankings Improve School Performance? Evidence from a Nationwide Reform in Tanzania', *Journal of Human Resources*, 0119-9969R1. https://doi.org/10.3368/jhr.56.3.0119-9969R1.

Conn K. M. (2014) 'Identifying effective education interventions in Sub-Saharan Africa: A meta-analysis of rigorous impact evaluations', in *Ph.D. Thesis*. Columbia University, New York City, NY. https://doi.org/10.7916/D898854G.

Conn, K. M. (2017). Identifying Effective Education Interventions in Sub-Saharan Africa: A Meta-analysis of Impact Evaluations. *Review of Educational Research*, 87(5), 863–98. https://doi.org/10.3102/0034654317712025.

Crawfurd, L. (2017). School Management and Public–Private Partnerships in Uganda. *Journal of African Economies*, 26(5), 539–60. https://doi.org/10.1093/jae/ejx021.

Davis B., Handa S., Hypher N., Rossi N. W., Winters P., Yablonski J. (2016) *From Evidence to Action: The Story of Cash Transfers and Impact Evaluation in Sub-Saharan Africa*. Oxford University Press, UK. doi: https://doi.org/10.4060/0b24b92e-5254-4d06-a317-84ccd6babe23.

de Hoop J., Rosati F. C. (2014). Does Promoting School Attendance Reduce Child Labor? Evidence from Burkina Fasos BRIGHT Project. *Economics of Education Review*, 39: 78–96. https://doi.org/10.1016/j.econedurev.2013.11.001.

de Hoop T., Ring H., Siwach G., Dias P., Tembo G., Rothbard V., Toungui A. (2020) 'Impact of e-Learning Technology and Activity-based Learning on Learning Outcomes: Experimental Evidence from Community Schools in Rural Zambia'. https://custom.cvent.com/4E741122FD8B4A1B97E483EC8BB51CC4/files/dehoopt.pdf.

De Walque D. B. C. M., Valente C. (2019) 'Incentivizing school attendance in the presence of parent-child information frictions', *The World Bank*, 1–63 (no. WPS8476) http://documents.worldbank.org/curated/en/720071529003623702/Incentivizing-school-attendance-in-the-presence-of-parent-child-information-frictions.

Delesalle E. (2019) 'The Effect of the Universal Primary Education Program on Labor Market Outcomes: Evidence from Tanzania', *National Bureau of Economic Research*, (working paper no. 25789). https://doi.org/10.3386/w25789.

Derksen L., Leclerc C., Souza P. C. (2020) 'Searching for Answers: The Impact of Student Access to Wikipedia'. Working paper. https://warwick.ac.uk/fac/soc/economics/research/centres/cage/manage/publications/450-2019_souza.pdf.

Deschênes S., Hotte R. (2019). Assessing the Effects of an Education Policy on Womens Well-being: Evidence from Benin, (halshs-02179704; PSE Working Papers) HAL. https://ideas.repec.org/p/hal/psewpa/halshs-02179704.html.

Diagne A., Mouhamadou Moustapha L. O., Sokhna O., Diallo F. L. (2014) 'Evaluation of the Impact of School Canteen Programs on Internal Efficiency of Schools, Cognitive Acquisitions and Learning Capacities of Students in Rural Primary Schools in Senegal', *Social Science Research Network*, (SSRN Scholarly Paper ID 3167973). https://papers.ssrn.com/abstract=3167973.

Donfouet, H., Ngware, M., Hungi, N., and Kitsao-Wekulo, P. (2018). Cost and Cost-Effectiveness of a Pre-Primary School Program in Kenya. Working Paper. Center for Research in Economics and Managemesnt (CREM), University of Rennes 1, University of Caen and CNRS. https://econpapers.repec.org/paper/tutcremwp/2018-09.htm.

Duflo A., Kiessel J., Lucas A. (2020) 'External Validity: Four Models of Improving Student Achievement', *National Bureau of Economic Research*, (working paper no. 27298). https://doi.org/10.3386/w27298.

Duflo, E., Ely R. T. (2017). Lecture: The Economist as Plumber. *American Economic Review*, 107(5), 1–26. https://doi.org/10.1257/aer.p20171153.

Duflo E., Dupas P., Kremer M. (2015a) 'School Governance, Teacher Incentives, and Pupil–Teacher Ratios: Experimental Evidence from Kenyan Primary Schools', *Journal of Public Economics*, 123: 92–110 https://doi.org/10.1016/j.jpubeco.2014.11.008.

Duflo, E., Dupas, P., and Kremer, M. (2015b). Education, HIV, and Early Fertility: Experimental Evidence from Kenya. *American Economic Review*, 105(9), 2757–97. https://doi.org/10.1257/aer.20121607.

Duflo E., Dupas P., Kremer M. (2019). The Impact of Free Secondary Education: Experimental Evidence from Ghana. Massachusetts Institute of Technology (Working Paper Cambridge). https://web.stanford.edu/~pdupas/DDK_GhanaScholarships.pdf.

Education Sub Saharan Africa (2020) 'African Education Research Database'. https://essa-africa.org/about_ESSA.

Evans D., Hausladen S., Kosec K., Reese N. (2014) 'Community-Based Conditional Cash Transfers in Tanzania: Results from a Randomized Trial', *The World Bank*. https://doi.org/10.1596/978-1-4648-0141-9.

Evans D., Ngatia M. (2020) 'School Uniforms, Short-run Participation, and Long-run Outcomes: Evidence from Kenya', *The World Bank Economic Review*. doi: https://doi.org/10.1093/wber/lhaa004.

Evans D., Popova A. (2016a) 'Cost-effectiveness Analysis in Development: Accounting for Local Costs and Noisy Impacts', *World Development*, 77: 262–76 https://doi.org/10.1016/j.worlddev.2015.08.020.

Evans, D., and Popova, A. (2016b). What Really Works to Improve Learning in Developing Countries? An Analysis of Divergent Findings in Systematic Reviews. *The World Bank Research Observer*, 31(2), 242–70. https://doi.org/10.1093/wbro/lkw004.

Evans D., Yuan F. (2019) 'What We Learn about Girls Education from Interventions that Do Not Focus on Girls', *The World Bank*, 1–45 (no. WPS8944). http://documents.worldbank.org/curated/en/243741563805734157/What-We-Learn-about-Girls-Education-from-Interventions-that-Do-Not-Focus-on-Girls.

Evans D., Yuan F. (2020) How Big is a Big Effect Size in International Education Studies? Center for Global Development Working Paper No. 545, Washington, DC. https://www.cgdev.org/publication/how-big-are-effect-sizes-international-education-studies.

Evans D., Filmer D. P., Yuan F. (2020) Are Teachers in Africa Poorly Paid? Evidence from 15 Countries. Center for Global Development Working Paper No. 545, Washington, DC. https://www.cgdev.org/publication/are-teachers-africa-poorly-paid-evidence-15-countries.

Eyal K., Woolard I. (2014) 'Cash Transfers and Teen Education: Evidence from South Africa'. https://www.researchgate.net/publication/267391729_Cash_Transfers_and_Teen_Education_Evidence_from_South_Africa?channel=doiandlinkId=544e4c350cf29473161b8977andshowFulltext=true.

Falisse J.-B., Huysentruyt M., Olofsgård A. (2019) 'Incentivizing Textbooks for Self-study: Experimental Evidence on Student Learning from the Democratic Republic of Congo'. Working paper. https://novafrica.org/wp-content/uploads/2019/05/textbook-paper-May-19-2019-final-Lisbon-draft-clean.pdf.

Fazzio I., Eble A., Lumsdaine R., Boone P., Bouy B., Hsieh J., Jayanty C., Johnson S., Silva A. F. (2020) 'Large Learning Gains in Pockets of Extreme Poverty: Experimental Evidence from Guinea Bissau'. Working paper. http://www.alexeble.com/research.

Fiala, N., Garcia-Hernandez, A., Narula, K., and Prakash, N. (2020). Wheels of Change: Transforming Womens Lives with Education and Empowerment. Center for the Study of African Economies Conference Papers. https://www.dropbox.com/s/is9sc8khliipbx3/Slides_Cycles%20%28Dec%202019%29.pdf?dl=0.

Filmer D., Rogers H., Angrist N., Sabarwal S. (2020) 'Learning-Adjusted Years of Schooling (LAYS): Defining a New Macro Measure of Education', *Economics of Education Review* 77, 101971 https://doi.org/10.1016/j.econedurev.2020.101971.

Fiszbein A., Schady N., Ferreira F. H. G., Grosh M., Keleher N., Olinto P., Skoufias E. (2009) 'Conditional Cash Transfers: Reducing Present and Future Poverty', *The World Bank*, 1–384 (no. 47603). http://documents.worldbank.org/curated/en/914561468314712643/Conditional-cash-transfers-reducing-present-and-future-poverty.

Gajigo, O. 2016. 'Closing the Education Gender Gap: Estimating the Impact of Girls Scholarship Program in The Gambia', *Education Economics* 24 (2): 167–88. https://doi.org/10.1080/09645292.2014.985287.

Ganimian A. J., Murnane R. J. (2016) 'Improving Education in Developing Countries: Lessons from Rigorous Impact Evaluations', *Review of Educational Research*. https://doi.org/10.3102/0034654315627499.

Gilligan D. O., Karachiwalla N., Kasirye I., Lucas A. M., Neal D. (2019) 'Educator Incentives and Educational Triage in Rural Primary Schools', *Journal of Human Resources*, 1118-9871R2 https://doi.org/10.3368/jhr.57.1.1118-9871R2.

Glewwe, P., Ilias N., and Kremer, M. (2010). Teacher Incentives. *American Economic Journal: Applied Economics*, 2(3), 205–27. https://doi.org/10.1257/app.2.3.205.

Glewwe P., Hanushek E. A., Humpage S. D., Ravina R. (2014) 'School resources and educational outcomes in developing countries: a review of the literature from 1990 to 2010', in P.W. Glewwe (ed), *Education Policy in Developing Countries*. University of Chicago Press. Chicago, IL.

Glewwe, P., Kremer, M., and Moulin, S. (2009). Many Children Left Behind? Textbooks and Test Scores in Kenya. *American Economic Journal: Applied Economics*, 1(1), 112–35. https://doi.org/10.1257/app.1.1.112.

Glewwe P., Muralidharan K. (2016) 'Chapter 10: improving education outcomes in developing countries: evidence, knowledge gaps, and policy implications', in E.A. Hanushek, S. Machin and L. Woessmann (eds), *Handbook of the Economics of Education*, vol. 5. Elsevier, North Holland, pp. 653–743. https://doi.org/10.1016/B978-0-444-63459-7.00010-5.

Gove, A., Poole, M. K., and Piper, B. (2017). Designing for Scale: Reflections on Rolling Out Reading Improvement in Kenya and Liberia. *New Directions for Child and Adolescent Development*, 2017(155), 77–95. https://doi.org/10.1002/cad.20195.

Habyarimana J. P., Sabarwal S. (2018) 'Re-Kindling Learning: EReaders in Lagos', *The World Bank*, 1–35 (no. WPS8665). http://documents.worldbank.org/curated/en/659331544105347027/Re-Kindling-Learning-eReaders-in-Lagos.

Hanushek, E. A., and Woessmann, L. (2008). The Role of Cognitive Skills in Economic Development. *Journal of Economic Literature*, 46(3), 607–68. https://doi.org/10.1257/jel.46.3.607

Hassan F., Lucchino P. (2016) 'Powering Education', (CEP Discussion Paper 1438). http://eprints.lse.ac.uk/67673/.

Haushofer, J., and Shapiro, J. (2016). The Short-term Impact of Unconditional Cash Transfers to the Poor: Experimental Evidence from Kenya. *The Quarterly Journal of Economics*, 131(4), 1973–2042. https://doi.org/10.1093/qje/qjw025.

Hulett, J. L., Weiss, R. E., Bwibo, N. O., Galal, O. M., Drorbaugh, N., and Neumann, C. G. (2014). Animal Source Foods Have a Positive Impact on the Primary School Test Scores of Kenyan Schoolchildren in a Cluster-randomised, Controlled Feeding Intervention Trial. *British Journal of Nutrition*, 111(5), 875–86. https://doi.org/10.1017/S0007114513003310.

Ingwersen N., Kazianga H., Linden L. L., Mamun A., Protik A., Sloan M. (2019) 'The Long-Term Impacts of Girl-Friendly Schools: Evidence from the Bright School Construction Program in Burkina Faso', (NBER working paper no. w25994). https://www.nber.org/papers/w25994.pdf.

İşcan, T. B., Rosenblum, D., and Tinker, K. (2015). School Fees and Access to Primary Education: Assessing Four Decades of Policy in Sub-Saharan Africa. *Journal of African Economies*, 24(4), 559–92. https://doi.org/10.1093/jae/ejv007.

Jere-Folotiya, J., Chansa-Kabali, T., Munachaka, J. C., Sampa, F., Yalukanda, C., Westerholm, J., Richardson, U., Serpell, R., and Lyytinen, H. (2014). The Effect of Using a Mobile Literacy Game to Improve Literacy Levels of Grade One Students in Zambian Schools. *Educational Technology Research and Development*, 62(4), 417–36. https://doi.org/10.1007/s11423-014-9342-9.

John, I. E., Udofia, N.-A., Udoh, N. A., and Anagbogu, M. A. (2016). Development of e-Career Guidance Programme for Secondary Schools in Akwa Ibom State. *Educational Media International*, 53(4), 298–312. https://doi.org/10.1080/09523987.2016.1254886.

Johnston J., Ksoll C. (2017) 'Effectiveness of Interactive Satellite Transmitted Instruction: Experimental Evidence from Ghanaian Primary Schools'. [Center for Education Policy Analysis (CEPA) working paper no. 17-08]. https://cepa.stanford.edu/sites/default/files/wp17-08-v201708.pdf.

Jones S., Sohnesen T. P., Trifkovic N. (2018) 'The evolution of private returns to education during post-conflict transformation: Evidence from Mozambique'. World Institute for Development Economics Research (WIDER) working paper, 2018. https://doi.org/10.35188/UNU-WIDER/2018/585-5.

Jukes, M. C. H., Turner, E. L., Dubeck, M. M., Halliday, K. E., Inyega, H. N., Wolf, S., Zuilkowski, S. S., and Brooker, S. J. (2017). Improving Literacy Instruction in Kenya through Teacher Professional Development and Text Messages Support: A Cluster Randomized Trial. *Journal of Research on Educational Effectiveness*, 10(3), 449–81. https://doi.org/10.1080/19345747.2016.1221487.

Kavuma S. N., Morrissey O., Upward R. (2015) 'Private Returns to Education for Wage-employees and the Self-employed in Uganda'. World Institute for Development Economics Research (WIDER) working paper. https://doi.org/10.35188/UNU-WIDER/2015/906-0.

Kazianga H., Linden L. L., Protik A., Sloan M. (2019) 'The Medium-Term Impacts of Girl-Friendly Schools: Seven-Year Evidence from School Construction in Burkina Faso', *National Bureau of Economic Research*, (working paper no. 26006). https://doi.org/10.3386/w26006.

Kerwin J. T., Thornton R. L. (2020) 'Making the Grade: The Sensitivity of Education Program Effectiveness to Input Choices and Outcome Measures', *The Review of Economics and Statistics*, 1–45 https://doi.org/10.1162/rest_a_00911.

Kilburn K., Handa S., Angeles G., Mvula P., Tsoka M. (2017) 'Short-term Impacts of an Unconditional Cash Transfer Program on Child Schooling: Experimental Evidence from Malawi', *Economics of Education Review*, 59: 63–80 https://doi.org/10.1016/j.econedurev.2017.06.002.

Knauer H. A., Jakiela P., Ozier O., Aboud F., Fernald L. C. H. (2020) 'Enhancing Young Childrens Language Acquisition through Parent–Child Book-Sharing: A Randomized Trial in Rural Kenya', *Early Childhood Research Quarterly*, 50: 179–90 https://doi.org/10.1016/j.ecresq.2019.01.002.

Koroknay-Palicz T., Montalvao J. (2019) 'The Impact of Social and Emotional Learning: Experimental Evidence from Adolescent Girls in Liberia'. Working paper. http://conference.iza.org/conference_files/Gender_2019/koroknay-palicz_t25104.pdf.

Kotze J., Fleisch B., Taylor S. (2019) 'Alternative Forms of Early Grade Instructional Coaching: Emerging Evidence from Field Experiments in South Africa', *International Journal of Educational Development*, 66: 203–13 https://doi.org/10.1016/j.ijedudev.2018.09.004.

Krafft C. (2015) 'Increasing Educational Attainment in Egypt: The Impact of Early Childhood Care and Education', *Economics of Education Review*, 46: 127–43 https://doi.org/10.1016/j.econedurev.2015.03.006.

Kraft, M. A. (2020). Interpreting Effect Sizes of Education Interventions. *Educational Researcher*, 49(4), 241–53. https://doi.org/10.3102/0013189X20912798.

Kremer, M., Brannen, C., and Glennerster, R. (2013). The Challenge of Education and Learning in the Developing World. *Science*, 340(6130), 297–300. https://doi.org/10.1126/science.1235350

Kremer, M., and Miguel, E. (2007). The Illusion of Sustainability. *The Quarterly Journal of Economics*, 122(3), 1007–65. https://doi.org/10.1162/qjec.122.3.1007.

Krishnaratne S., White H., Carpenter E. (2013). Quality Education for All Children? What Works in Education in Developing Countries. 3ie (working paper 20: 155). New Delhi: International Initiative for Impact Evaluation (3ie). https://www.3ieimpact.org/evidence-hub/publications/working-papers/quality-education-all-children-what-works-education.

Kuepié, M., and Nordman, C. J. (2016). Where Does Education Pay Off in Sub-Saharan Africa? Evidence from Two Cities of the Republic of Congo. *Oxford Development Studies*, 44(1), 1–27. https://doi.org/10.1080/13600818.2015.1110568.

Laitin, D. D., Ramachandran, R., and Walter, S. L. (2019). The Legacy of Colonial Language Policies and Their Impact on Student Learning: Evidence from an Experimental Program in Cameroon. *Economic Development and Cultural Change*, 68(1), 239–72. https://doi.org/10.1086/700617.

Le Nestour A., Moscoviz L., Sandefur J. (2020). Trends in school quality in 90 developing countries: 1950 to 2000.

Leaver C., Ozier O., Serneels P., Zeitlin A. (2019) 'Recruitment, Effort, and Retention Effects of Performance Contracts for Civil Servants: Experimental Evidence from Rwandan Primary Schools'. https://www.poverty-action.org/publication/recruitment-effort-and-retention-effects-performance-contracts-civil-servants.

Lehmann-Uschner K. (2020). Returns to Education among the Self-employed: Evidence from Rural Western Uganda. Centre for the Study of African Economies (CSAE) Conference, 2020.

Lehrer K., Mawoyo M., Mbaye S. (2019) 'The Impacts of Interactive Smartboards on Learning Achievement in Senegalese Primary Schools (3ie Grantee Final Report)'. https://developmentevidence.3ieimpact.org/search-result-details/impact-evaluation-repository/the-impacts-of-interactive-smartboards-on-learning-achievement-in-senegalese-primary-schools/7721.

Lichand G., Wolf S. (2020) Arm-Wrestling in the Classroom: The Non-Monotonic Effects of Monitoring Teachers. Working paper. https://www.dropbox.com/s/7ww4z0fy8i2a0sh/Arm_Wrestling_in_the_Classroom%20-%20July08.pdf?dl=0.

Lipcan A., Crawfurd L., Law B. (2018) 'Learning in Lagos: Comparing Student Achievement in Bridge, Public, and Private Schools', report submitted to the Education Data, Research and Evaluation in Nigeria. https://www.opml.co.uk/files/Publications/8022-education-data-research-evaluation-nigeria-edoren/learning-in-lagos.pdf?noredirect=1.

Lucas, A. M., McEwan, P. J., Ngware, M., and Oketch, M. (2014). Improving Early-Grade Literacy in East Africa: Experimental Evidence from Kenya and Uganda. *Journal of Policy Analysis and Management*, 33(4), 950–76. https://doi.org/10.1002/pam.21782.

Lysenko L., Abrami P. C., Wade C. A., Marsh J. P., WaGioko M., Kiforo E. (2019) 'Promoting Young Kenyans Growth in Literacy with Educational Technology: A Tale of Two Years of Implementation', *International Journal of Educational Research*, 95: 176–89 https://doi.org/10.1016/j.ijer.2019.02.013.

Martinez S., Naudeau S., Pereira V. A. (2017) 'Preschool and child development under extreme poverty: Evidence from a randomized experiment in rural Mozambique', *The World Bank*, 1–50 (no. WPS8290). http://documents.worldbank.org/curated/en/756171513961080112/Preschool-and-child-development-under-extreme-poverty-evidence-from-a-randomized-experiment-in-rural-Mozambique.

Masino S., Niño-Zarazúa M. (2016) 'What Works to Improve the Quality of Student Learning in Developing Countries?' *International Journal of Educational Development*, 48: 53–65 https://doi.org/10.1016/j.ijedudev.2015.11.012.

Masuda K., Yamauchi C. (2018). The Effects of Universal Secondary Education Program Accompanying Public-Private Partnership on Students Access, Sorting and Achievement: Evidence from Uganda (no. 2018-4; CEI Working Paper Series). Center for Economic Institutions. Institute of Economic Research, Hitotsubashi University. http://hermes-ir.lib.hit-u.ac.jp/rs/bitstream/10086/29261/1/wp2018-4.pdf.

Mbiti, I. (2016). The Need for Accountability in Education in Developing Countries. *Journal of Economic Perspectives*, 30(3), 109–32. https://doi.org/10.1257/jep.30.3.109.

Mbiti, I., Muralidharan, K., Romero, M., Schipper, Y., Manda, C., and Rajani, R. (2019a). Inputs, Incentives, and Complementarities in Education: Experimental Evidence from Tanzania. *The Quarterly Journal of Economics*, 134(3), 1627–73. https://doi.org/10.1093/qje/qjz010

Mbiti I., Romero M., Schipper Y. (2019b) 'Designing Effective Teacher Performance Pay Programs: Experimental Evidence from Tanzania', *National Bureau of Economic Research*, (working paper no. 25903). https://doi.org/10.3386/w25903.

Mbiti I., Schipper Y. 'Teacher and Parental Perceptions of Performance Pay in Education: Evidence from Tanzania', *Journal of African Economies*. (this issue)

McDermott P., Allen N. (2015) 'Successes and Challenges of Implementing a Teacher Education Project in Rural Sierra Leone', *International Journal of Educational Research*, 71: 16–25 https://doi.org/10.1016/j.ijer.2015.02.001.

McEwan, P. J. (2015). Improving Learning in Primary Schools of Developing Countries: A Meta-analysis of Randomized Experiments. *Review of Educational Research*, 85(3), 353–94. https://doi.org/10.3102/0034654314553127.

Medhin, G., and Erulkar, A. (2017). Evaluation of a Safe Spaces Program for Girls in Ethiopia. *Girlhood Studies*, 10(1), 107–25. https://doi.org/10.3167/ghs.2017.100108.

Mensah J. T., Nsabimana A. (2020) 'Food for Thought: School Feeding and Cognitive Performance in Rwanda'. Working paper. https://custom.cvent.com/4E741122FD8B4A1B97E483EC8BB51CC4/files/schoolfeedingandstudentperformanceinrwandabyaimablejustice.pdf.

Morabito C., Van de Gaer D., Figueroa J. L., Vandenbroeck M. (2018) 'Effects of High Versus Low-quality Preschool Education: A Longitudinal Study in Mauritius', *Economics of Education Review*, 65: 126–37 https://doi.org/10.1016/j.econedurev.2018.06.006.

Moshoeshoe, R., Ardington, C., and Piraino, P. (2019). The Effect of the Free Primary Education Policy on School Enrolment and Relative Grade Attainment in Lesotho. *Journal of African Economies*, 28(5), 511–32. https://doi.org/10.1093/jae/ejz007.

Moussa, W., and Omoeva, C. (2020). The Long-term Effects of Universal Primary Education: Evidence from Ethiopia, Malawi, and Uganda. *Comparative Education Review*, 64(2), 179–206. https://doi.org/10.1086/708144.

Muralidharan K. (2017) 'Chapter 3: field experiments in education in developing countries', in A.V. Banerjee and E. Duflo (eds), *Handbook of Economic Field Experiments*, vol. 2., Elsevier, North-Holland, pp. 323–85. https://doi.org/10.1016/bs.hefe.2016.09.004.

Muralidharan, K., and Prakash, N. (2017). Cycling to School: Increasing Secondary School Enrollment for Girls in India. *American Economic Journal: Applied Economics*, 9(3), 321–50. https://doi.org/10.1257/app.20160004.

Nikiema, P. R. (2019). The Impact of School Feeding Programmes on Educational Outcomes: Evidence from Burkina Faso. *Journal of African Economies*, 28(3), 323–41. https://doi.org/10.1093/jae/ejy026.

Omoeva C., Gale C. (2016) 'Universal, but not Free: Household Schooling Costs and Equity Effects of Ugandas Universal Secondary Education Policy', *International Journal of Educational Development*, 50: 41–50 https://doi.org/10.1016/j.ijedudev.2016.05.007.

Oye M., Pritchett L., Sandefur J. (2016). Girls Schooling is Good, Girls Schooling with Learning is Better. Education Commission, Center for Global Development.

Özler B., Fernald L. C. H., Kariger P., McConnell C., Neuman M., Fraga E. (2018) 'Combining Pre-school Teacher Training with Parenting Education: A Cluster-randomized Controlled Trial', *Journal of Development Economics*, 133: 448–67 https://doi.org/10.1016/j.jdeveco.2018.04.004.

Parker M. E., Mosites E., Reider K., Ndayishimiye N., Waring M., Nyandimbane G., Masumbuko D., Ndikuriyo L., Matthias D. (2015) 'A Blinded, Cluster-Randomized, Placebo-Controlled School FeedingTrial in Burundi Using Rice Fortified With Iron, Zinc, Thiamine, and Folic Acid', *Food and Nutrition Bulletin*, doi: https://doi.org/10.1177/0379572115615234.

Patrinos H. A., Angrist N. (2018) 'Global Dataset on Education Quality: A Review and Update (2000-2017)', *The World Bank*, 1–37 (no. WPS8592). http://documents.worldbank.org/curated/en/390321538076747773/Global-Dataset-on-Education-Quality-A-Review-and-Update-2000-2017.

Peet E. D., Fink G., Fawzi W. (2015) 'Returns to Education in Developing Countries: Evidence from the Living Standards and Measurement Study Surveys', *Economics of Education Review*, 49: 69–90 https://doi.org/10.1016/j.econedurev.2015.08.002.

Pellerano L., Moratti M., Jakobsen M., Gajgar M., Barca V. (2014) 'Child Grants Programme Impact Evaluation [Follow-up Report]'. https://socialprotection.org/discover/publications/child-grants-programme-impact-evaluation.

Pellicer M. (2018) 'The Evolution of Returns to Education in the Middle East and North Africa: Evidence from Comparable Education Policy Changes in Tunisia', *Economics of Education Review*, 62: 183–91 https://doi.org/10.1016/j.econedurev.2017.11.008.

Piper, B., Destefano, J., Kinyanjui, E. M., and Ong'ele, S. (2018a). Scaling Up Successfully: Lessons from Kenyas Tusome National Literacy Program. *Journal of Educational Change*, 19(3), 293–321. https://doi.org/10.1007/s10833-018-9325-4.

Piper, B., Jepkemei, E., and Kibukho, K. (2015). Pro-poor Primr: Improving Early Literacy Skills for Children from Low-income Families in Kenya. *Africa Education Review*, 12(1), 67–87. https://doi.org/10.1080/18146627.2015.1036566.

Piper, B., Ralaingita, W., Akach, L., and King, S. (2016a). Improving Procedural and Conceptual Mathematics Outcomes: Evidence from a Randomised Controlled Trial in Kenya. *Journal of Development Effectiveness*, 8(3), 404–22. https://doi.org/10.1080/19439342.2016.1149502.

Piper B., Simmons Zuilkowski S., Dubeck M., Jepkemei E., King S. J. (2018b) 'Identifying the Essential Ingredients to Literacy and Numeracy Improvement: Teacher Professional Development and Coaching, Student Textbooks, and Structured Teachers Guides', *World Development*, 106: 324–36 https://doi.org/10.1016/j.worlddev.2018.01.018.

Piper B., Zuilkowski S. S., Kwayumba D., Strigel C. (2016b) 'Does Technology Improve Reading Outcomes? Comparing the Effectiveness and Cost-effectiveness of ICT Interventions for Early Grade Reading in Kenya', *International Journal of Educational Development*, 49: 204–14 https://doi.org/10.1016/j.ijedudev.2016.03.006.

Piper B., Zuilkowski S. S., Kwayumba D., Oyanga A. (2018c) 'Examining the Secondary Effects of Mother-tongue Literacy Instruction in Kenya: Impacts on Student Learning in English, Kiswahili, and Mathematics', *International Journal of Educational Development*, 59: 110–27 https://doi.org/10.1016/j.ijedudev.2017.10.002.

Piper B., Zuilkowski S. S., Mugenda A. (2014) 'Improving Reading Outcomes in Kenya: First-year Effects of the PRIMR Initiative', *International Journal of Educational Development*, 37: 11–21 https://doi.org/10.1016/j.ijedudev.2014.02.006.

Piper, B., Zuilkowski, S. S., and Ong'ele, S. (2016c). Implementing Mother Tongue Instruction in the Real World: Results from a Medium-scale Randomized Controlled Trial in Kenya. *Comparative Education Review*, 60(4), 776–807. https://doi.org/10.1086/688493.

Popova A., Evans D., Breeding M. E., Arancibia V. (2018) 'Teacher Professional Development around the World: The Gap between Evidence and Practice', *The World Bank*, 1–65 (no. WPS8572). http://documents.worldbank.org/curated/en/349051535637296801/Teacher-Professional-Development-around-the-World-The-Gap-between-Evidence-and-Practice.

Pophiwa N., Deliwe C. N., Mathe J., Taylor S. (2020) 'Using evaluations to inform policy and practice in a government department: the case of the Department of Basic Education in South Africa', in I. Goldman and M. Pabari (eds), *Using Evidence in Policy and Practice: Lessons from Africa*. Routledge & CRC Press, London, UK. https://www.routledge.com/Using-Evidence-in-Policy-and-Practice-Lessons-from-Africa/Goldman-Pabari/p/book/9780367440077.

Psacharopoulos, G., and Patrinos, H. A. (2018). Returns to Investment in Education: A Decennial Review of the Global Literature. *Education Economics*, 26(5), 445–58. https://doi.org/10.1080/09645292.2018.1484426.

Pugatch T., Schroeder E. (2014) 'Incentives for Teacher Relocation: Evidence from the Gambian Hardship Allowance', *Economics of Education Review*, 41: 120–36 https://doi.org/10.1016/j.econedurev.2014.04.003.

Pugatch, T., and Schroeder, E. (2018). Teacher Pay and Student Performance: Evidence from the Gambian Hardship Allowance. *Journal of Development Effectiveness*, 10(2), 249–76. https://doi.org/10.1080/19439342.2018.1452778.

Ramachandran R. (2017) 'Language Use in Education and Human Capital Formation: Evidence from the Ethiopian Educational Reform', *World Development*, 98: 195–213 https://doi.org/10.1016/j.worlddev.2017.04.029.

Riley E. (2019) 'Role Models in Movies: The Impact of Queen of Katwe on Students Educational Attainment'. Working paper. https://custom.cvent.com/4E741122FD8B4A1B97E483EC8BB51CC4/files/rileyemma.pdf.

Romero M., Sandefur J. (2019) *Beyond Short-term Learning Gains: The Impact of Outsourcing Schools in Liberia after Three Years*. Center For Global Development. https://www.cgdev.org/publication/beyond-short-term-learning-gains-impact-outsourcing-schools-liberia-after-three-years.

Romero, M., Sandefur, J., and Sandholtz, W. A. (2020). Outsourcing Education: Experimental Evidence from Liberia. *American Economic Review*, 110(2), 364–400. https://doi.org/10.1257/aer.20181478.

Sabarwal S., Evans D., Marshak A. (2014) 'The Permanent Input Hypothesis: The Case of Textbooks and (No) Student Learning in Sierra Leone', *The World Bank*, 1–37 (no. WPS7021). http://documents.worldbank.org/curated/en/806291468299200683/The-permanent-input-hypothesis-the-case-of-textbooks-and-no-student-learning-in-Sierra-Leone.

Sabates R., Bhutoria A., Sabates-Wheeler R., Devereux S. (2019) 'Schooling Responses to Income Changes: Evidence from Unconditional Cash Transfers in Rwanda', *International Journal of Educational Research*, 93: 177–87 https://doi.org/10.1016/j.ijer.2018.11.011.

Sabet, S. M., and Brown, A. N. (2018). Is Impact Evaluation Still on the Rise? The New Trends in 2010–2015. *Journal of Development Effectiveness*, 10(3), 291–304. https://doi.org/10.1080/19439342.2018.1483414.

Sakaue K. (2018) 'Informal Fee Charge and School Choice under a Free Primary Education Policy: Panel Data Evidence from Rural Uganda', *International Journal of Educational Development*, 62: 112–27 https://doi.org/10.1016/j.ijedudev.2018.02.008.

Samahiya M. (2020). Returns to Investment in Education: Evidence from a Quantile Regression. Centre for the Study of African Economies (CSAE) Conference, 2020.

Sandefur J. (2019) 'Justin Sandefur on Twitter: "In 4 of the 5 largest countries in Africa, fewer than 1 in 5 working people has a wage job. Always a source of confusion when I read about wages or unemployment in the region. https://t.co/uxYhOeag7X” /Twitter.Twitter'. https://twitter.com/justinsandefur/status/1133923214030233600.

Seid Y. (2017) 'Mother-tongue Instruction and Later Labor Market Outcomes: Evidence from a Natural Experiment in Ethiopia'. Working paper. https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=CSAE2018andpaper_id=71.

Seid, Y. (2019). The Impact of Learning First in Mother Tongue: Evidence from a Natural Experiment in Ethiopia. *Applied Economics*, 51(6), 577–93. https://doi.org/10.1080/00036846.2018.1497852.

Serneels P., Beegle K., Dillon A. (2016) 'Do Returns to Education Depend on How and Who You Ask?' Working Paper. *The World Bank*. doi: https://doi.org/10.1596/1813-9450-7747.

Snilstveit B., Stevenson J., Menon R., Philips D., Gallagher E., Geelen M., Jobse H., Schimdt T., Jimenez E. (2016) 'The Impact of Education Programmes on Learning and School Participation in Low- and Middle-income Countries', (3ie Systematic Review Summary 7). International Initiative for Impact Evaluation (3ie). https://www.3ieimpact.org/sites/default/files/2019-05/srs7-education-report.pdf.

Snilstveit B., Stevenson J., Philips D., Vojtkova M., Gallagher E., Schmidt T., Jobse H., Geelen M., Pastorello M. G., Eyers J. (2015) 'Interventions for Improving Learning Outcomes and Access to Education in Low- and Middle Income Countries: A Systematic Review', (3ie Systematic Review 24). International Initiative for Impact Evaluation (3ie). https://developmentevidence.3ieimpact.org/search-result-details/systematic-review-repository/interventions-for-improving-learning-outcomes-and-access-to-education-in-low-and-middle-income-countries-a-systematic-review/9097.

Taylor S., von Fintel M. (2016) 'Estimating the Impact of Language of Instruction in South African Primary Schools: A Fixed Effects Approach', *Economics of Education Review*, 50: 75–89 https://doi.org/10.1016/j.econedurev.2016.01.003.

Uba, E., Oteikwu, E. A., Onwuka, E., and Abiodun-Eniayekan, E. (2017). A Research-based Evidence of the Effect of Graphic Organizers on the Understanding of Prose Fiction in ESL Classroom. *SAGE Open*, 7(2), 2158244017709506. https://doi.org/10.1177/2158244017709506.

Valente C. (2019) 'Primary Education Expansion and Quality of Schooling', *Economics of Education Review*, 73: 101913 https://doi.org/10.1016/j.econedurev.2019.101913.

Valerio A., Sanchez Puerta M. L., Tognatta N. R., Monroy Taborda S. (2016) 'Are There Skills Payoffs in Low- and Middle-income Countries? Empirical Evidence Using STEP Data', *The World Bank*, 1–46 (no. WPS7879). http://documents.worldbank.org/curated/en/231391478194467051/Are-there-skills-payoffs-in-low-and-middle-income-countries-empirical-evidence-using-STEP-data.

Wamalwa F. M., Burns J. (2018) 'Private Schools and Student Learning Achievements in Kenya', *Economics of Education Review*, 66: 114–24 https://doi.org/10.1016/j.econedurev.2018.07.004.

Williams, T. P., Abbott, P., and Mupenzi, A. (2015). 'Education at Our School is Not Free': The Hidden Costs of Fee-free Schooling in Rwanda. *Compare: A Journal of Comparative and International Education*, 45(6), 931–52. https://doi.org/10.1080/03057925.2014.938611.

Woldehanna T., Araya M. W. (2017) 'Early Investment in Preschool and Completion of Secondary Education in Ethiopia: Lessons from Young Lives'. (Young Lives Working Paper 168). https://www.younglives.org.uk/content/early-investment-preschool-and-completion-secondary-education-ethiopia-lessons-young-lives.

Wolf, S., Aber, J. L., Behrman, J. R., and Tsinigo, E. (2019). Experimental Impacts of the "Quality Preschool for Ghana" Interventions on Teacher Professional Well-being, Classroom Quality, and Childrens School Readiness. *Journal of Research on Educational Effectiveness*, 12(1), 10–37. https://doi.org/10.1080/19345747.2018.1517199.

World Bank (2018a) *World Development Report 2018: Learning to Realize Educations Promise*. The World Bank Group. Washington, DC.

World Bank (2018b) 'Human Capital Index (HCI)'. https://datacatalog.worldbank.org/dataset/human-capital-index.

World Bank (2018c) 'The Human Capital Project'. https://openknowledge.worldbank.org/handle/10986/30498.

World Bank (2020) 'World Development Indicators'. https://databank.worldbank.org/source/world-development-indicators.

Zeitlin A. 'Teacher Turnover in Rwanda', *Journal of African Economies*, (this issue).

Zuilkowski, S. S., Piper, B., Ong'ele, S., and Kiminza, O. (2018). Parents, Quality, and School Choice: Why Parents in Nairobi Choose Low-cost Private Schools over Public Schools in Kenyas Free Primary Education Era. *Oxford Review of Education*, 44(2), 258–74. https://doi.org/10.1080/03054985.2017.1391084.

Zuilkowski, S. S., Piper, B., and Ong'ele, S. (2020). Are Low-Cost-Private Schools Worth the Investment? Evidence on Literacy and Mathematics Gains in Nairobi Primary Schools. *Teachers College Board*, 122(1), 1–30. https://www.tcrecord.org/Content.asp?ContentId=22953.