African Population and Health Research Center

RTI INTERNATIONAL

CIFF CHILDREN'S INVESTMENT FUND FOUNDATION

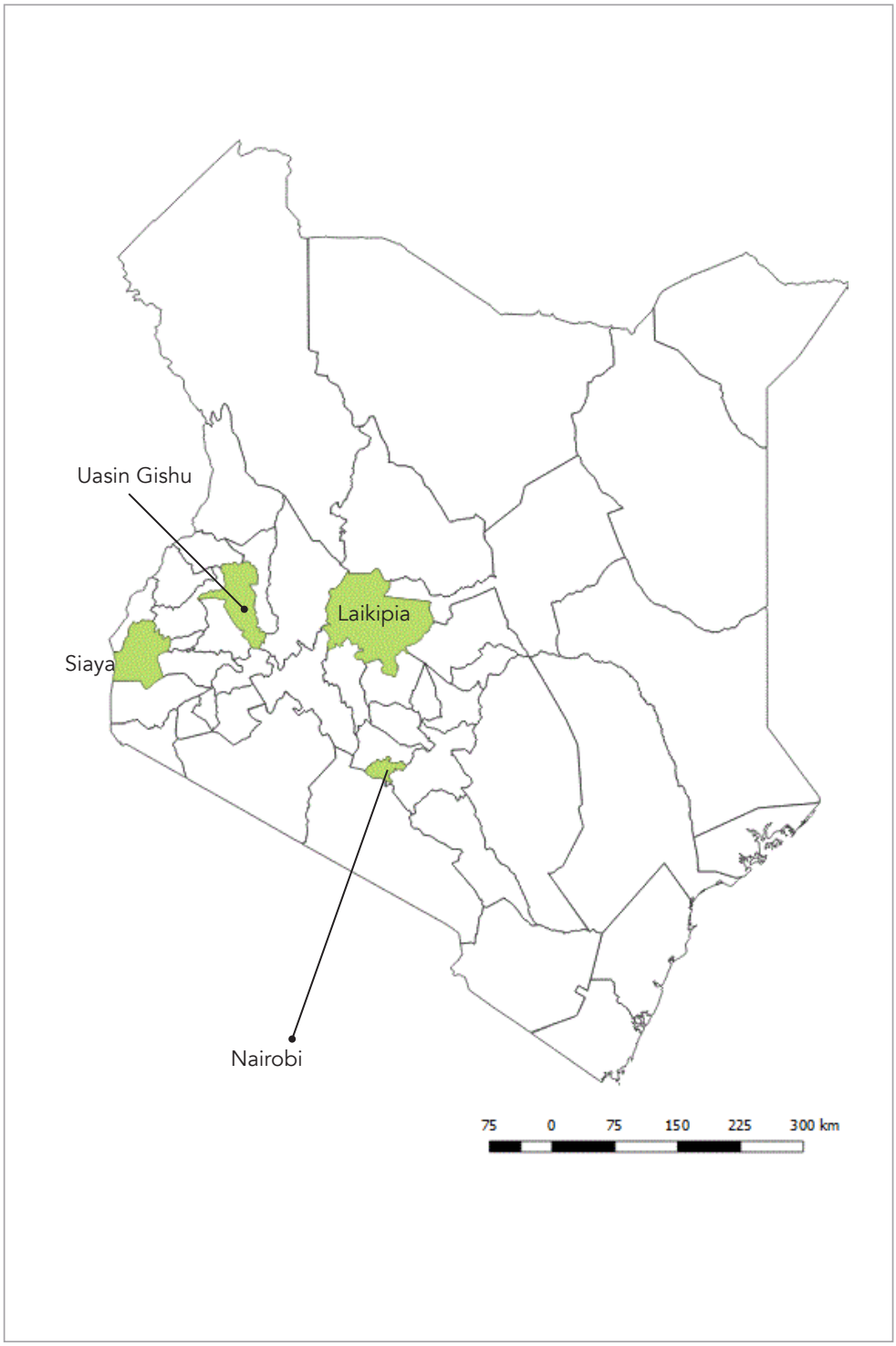
Impact Evaluation of Tayari School Readiness Program in Kenya

Endline Report
Short Version

Moses W. Ngware, Njora Hungi, Patricia Wekulo, Maurice Mutisya, Cheikh Faye, Joan Njagi, Nelson Muhia, Elvis Wambiya, Hermann Donfouet & Clement Oduor

December 2018

Location of study counties in Kenya



Contents

List of Tables

List of Boxes

List of Figures

Abbreviations and Acronyms

APBET	Alternative Provision of Basic Education and Training
APHRC	African Population and Health Research Center
CHA	Community Health Assistant
CEA	Cost-effectiveness Analysis
CHV	Community Health Volunteer
CIFF	Children's Investment Fund Foundation
DICECE	District Center for Early Childhood Education
DID	Difference-in-difference
ECDE	Early Childhood Development and Education
EYE	Education and Youth Empowerment
ICER	Cost-effectiveness ratio
KNEC	Kenya National Examinations Council
MoE	Ministry of Education
PP2	Pre-primary Class 2
RCT	Randomized Control Trial
RTI	RTI International
T0	Control group of schools
T1	Treatment 1 group of schools
T2	Treatment 2 group of schools
T3	Treatment 3 group of schools
TSC	Teachers' Service Commission
TSRI	Tayari School Readiness Index

Acknowledgements

This is a shorter version of the Tayari impact evaluation and that there is a longer version of the same. The report provides the endline findings of the Tayari[1] impact evaluation. The study was conducted by the African Population and Health Research Center's (APHRC) Education and Youth Empowerment (EYE) Unit. We are grateful to all APHRC researchers who supported the evaluation at various stages. We further extend our gratitude to our partners' research and professional inputs during the evaluation process. Specifically, we wish to thank RTI International, Ministry of Education, Kenya National Examination Center, Teachers' Service Commission, Kenya Institute of Curriculum Development and staff from local universities who supported the review of research tools and training of field teams. The continuous support from the implementer – RTI International – to enhance our understanding of Tayari implementation is greatly appreciated.

We would also like to express our gratitude to the field teams that collected data in the four counties. The time and voluntary participation of learners, teachers, head teachers, District Center for Early Childhood Education officers, and instructional coaches who played a key role in providing data for the study cannot go unnoticed. We also thank parents for consenting to their children's participation in this study. Last but not least, we wish to thank CIFF for funding this evaluation; and its staff who constructively engaged with us during this process. The views presented in this report are those of the authors and are not necessarily shared by those mentioned.

[1]Tayari is a Swahili word for 'readiness'.

1.0 Introduction

Tayari is a Kiswahili word meaning "readiness". Participation in early childhood development and education (ECDE) programs is associated with better schooling adjustment and higher levels of academic achievement.

The pilot program aimed to develop a cost-effective, scalable model of ECDE that would ensure that children who are prepared to join Standard 1 are cognitively, physically, socially and emotionally ready to start, and succeed in primary school.

This report describes the endline findings of an external evaluation of a pre-primary school pilot program known as "Tayari", which is a Kiswahili word meaning "readiness". Participation in early childhood development and education (ECDE) programs is associated with better schooling adjustment and higher levels of academic achievement. In Kenya, ECDE currently faces considerable challenges related to poor management of the sector, characterised by insufficient funding and allocation of resources and inconsistent curriculums and programs in existing pre-primary schools. Consequently, many ECDE programs in Kenya are of questionable quality and are arguably limited in their ability to adequately prepare children for primary school. Thus, in an effort to improve the quality of ECDE programs, the Tayari model was piloted by RTI International in partnership with the Ministry of Education. The pilot program aimed to develop a cost-effective, scalable model of ECDE that would ensure that children who are prepared to join Standard 1 are cognitively, physically, socially and emotionally ready to start, and succeed in primary school. The African Population and Health Research Center (APHRC) undertook an independent external evaluation to measure the impact and cost-effectiveness of the Tayari program. The pilot program was funded by the Children's Investment Fund Foundation (CIFF) between 2016 and 2018.

1.1 Target population

The Tayari pilot program targeted pre-primary school children in ECDE centers in four counties in Kenya: Laikipia, Nairobi, Siaya and Uasin Gishu. Both public and Alternative Provision of Basic Education and Training (APBET) ECDE centers were targeted in Nairobi while only public centers were targeted in the other three counties. Low-fee private schools in Nairobi consider themselves as APBET, though the government does not categorise them as such.

1.2 Tayari intervention components

The Tayari intervention comprises the following four key components:

- Training for DICECE[2] officers (supporting public centers) and instructional coaches (supporting APBET centers) in the use of tablet-based technology to supervise and mentor ECDE teachers in improved pedagogy approach;
- Teacher support and training to increase active learning and instructional time.

[2]District Center for Early Childhood Education (DICECE) officers (now referred to as 'Sub-County ECDE Coordinators') are the technical persons in charge of providing classroom instructional support to teachers in public ECDE centers in Kenya.

This component also focused on development of child-centered instructional materials and utilization of books and teachers' guides;

- Books and teachers' guides (also referred to as "instructional materials") component involves providing each learner with low-cost instructional materials (workbooks) on a 1:1 ratio, and providing teachers' guides linked to the workbooks; and
- A health support component that promotes the holistic development of the child by encouraging key health and hygiene practices such as hand washing, proper latrine use, treatment of drinking water at the point of use, and use of child health data for decision making.

1.3 Evaluation questions

The outcome evaluation posed four questions:

- What is the impact of (i) classroom instruction model (T1, T2), and (ii) classroom instruction and health support package (T3) on school readiness (as measured by learner achievement in literacy, numeracy and executive functioning)?
- Does the effect of the interventions vary by providercenter type (public or APBET), length of exposure to the intervention and learner sex?
- Are health interventions together with classroom instruction models more effective in improving learning outcomes than classroom instruction model alone? (That is, comparing T3 to T2, and also T3 to T1).
- Are interventions cost-effective? What are the costs of the interventions and their incremental effects on assessment scores?

1.4 Evaluation design

A randomized control trial (RCT) design was adopted for the evaluation involving three separate treatment group and one control group for each type of ECDE center. As shown in Figure 1.1 the first treatment group (T1) received components (a) and (b) of the intervention; the second treatment group (T2) received components (a), (b) and (c) of the intervention, while the third treatment group received all the four components. The control group (T0) received no treatment but will be offered the components found to work after completion of the pilot phase in 2018.

Figure 1.1: Tayari study groups

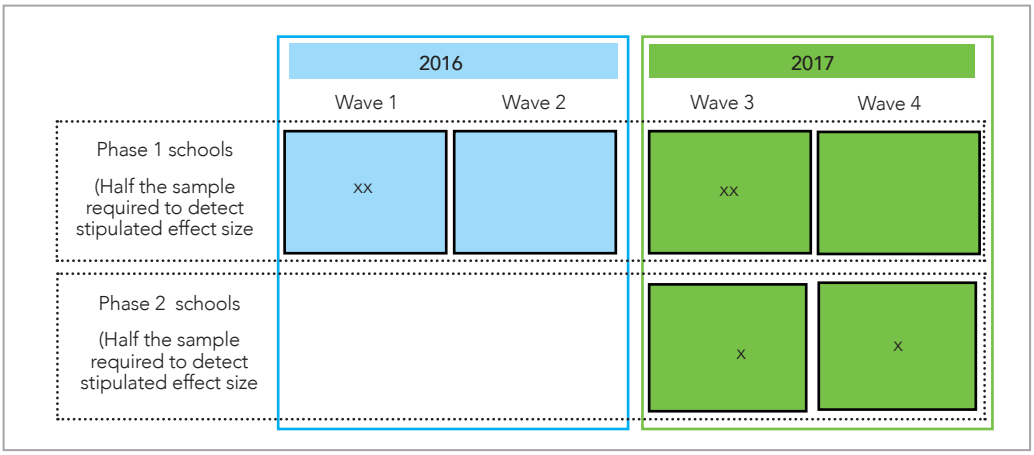
Intervention	Study Group			
	T0	T1	T2	T3
Training of teachers and sub-County ECDE Coordinators		×	×	×
Provision of instructional support		×	×	×
Provision of instructional materials			×	×
Provision of health interventions				×

1.5 Sampling procedures and sample size

Power calculations were used to determine the number of ECDE centers required to detect a mean effect size of 0.20 standard deviations at the program level. Assuming a school attrition rate of 5% for the evaluation study, this worked out to 300 public schools and 300 APBET schools. The study used half (300) the required total sample of 600 ECDE centers during Phase 1 in 2016, and the other half was added in 2017 during Phase 2. By 2017, the Phase 1 schools and learners had been exposed to the Tayari model for two years while Phase 2 schools and learners had been exposed to the model for only one year. Each phase involved two waves of data collection (i.e. Waves 1 and 2 during Phase 1 conducted in 2016 and Waves 3 and 4 during Phase 2 conducted in 2017). This stepped-wedge like design was adopted to reduce costs of the study and to examine the effects of duration of exposure to the Tayari intervention. Wave 3 was a midline for Phase 1; while Phase 3 was a baseline all Phase 2 schools, and for the leaners in Phase 1 (schools had already participated in a baseline in 2016/Wave 1).

Each wave of the evaluation targeted children in the four counties who were attending their final year of pre-primary school (PP2). In each wave, a total of 16 PP2 learners from each sampled ECDE center were randomly selected for assessment. If a PP2 class had less than 16 learners, all the learners in that class were included in the study. In ECDE centers with more than one PP2 class, one class was randomly selected to participate in the study. The PP2 teachers of the selected classes and head teachers of the selected ECDE centers were automatically included in the evaluation study.

Figure 1.2: Tayari stepped-wedge like design



Note: "x" indicates that data were collected from the schools during this wave.

1.6 Survey instruments

The data covered in this report were collected using three main instruments namely (a) a learner direct assessment test[3] - covering key domains of ECDE learning including literacy, numeracy and executive functioning, (b) an ECDE teacher questionnaire, and (c) a head teacher or teacher-in-charge of ECDE center questionnaire.

[3]Details on how the learner direct assessment test was developed including piloting can be found in the Tayari baseline report (Ngware et al., 2016).

The information sought from the teachers included details of their personal and professional characteristics, classroom resources and learner enrolment. Information on personal and professional characteristics as well as information about their schools was also sought from the teacher-in-charge of the ECDE centers.

1.7 Training of enumerators

In each study wave, enumerators were recruited to collect data in the four counties. Among the minimum criteria for selection of candidates were: at least a high school level of education, fluency in the local language of the study area, and previous data collection experience, preferably with young children. Efforts were made to retain as many as possible of the enumerators across data collections waves. As such, by 2017, many of the enumerators had enhanced their skills in collecting data for Tayari, having been involved in more than one round of data collection.

In each wave, the enumerators were trained on each of the Tayari study tools and how to use electronic devices to administer them, and how to observe literacy and numeracy lessons. They were also trained on sampling procedures and ethical issues to be observed during data collection. The enumerators were also trained on how to build rapport with the learners and to administer the tools within a time frame that would not tire learners. As part of their training, enumerators practiced through supervised group work, role plays, and practice runs of the tools in ECDE centers in Kiambu County.

In addition, all enumerators observed and rated the same mock interview several times until at least 95% inter-rater reliability score was attained for each study tool. All practical exercises were followed by debriefing sessions to ensure that all the enumerators had common understanding of the tools and the procedures. By the end of the training all the enumerators were adequately versed on the study tools and methods, well equipped, confident, and prepared to collect data.

1.8 Data collection and management

Enumerators used electronic devices to administer all the survey instruments. The direct assessment test was administered to the selected PP2 learners in a 15-20 minute, face-to-face assessment session with each learner. The sessions began with a brief introduction to build rapport between the learner and the enumerator. During the administration of the test, practice items were used to enhance learners' understanding of the requirements of each item. Enumerators also interviewed the teachers of the selected PP2 learners as well as the head teacher or teacher in charge of the ECDE center on a one-to-one basis.

Several measures were taken to ensure data quality throughout the data collection process. For instance, prior to data collection, data capture software was installed in tablets with quality control measures to disallow out-of-range data, missing values where none were expected, and allow observation of skips where necessary. During data collection, the senior members of the core research team conducted random spot check visits to confirm the accuracy of information collected and adherence to procedures. The data collected were verified on site for accuracy and completeness, after which they were uploaded to a central server. Thereafter, the data were synchronised and cleaned for inconsistency and missing values.

1.9 Analyses

Difference-in-difference (DID) technique was used to understand the performance of the treatment groups and the control group on the outcome measures of interest. DID was used to assess the impact of the intervention on learner achievement between Wave 3 (baseline in 2017) and Wave 4 (endline in 2017) by school type and phase. To establish the impact of the intervention, DIDs were conducted between the control group (T0) and each of the three treatment groups (T1, T2, and T3), on the school mean Tayari School Readiness Index (TSRI) score, executive functioning, literacy and numeracy domains, and their sub-domains. Thereafter, evaluators computed standardized effect sizes (Cohens, 1977) by dividing obtained DIDs with the pooled standard deviation of the groups being compared. A standardized effect size provides an opportunity for comparing the effectiveness of an intervention to alternative initiatives as well as ease of interpretation. In intervention evaluations such as Tayari, effect size is used to quantify the difference between two groups – with large values being associated with more impactful interventions and small values being associated with less impactful interventions. According to Cohens (1977), an effect size of 0.2 is interpreted as small, 0.5 as moderate, and 0.8 as large.

2.0 Participants and their schools

This chapter provides baseline and endline information of participants and schools included in this study. For schools included in the evaluation study for the first time in 2016 (i.e. Phase 1 schools), the baseline data were collected in January/February 2016 (Wave 1), while baseline information of schools included for the first time in 2017 (Phase 2 schools) were collected in January/February 2017 (Wave 3). Information presented in this chapter include distribution of boys and girls in the evaluation sample, personal and professional characteristics of the sampled teachers and head teachers[4] , as well as characteristics of the sampled classrooms and schools.

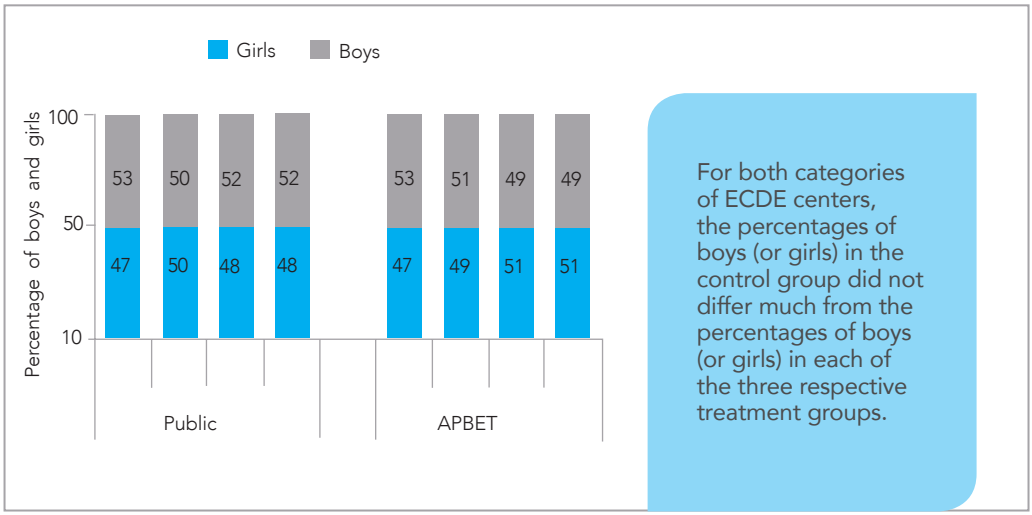
For each ECDE center category, comparisons are made between the respective control groups (T0) and each of the three respective treatment groups – T1, T2 and T3. The main purpose of these comparisons is to examine baseline balance between the treatment groups and the control group on the key variables hypothesized or known to influence learning achievement. For some selected variables, comparison is also made between the baseline and endline information in order to examine changes – in which case, the endline information presented for both Phases 1 and 2 schools were collected in September/October 2017 (Wave 4).

2.1 Learner sex and school attendance

For both categories of ECDE centers, the distribution of boys and girls in the control group did not differ much from that in each of the three respective treatment groups (Figures 2.1 and 2.2). However, there were few differences (non-significant) in the percentages of boys and girls across treatment groups and across the ECDE categories (private versus public).

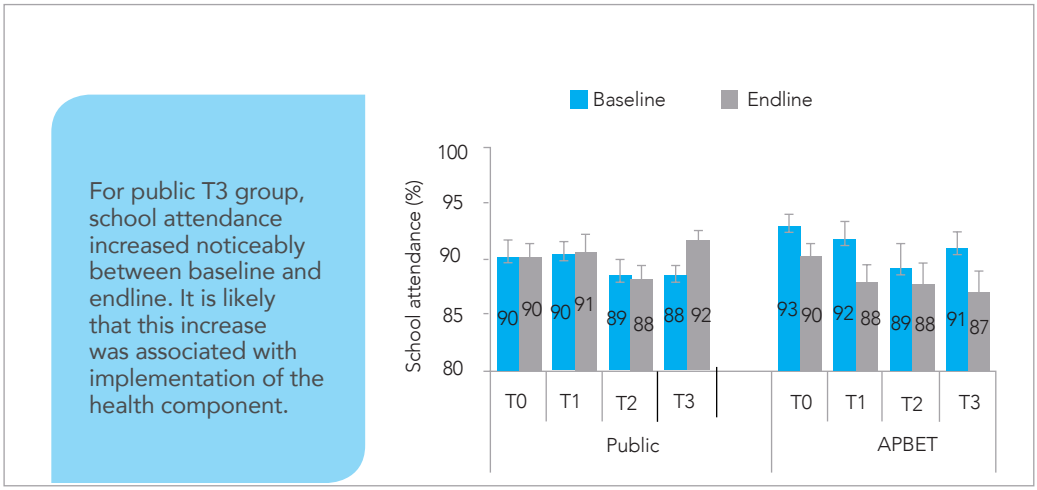
Regarding school attendance baseline data and as shown in Figure 2.2, the percentage of learners in school on the day of data collection was similar between each treatment and control groups and within each type of school. The attendance rates were between 87% and 93%.

Figure 2.1: Proportion of learners by sex in ECDE centers at baseline



[4]These are head teachers of primary schools in which the ECDE center is attached or the teacher in charge of the center

Figure 2.2: School attendance on the day of data collection at baseline and endline



IMPORTANT: In Figure 2.2, the bars for public T2 baseline and endline show the same value (88) but are of slightly different lengths because of rounding up of decimals. The same applies to bars in other graphs presented in this report.

2.2 Teacher age, years of experience, education and pre-service training

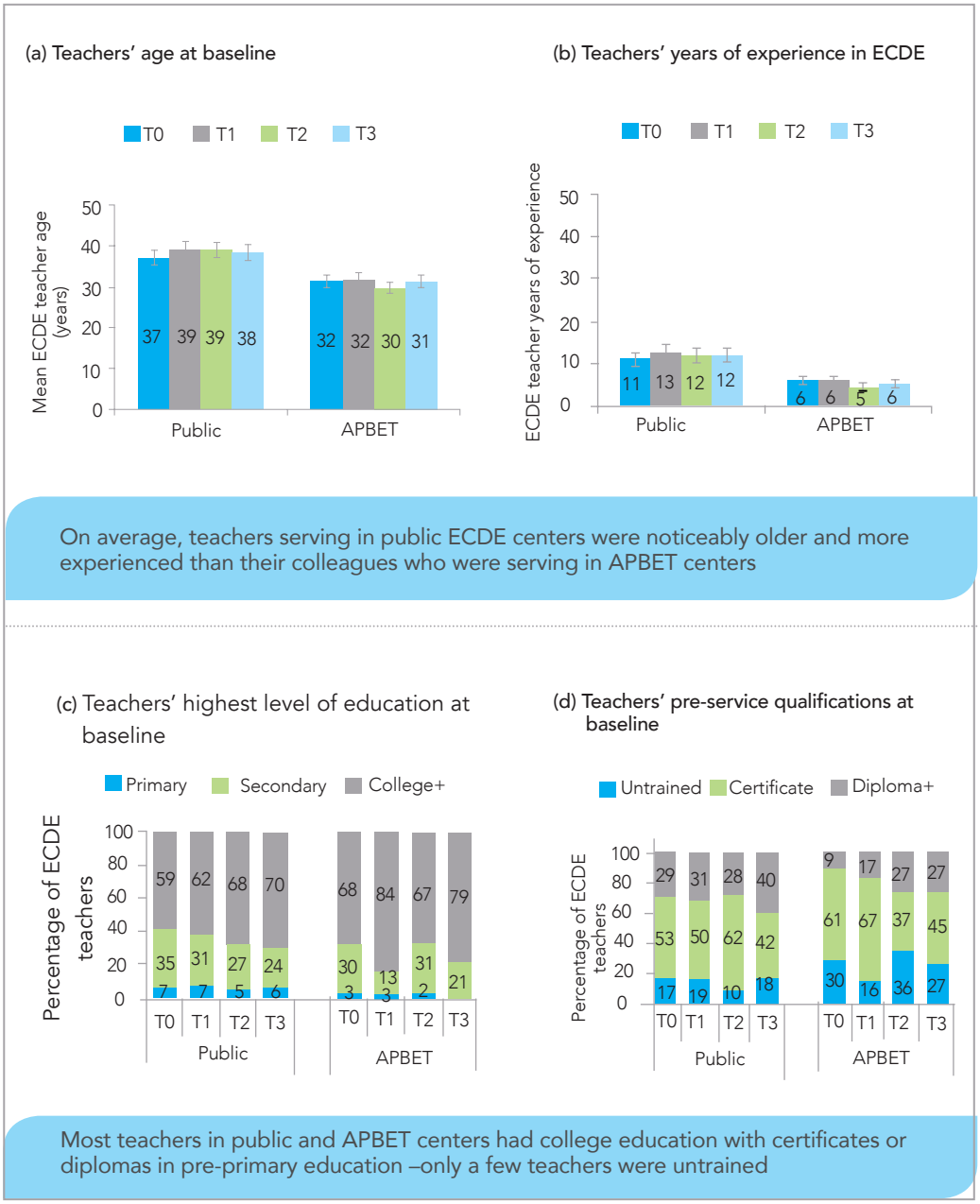
Baseline results of teacher age, years of experience teaching in ECDE institutions, highest level of education attained and pre-service training are shown in Figure 2.3. The key points regarding these results are summarized in the next paragraphs.

Teacher age and experience: In general, within each ECDE center category, results show existence of baseline balance in teacher age and teacher years of experience. However, on average, teachers serving in public ECDE centers were noticeably older and more experienced than their colleagues who were serving in APBET centers – perhaps because teachers in APBET schools are generally employed on temporary contracts resulting into high teacher turnover rates.

Teacher education and qualification: Irrespective of ECDE center category or study group, a vast majority of teachers had a college or university education (59-70% for public and 67-84% for APBET). On the other hand, a vast majority of the teachers in public and APBET centers had certificates or diplomas in pre-primary education – meaning that only a few teachers were untrained.

However, in terms of baseline balance, a noticeably lower proportion of teachers in public schools had a college or university education in the control group (59%) than in the T2 (68%) or T3 (70%) groups. Likewise, for APBET centers, the percentage of teachers with at least a college education was noticeably lower in the control group (68%) than in the T1 (84%) or T3 (79%) groups. In terms of pre-service training, the percentage of untrained teachers in the public control group (17%) was markedly higher than the corresponding percentage in the T2 group (10%)In APBET schools, the percentage of untrained teachers in control schools (30%) was much higher than in the T1 schools (16%).

Figure 2.3: Teacher age, experience, education and pre-service training at baseline



Overall, teacher academic and professional qualifications could be a potential source of differences in the impact of the intervention as we did not find baseline balance between the control and treatment groups. However, our analytical approach adjusts for this possible source of bias.

2.3 Teacher possession of teaching documents and health records

The percentages of teachers who had key teaching documents (learner progress records, schemes of work, record of work, and lesson plans) and learner health records at baseline and endline are presented in Figure 2.4.

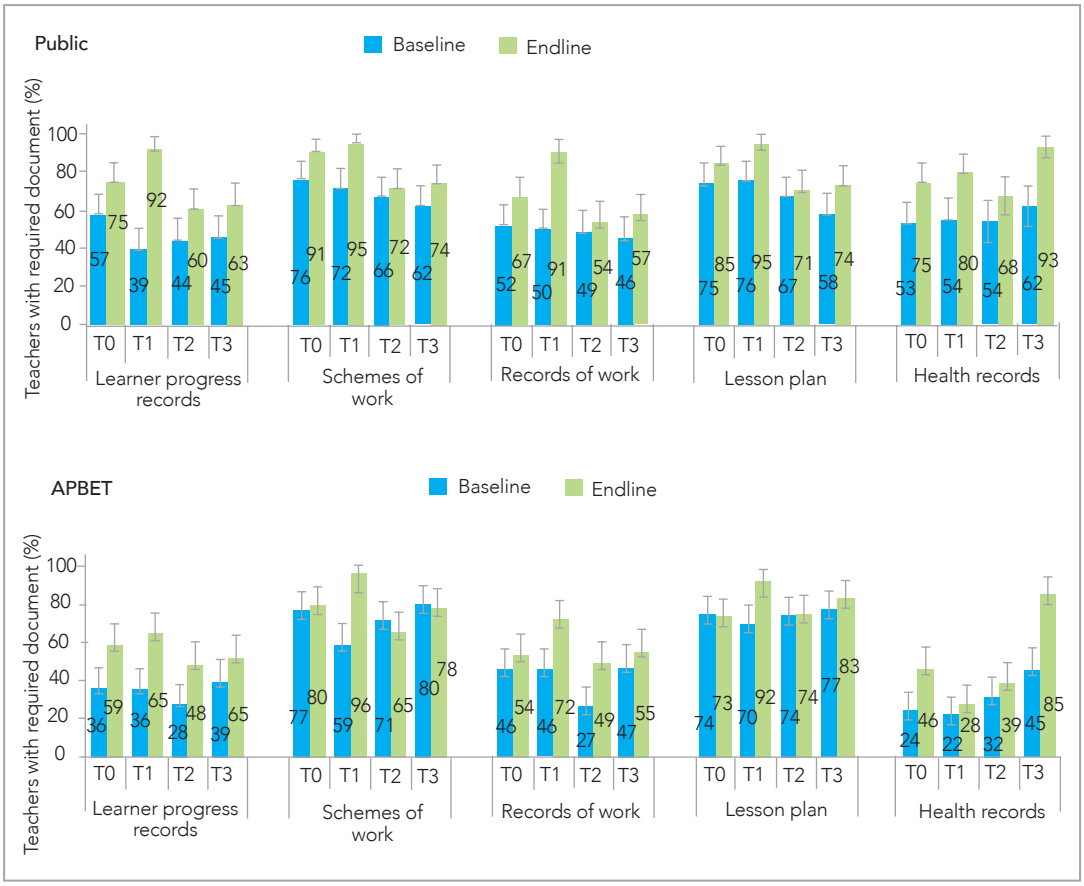
In general, the results show that the distribution of these documents and records were about the same across control and treatment groups for both categories of ECDE centers at baseline. Although not of any statistical significance, in public centers, learner progress records were notably more among teachers in control schools (57%) than among teachers in T1 schools (39%), while lesson plans were more in the control schools (75%) than in the T3 schools (58%). Likewise, in APBET centers, schemes of work were markedly more in the control schools (77%) than in the T1 schools (59%), records of work were more in the control schools (46%) than in the T2 schools (27%), and health records were less in the control schools (24%) than in the T3 schools (45%). Importantly, none of these differences were of any statistical significance indicating existence of baseline balance in the distribution of these documents.

In terms of changes, results show that the availability of these documents and records increased markedly between baseline and endline, regardless of ECDE center category, and regardless of whether the teachers were in control or treatment schools. For teachers in the treatment schools, the observed large increase in health records among teachers in T3 schools was expected because the Tayari model encouraged teachers to keep these records. An increase in the availability of health records in T3 (especially in public centers) is consistent with the increase in learners' attendance at endline.

It is also important to note that baseline data were collected at the beginning of the school year (in January/February) – a time when many teachers are often still settling into the new academic year and are thus unlikely to have some of these documents and records (e.g. learner progress records). On the other hand, endline data were collected towards the end of school year – a time when teachers are well into the academic year and are therefore likely to have these documents.

Learning materials in an ECDE classroom – Nairobi, APBET

Figure 2.4: Teacher possession of teaching and health records

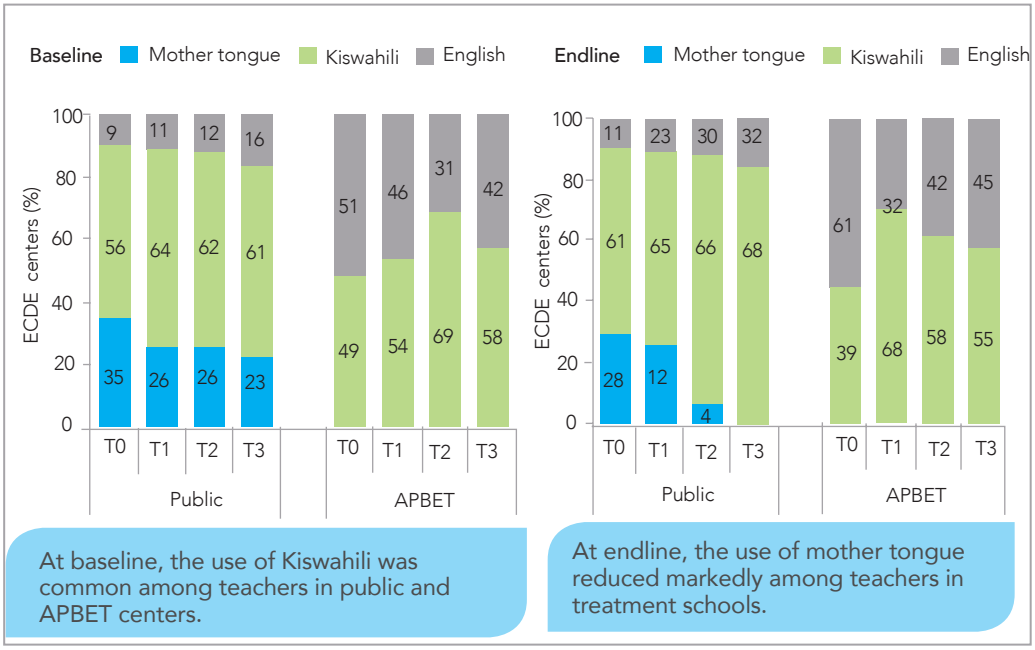


2.4 Language of instruction

The percentages of teachers who reported the use of mother tongue, Kiswahili, or English as their main language of instruction in the classroom are displayed in Figure 2.5.

Regardless of treatment group, more than half of the teachers in public centers reported the use of Kiswahili (56-64%) with the remainder reporting the use of mother tongue or English as the language of instruction at baseline. The use of Kiswahili was also common among teachers in APBET centers, and so was the use of English. However, in APBET centers, no teacher reported using mother tongue – and this should be expected given that APBET teachers in urban areas (Nairobi) teach learners with different first languages. At endline, the use of mother tongue reduced markedly among teachers in treatment schools with teachers preferring to use English and Kiswahili instead. These changes could have been driven by the Tayari program as the instructional materials are in English, and delivery would be easier in English - with alternate switching to Kiswahili.

Figure 2.5: Language of instruction



2.5 Class size and multigrade teaching

For both categories of ECDE centers, the mean class size in the control schools did not differ much from the mean class sizes in treatment schools (Figure 2.6). In addition, there were insignificant changes in mean class size in each group between baseline and endline. Likewise, for public centers, the percentages of teachers practicing multigrade teaching in control schools did not significantly differ from the corresponding percentages in treatment schools (Figure 2.7). However, for APBET centers, multigrade teaching was notably more common among teachers in T2 schools (37.2%) than among their counterparts in control schools (17.6%). In general, multigrade teaching was slightly more common among public centers than in APBET centers. Changes in multigrade teaching between baseline and endline were negligible regardless of ECDE center type or study group.

Figure 2.6: Mean class size at baseline and endline

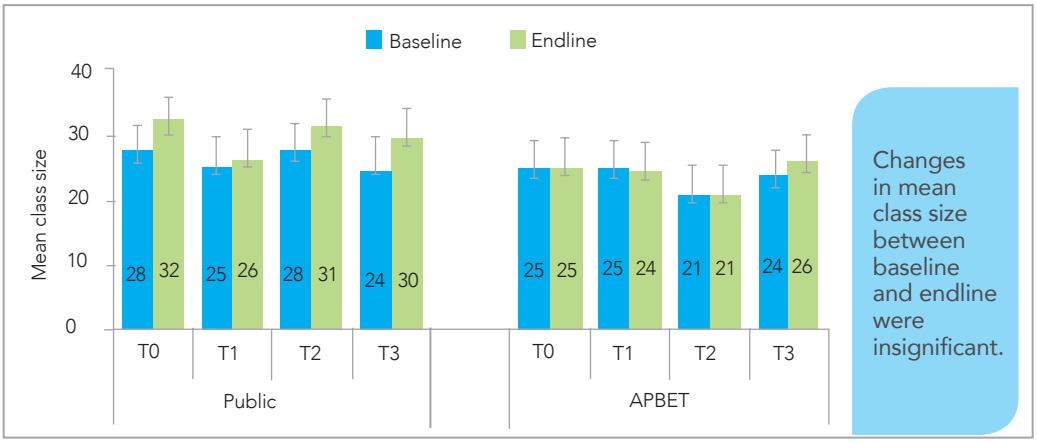
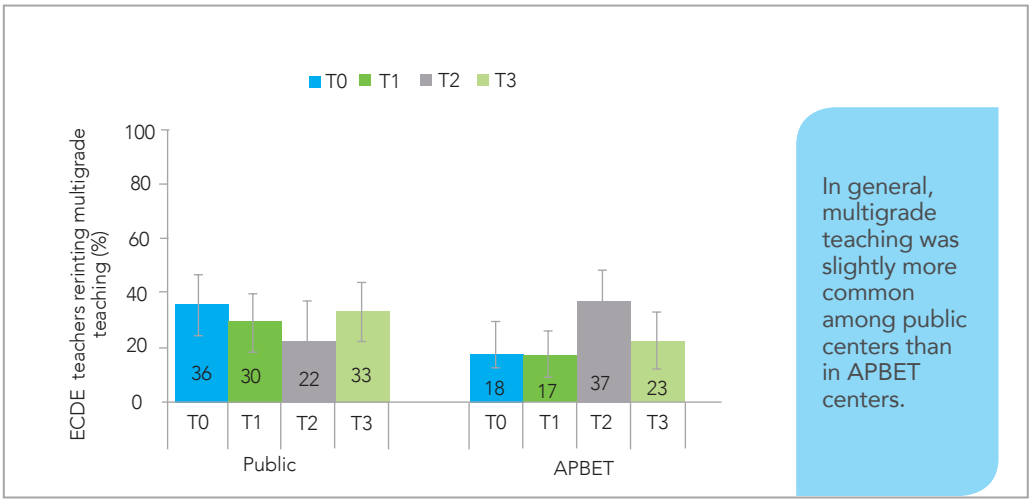


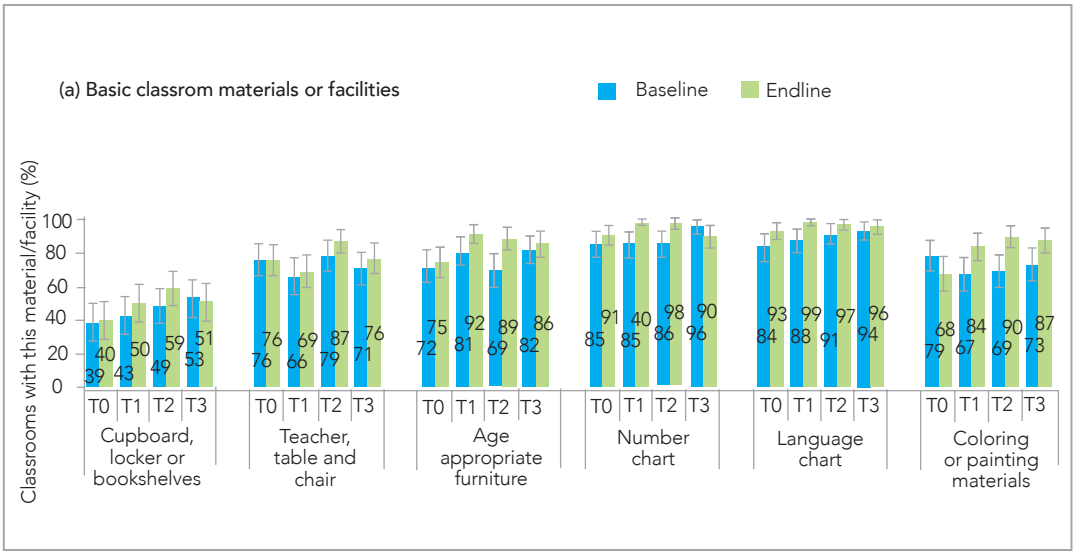
Figure 2.7: Percentages of ECDE teachers reporting multigrade teaching at baseline



2.6 Classroom teaching,learning materials and facilities

The percentages of classrooms with various teaching and learning materials at baseline and endline are depicted in Figure 2.8 and Figure 2.9 for public and APBET centers, respectively. Except in very few instances, the percentages of these materials in control and treatment schools did not differ much. In addition, the levels of these materials generally increased between baseline and endline, and more so big books (books printed in A3 or larger type of paper) in T2 and T3 schools. However, the significant increase in the levels of big books was expected because Tayari implementation supplied T2 and T3 schools with big books.

Figure 2.8: Teaching and learning materials in public ECDE centers



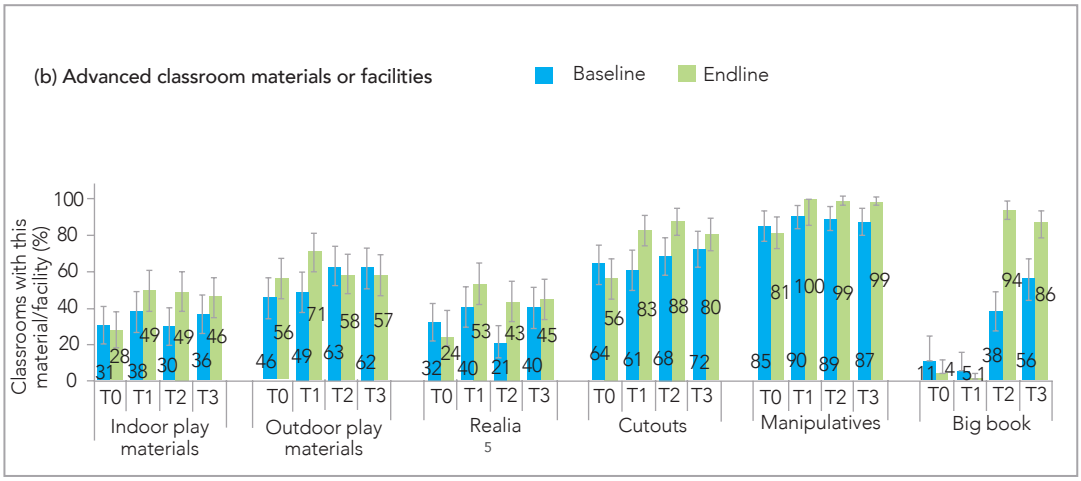


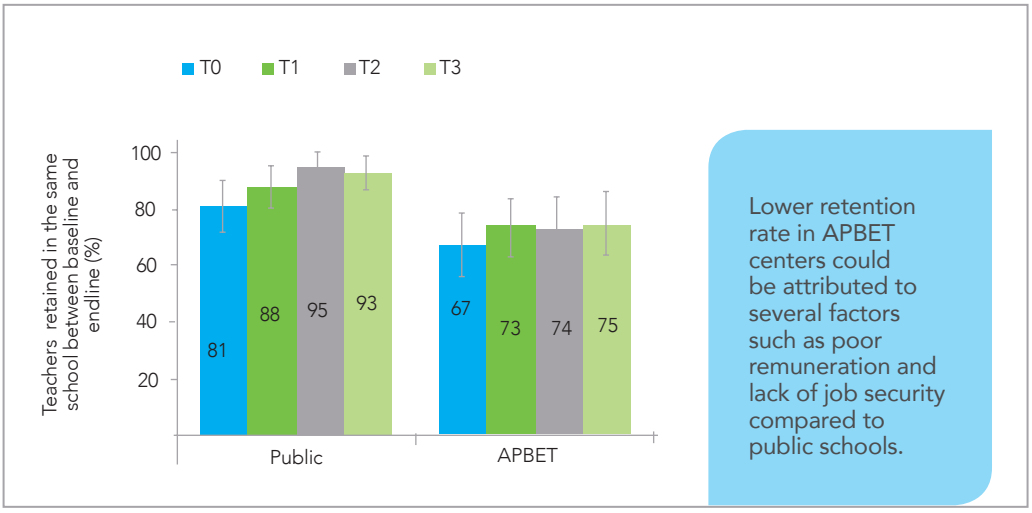
Figure 2.9: Teaching and learning materials in APBET ECDE centers

[5]Realia refers to real objects

2.7 Teachers retained in the same school

The percentages of teachers retained in the same schools in 2017 (between Wave 3 and Wave 4) are displayed in Figure 2.10. Retention of teachers in 2017 across treatment groups ranged from about 81% to 95% in public centers, and from about 67% to 74% in APBET centers. For both public and APBET centers, retention rates in the control group were lower than in the treatment groups but the differences were not statistically significant. It could be that the training received through the Tayari program is an incentive for teachers to remain in their schools, as it promotes their professional development. Overall, the rate of retention was higher in public than in APBET centers. The lower retention rate in APBET centers could be attributed to several factors such as poor remuneration and lack of job security when compared to public schools.

Figure 2.10 : Teacher retention between Wave 3 and Wave 4



2.8 Characteristics of head-teachers and their schools

The percentages of ECDE head teachers who reported having attended school management training are displayed in the first panel of Figure 2.11, and their years of experience as a teacher are displayed in the second panel. The first panel of Figure 2.12 displays the percentage of ECDE centers with working electricity (either main or solar), and the second panel displays the percentages of centers with "clean" water (whether piped, well, or borehole). The percentage of ECDE centers attached to a primary school (as oppose to standalone centers) are shown in Figure 2.13 .

In general, within each ECDE center category and evaluation group, the results show existence of baseline balance in head teacher management training, head teacher years of experience, and provision of working electricity and clean water in their schools. In addition, results show that a vast majority of the ECDE centers were attached to primary schools; which was expected because the government has been encouraging primary schools to establish ECDE centers.

Figure 2.11: Head teacher selected characteristics at baseline

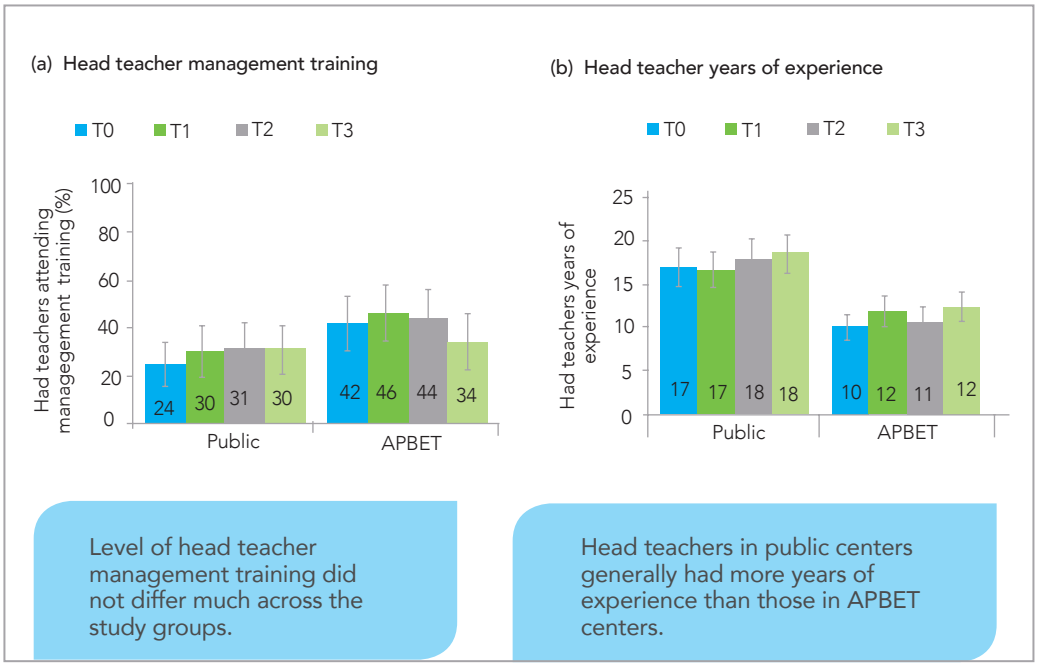


Figure 2.12: Electricity supply and provision of water at baseline

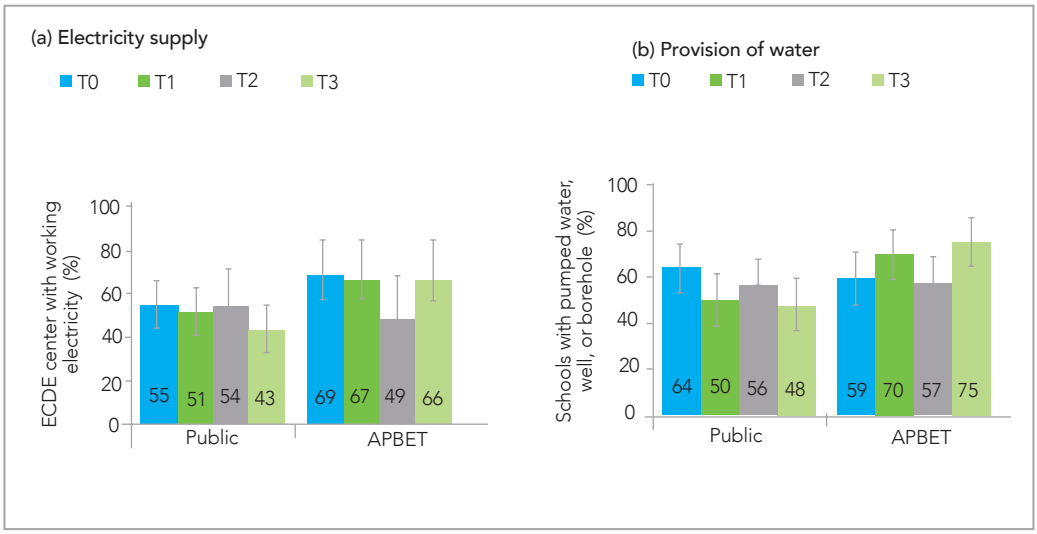
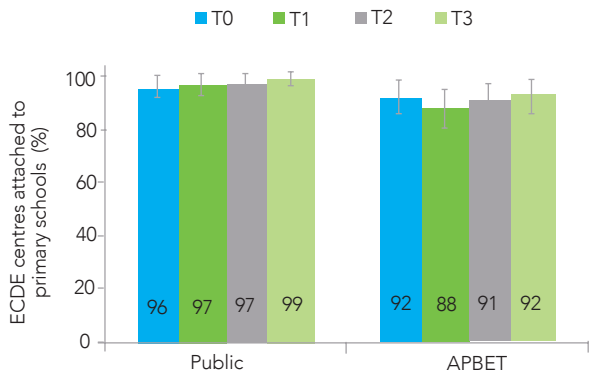


Figure 2.13: Percentages of ECDE centers attached to primary schools



A vast majority of the ECDE centers were attached to primary schools. This was expected given that the government has been encouraging primary schools to establish ECDE centers.

2.9 School facilities

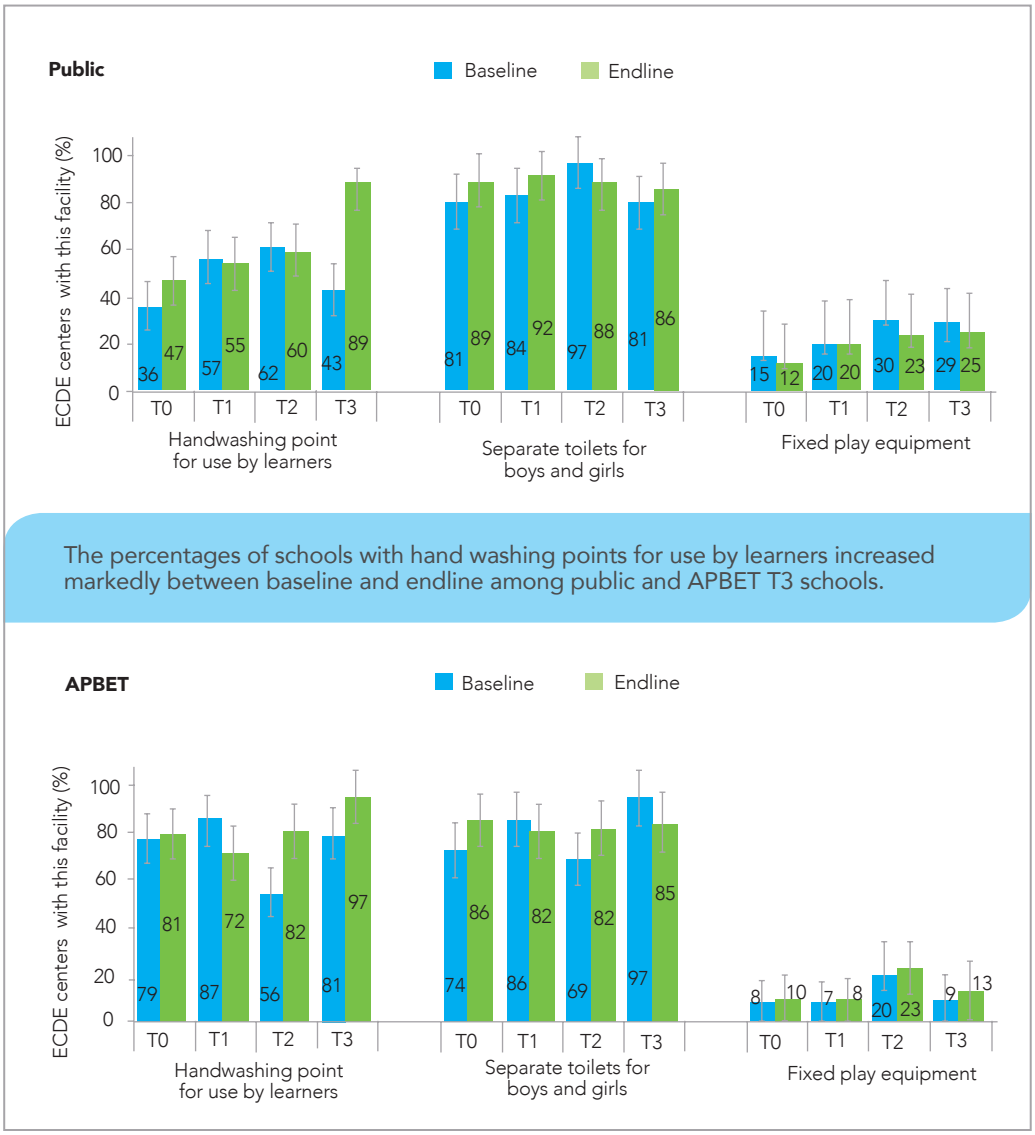
The percentages of ECDE centers with handwashing points for use by learners, separate toilets for boys and girls, and fixed play equipment (such as swings and slides) at baseline and endline are shown in Figure 2.14 for public and APBET centers.

The percentages of schools with handwashing points increased markedly between baseline and endline among public and APBET T3 schools. This finding was expected because Tayari implementation encouraged T3 schools to establish handwashing points for use by learners. However, it was unclear why there was a sharp increase in these handwashing points among APBET T2 schools from 56 to 82 percent.

In addition, a vast majority of the ECDE centers had separate toilets for boys and girls both at baseline and at endline. However, at baseline, levels of separate toilets were much higher in public T2 schools (97%) than in control schools (81%), and in APBET T3 schools (96%) than in control schools (74%). Moreover, the percentages of fixed play equipment were generally low at both baseline and endline – and more so among APBET schools.

Posters in an ECDE classroom

Figure 2.14 : Percentages of ECDE centers with various school facilities



The percentages of schools with hand washing points for use by learners increased markedly between baseline and endline among public and APBET T3 schools.

Learner-enumerator rapport session before one-on-one direct assessment

3.0 Impact of Tayari on learner achievement

This chapter focuses on the endline impact of the three Tayari treatment packages on learners' achievement scores that were derived from the direct assessment tool. The results cover:

- The learners' scores on the overall Tayari school readiness index (TSRI).
- The learners' scores on the three main learning domains of interest in this study (i.e. executive function, literacy, and numeracy).
- The learners' scores on the five literacy sub-domains (i.e. rhymes, letter naming, letter sounds, initial sound discrimination, and listening comprehension).
- The scores in numeracy sub-domains (i.e. shape identification, quantity discrimination, addition and subtraction , measurement vocabulary, number naming, producing sets, and mental tasks).

For each ECDE center type (public versus APBET), comparisons are made between the respective control group and each of the three respective treatment groups. For the overall TSRI, comparisons are also made within each learner sex group in each of the control group and the three treatment groups.

As mentioned in Section 1.5, Phase 1 schools were exposed to the intervention for two years while Phase 2 schools were for one year. Hence, in order to examine the effects of duration of exposure to Tayari treatment, reporting in this chapter focuses on three datasets - all collected in 2017.

The first dataset involves all the ECDE centers participating in this study – specifically, data collected in 2017 from Phase 1 and Phase 2 schools combined. The second set involves Phase 1 schools only – that is, data collected in 2017 from the centers that were included in the study for the first time in 2016. The third set involves Phase 2 schools only, which are the centers that were included in the study for the first time in 2017.

3.1 Effects of the intervention packages on school readiness

Effect sizes for the three Tayari treatment groups (T1, T2 & T3) are displayed in Table 3.1 (and also depicted in Figure 3.1) for the overall TSRI scores (the measure for school readiness) for schools in the three datasets (Phase 1, Phase 2 & Combined) by ECDE categories (public versus APBET). Box 3.1 provides information on how to interpret effect sizes in terms of what percentages of schools exposed to Tayari outperformed an average school in the control group - this follows Coe (2002) interpretation of standardized effect sizes.

Impact in public ECDE centers: Combined data for Phases 1 and 2 public ECDE centers shows that each treatment component had a moderate and positive impact on school readiness. The corresponding average standardised effect size for T1 (teacher training and classroom support) was 0.30, while those for T2 (T1 plus the addition of instructional materials) and T3 (the addition of health and hygiene knowledge) were 0.34 and 0.31 respectively. This means that each the Tayari pilot intervention regardless of time exposure (either 1 or 2 years) improved mean school readiness scores in public centers. For instance, an effect size of about 0.30 implies that at least 62% of the schools exposed to the Tayari intervention outperformed an average school that was not exposed to the intervention (see Table 3.1).

Box 3.1: Information on how to interpret effect sizes in terms of what percentages of schools exposed to Tayari outperformed an average school in the control group.

Impact in APBET centers:

Combined data for Phases 1 and 2 APBET ECDE centers shows a negligible impact on the mean school readiness scores for T1 treatment with a standardised effect size of .08.[7] However, the other two treatment packages showed positive moderate to large impact on school readiness in APBET centers. The overall effect size for T2 was 0.52 and 0.42 for T3. At least 69% of T2 schools and 66% of T3 schools outperformed the average school in the APBET control group.

Impact in public versus impact in APBET:

In general, for Phase 1 and 2 schools within the same treatment package, the Tayari interventions had larger impacts in APBET centers when compared to those in public centers – with the exception of T1 schools where the opposite was observed. For example, when considering data pooled together for T2 centers, 63% of the public centers had higher scores than an average control center; while the same was observed in 70% of the APBET centers.

Overall impact in public and APBET centers:

The third panel of Table 3.1 presents the average effects of the treatment packages after combining data from public and APBET centers (also depicted in Figure 3.1). Though this was not part of the evaluation design, of the results are instructive both for practical and statistical reasons. The overall standardised effect sizes for T1, T2, and T3 were 0.25, 0.37 and 0.36 respectively; all statistically significant at 5% level This means that at least 60% of schools in the treatment groups scored higher on the school readiness index than the average school in the control groups.

[7]This is very surprising as initial impact (at midterm) had shown some potential impact. One possible explanation to this negligible effect could be the reaction of T1 centers after missing out on instructional materials (T2). There may be other plausible explanations that could be provided by the implementation including administrative decisions by the centers to adhere to the Tayari protocol.

Table 3.1: Treatment effects on school readiness by school phase

		Combined			Phase 1			Phase 2	
		# Schools	ES		# Schools	ES		# Schools	ES
Public schools	T1	150	0.30	*	77	0.07	73	0.50	**
	T2	153	0.34	**	78	0.13	75	0.57	**
	T3	150	0.31	*	77	0.23	73	0.38	
APBET schools	T1	150	0.08		74	0.13	76	0.02	***
	T2	147	0.52	***	73	0.27	74	0.78	***
	T3	139	0.42	**	70	0.20	69	0.68	
Public & APBET schools	T1	300	0.25	**	151	0.09	149	0.40	**
	T2	300	0.37	***	151	0.14	149	0.61	***
	T3	289	0.36	***	147	0.24	142	0.46	***

Notes: * Significant at 10%; ** Significant at 5%; *** Significant at 1%; ES= Effect size; Phase 1 = Data collected in 2017 from schools included in the study for the first time in 2016; Phase 2 = Data collected in 2017 from schools included in the study for the first time in 2017; Combined = Combined data data collected in 2017 from Phase 1 and Phase 2 schools; Public = Data collected from Public schools; APBET = Data collected from APBET schools – with a focus on low-cost private schools; and Public & APBET = Data collected from Public schools and APBET schools pooled together.

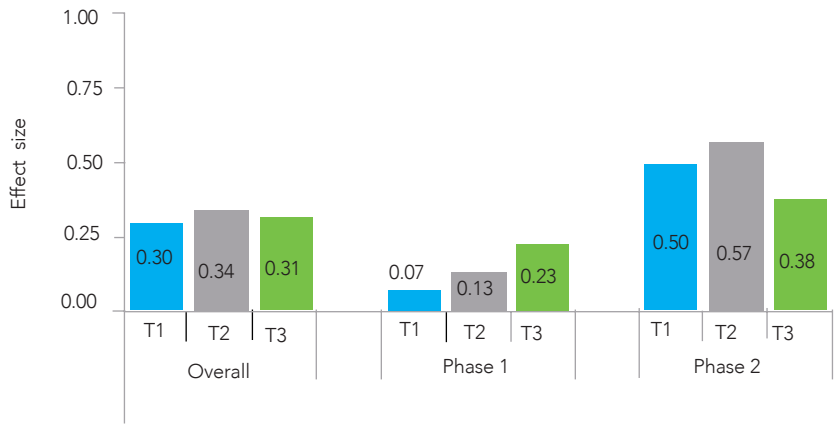
Box 3.2: Effect sizes and the minimum percentages of schools in the treatment group scoring higher than an average school in the control group

ES	%	ES	%	ES	%	ES	%
0.01	50.4	0.21	58.3	0.41	65.9	0.61	72.9
0.02	50.8	0.22	58.7	0.42	66.3	0.62	73.2
0.03	51.2	0.23	59.1	0.43	66.6	0.63	73.6
0.04	51.6	0.24	59.5	0.44	67.0	0.64	74.9
0.05	52.0	0.25	59.9	0.45	67.4	0.65	74.2
0.06	52.4	0.26	60.3	0.46	67.7	0.66	74.5
0.07	52.8	0.27	60.6	0.47	68.1	0.67	74.9
0.08	53.2	0.28	61.0	0.48	68.4	0.68	75.2
0.09	53.6	0.29	61.4	0.49	68.8	0.69	75.5
0.10	54.0	0.30	61.8	0.50	69.1	0.70	75.8
0.11	54.4	0.31	62.2	0.51	69.5	0.71	76.1
0.12	54.8	0.32	62.6	0.52	69.8	0.72	76.4
0.13	55.2	0.33	62.9	0.53	70.2	0.73	76.7
0.14	55.6	0.34	63.3	0.54	70.5	0.74	77.0
0.15	56.0	0.35	63.7	0.55	70.9	0.75	77.3
0.16	56.4	0.36	64.1	0.56	71.2	0.76	77.6
0.17	56.7	0.37	64.4	0.57	71.6	0.77	77.9
0.18	57.1	0.38	64.8	0.58	71.9	0.78	78.2
0.19	57.5	0.39	65.2	0.59	72.2	0.79	78.5
0.20	57.9	0.40	65.5	0.60	72.6	0.80	78.8

Example:
An ES of 0.30 implies that at least 61.8% of the schools in the treatment group outperformed the average school in the control group, while and ES of 0.50 implies that at least 69.1% of the schools in the treatment group outperformed the average in the control group.

Figure 3.1: Treatment effects on school readiness by school phase

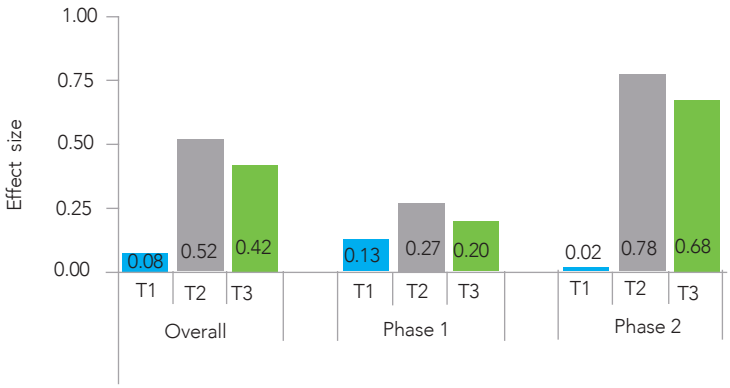
(a) Public schools only

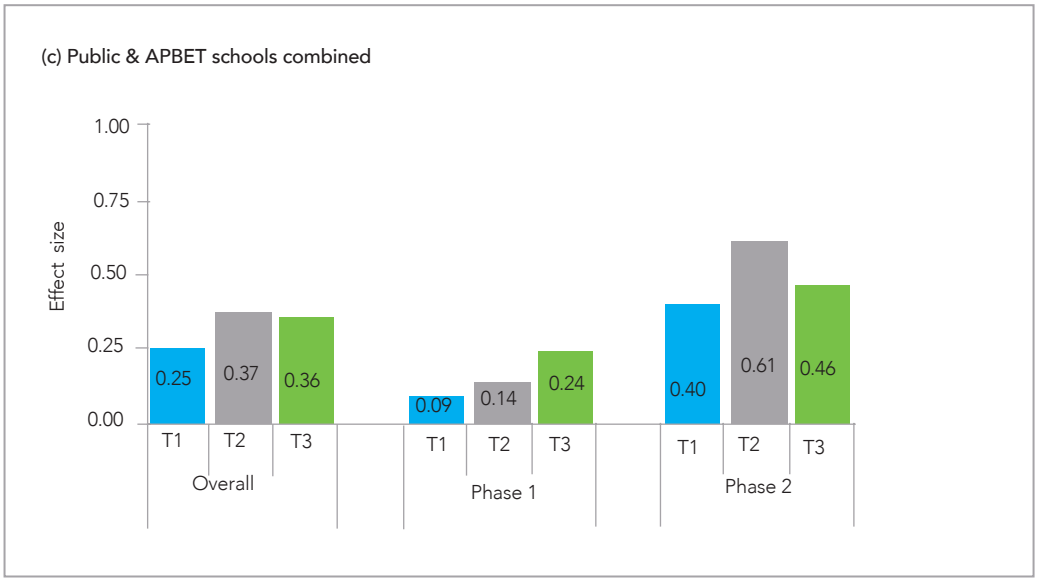


The positive effect sizes mean that, in general, the three Tayari treatment packages were useful in enhancing school readiness in both public and APBET centers:

- Effect size was higher in schools receiving packages that included both classroom instruction model and provision of learning materials (i.e.T2 & T3) than in schools receiving the classroom instruction model but without provision of learning material (T1).
- Higher in Phase 2 schools than in Phase 1 schools.
- Higher in APBET schools than in public schools.

(b) APBET schools only





Note: An effect size of 0.57 implies that at least 72% of the Phase 2 public T2 schools outperformed an average center that was not exposed to the intervention – this follows Coe (2002) interpretation of standardised effect sizes.

Impact of the health component:

Overall, the impact of the T3 package – which includes T2 plus a health component - was lower than that of the T2 package especially in APBET centers. The expectation was that the health component would have additional advantage in improving mean school readiness scores. The Tayari theory of change stipulated that the health support to the ECDE centers would reduce incidences of illness among learners, which would in turn improve learners' school attendance (thus increasing the opportunity to learn), and consequently improve their learning achievement. Assuming that there was no implementation bias, it could be that the health component did not improve learners' school attendance in meaningful ways. Nevertheless, it is worth noting some studies have also found that health interventions do not necessarily have direct impact on learning scores in similar contexts in Kenya. For example, Miguel and Kremer (2004) found that a deworming program targeting primary school pupils in western Kenya resulted in an increase in attendance but the increased time in school did not significantly improve test scores.

Impact by duration of exposure:

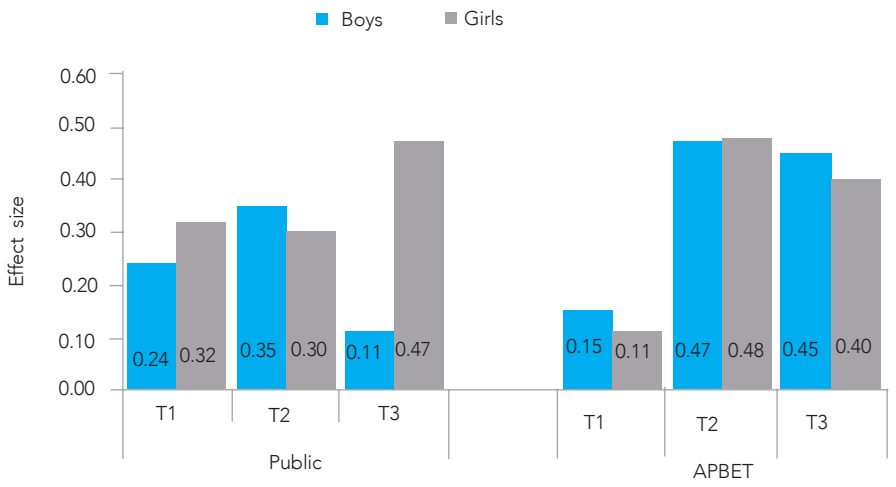
For both categories of ECDE centers, when the data were split by school phase, the effect sizes of the treatment packages were overwhelmingly not of any statistical significance in Phase 1 schools (this is very consistence with our midterm results) but a vast majority of the effect sizes were significant in the Phase 2 schools. In addition, the effect sizes of Phase 2 schools were generally larger than those of Phase 1 schools – meaning that Tayari intervention had much greater impact in Phase 2 centers than in Phase 1 centers. For Phase 2 in public centers, at least 69% and 72% of the centers in T1 and T2 respectively, scored higher than the average centers in Phase 2 control group; while in APBET, about 78% and 75% of centers in T2 and T3 respectively, scored higher than the average centers in the control group.

Although statistical significance cannot be emphasized after splitting data because the sample size is reduced, these findings contradict the hypothesis that a longer exposure to the Tayari treatment packages would have added advantage in terms of enhancing school readiness. It might be that Phase 2 schools had the advantage of hearing about the good practices of Tayari long before they received it and/or being exposed to improved Tayari model following a one-year piloting of the model in Phase 1 schools; alternatively, it may be that Phase 1 schools experienced a 'culture shift' due to the change in instructional delivery and are slowly coming out of it.

Impact by learner sex:

Effect sizes for the overall TSRI scores for the combined data (i.e. Phase 1 and Phase 2 centers pooled together) disaggregated by learner sex are depicted in Figure 3.2. For APBET centers, within the same treatment package, the effect sizes for boys did not differ much from those for girls. However, in public centers, the intervention seem to have greater impact among girls than among boys, especially in T1 (0.24 for boys versus 0.32 for girls) and T3 (0.11 for boys versus 0.47 for girls). For public T3, it could be that the health component – which among other things involved encouraging healthy behaviours among learners such as washing of hands before eating or after visiting the toilet – was better adhered to by girls than boys.

Figure 3.2: Treatment effects on school readiness - Phases 1 and 2 combined



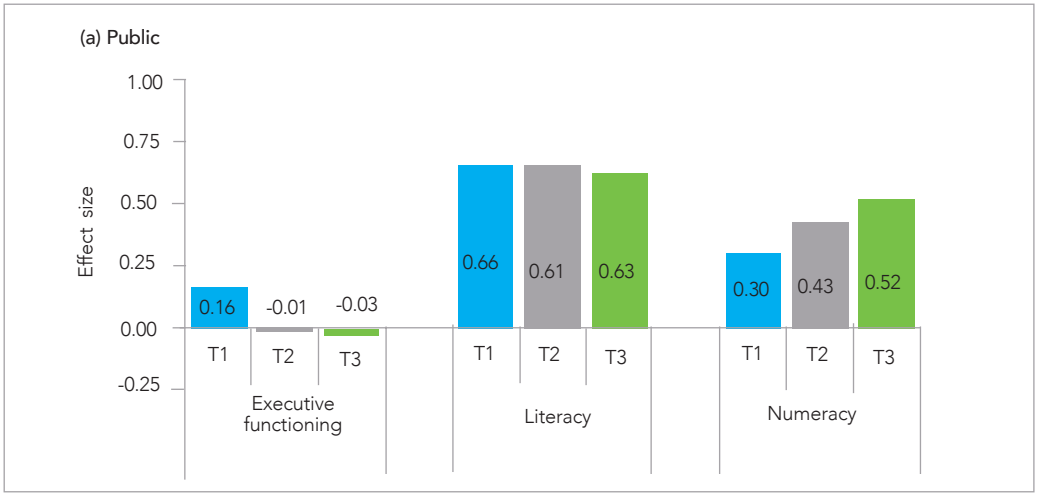
In public centers, the intervention had more impact among girls than among boys, especially in T1 and T3. However, the intervention did not impact differently by learner sex in APBET centers.

3.2 Effects of the intervention on main learning domains

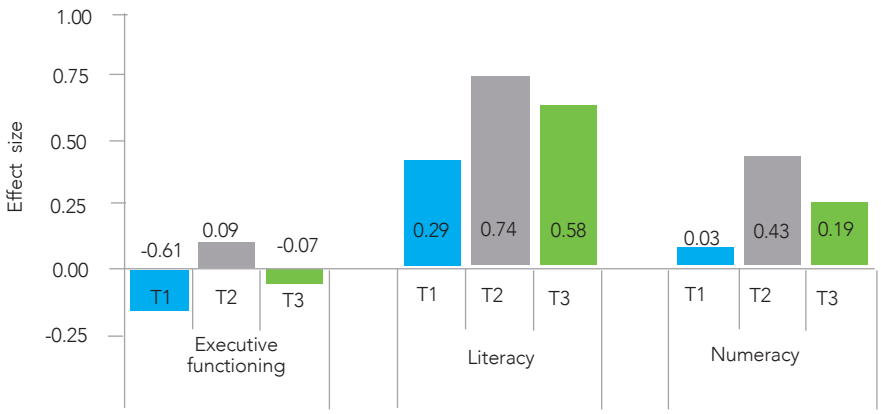
The effect sizes for sub-test scores as defined by the three main learning domains of interest in this study (i.e. executive function, literacy and numeracy) are depicted in Figure 3.3. The results of the literacy and the numeracy sub-domains are depicted in Figures 3.4 and 3.5, respectively. Effect on main domains: With only a few exceptions, each of the three treatment packages was associated with moderate to large effect sizes for literacy and numeracy scores, but with mostly trivial effects sizes for executive function scores for both types of ECDE centers (Figure 3.3). It is possible that teachers concentrated more on developing the literacy and numeracy skills among learners with little attention to executive functioning – for many teachers, "learning" is normally interpreted to mean working on literacy and numeracy tasks. In addition, the packages seem to have more impact on literacy scores than on numeracy scores.

Above: More examples of Tayari instructional materials developed with support from RTI International

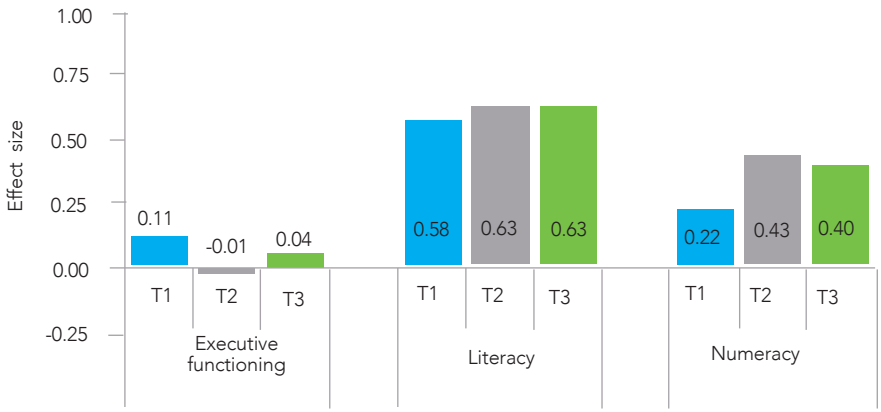
Figure 3.3: Treatment effect sizes on learning domains – Phases 1 and 2 combined



(b) APBET



(c) Public & APBET

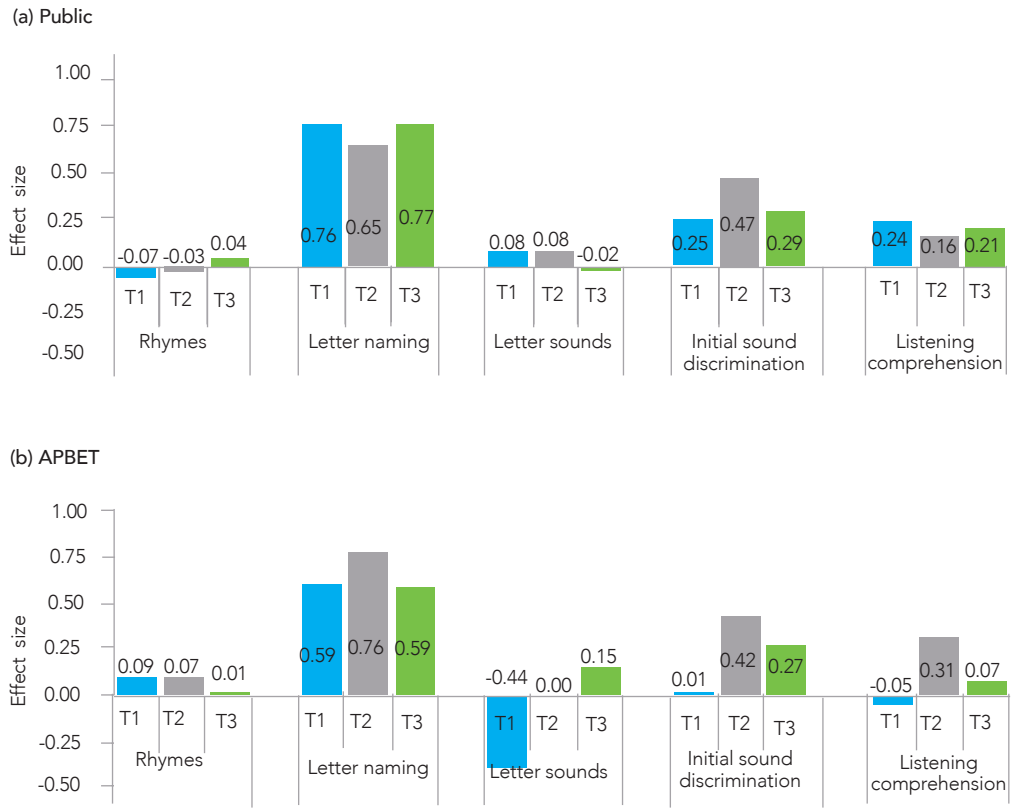


For both types of ECDE centers, the three treatment packages were generally effective in improving school mean scores in literacy and numeracy domains but not effective in improving scores in executive function domain.

Impact on specific literacy subdomains:

The intervention was very effective in improving school mean scores in letter naming (for all the three packages in both ECDE centers types), and to some extent effective in improving mean scores in specific literacy content areas of initial sound discrimination and listening comprehension, especially in public ECDE centers (Figure 3.4). However, the intervention was ineffective in improving school mean scores in content areas of letter sound and rhymes – and these are the areas that should be revisited during the scaling-up phase of the Tayari model. However, this not surprising because our spot checks after the midterm results showed that a considerable number of teachers in control schools were also conversant with skills for teaching letter sounds and rhyming words gained through various training programs.

Figure 3.4: Treatment effect sizes on literacy subdomains – Phases 1 and 2

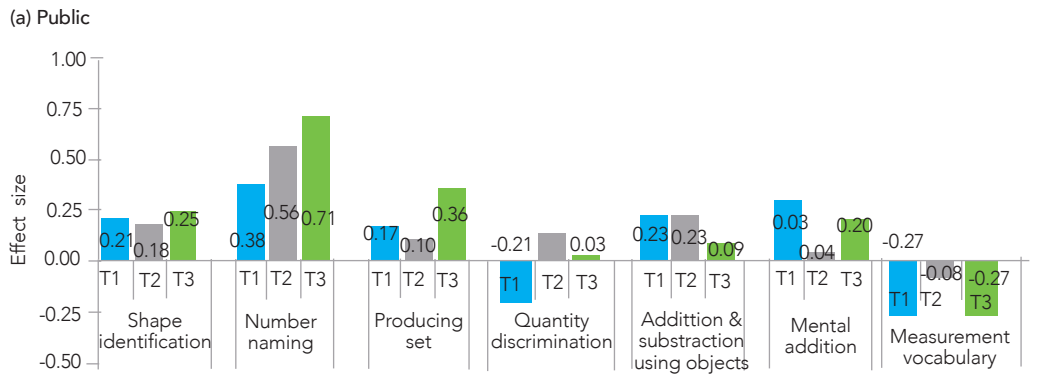


Tayari was very effective in improving scores in letter naming; somewhat effective in improving scores in initial sound discrimination and listening comprehension; but ineffective in improving scores in letter sounds and rhymes.

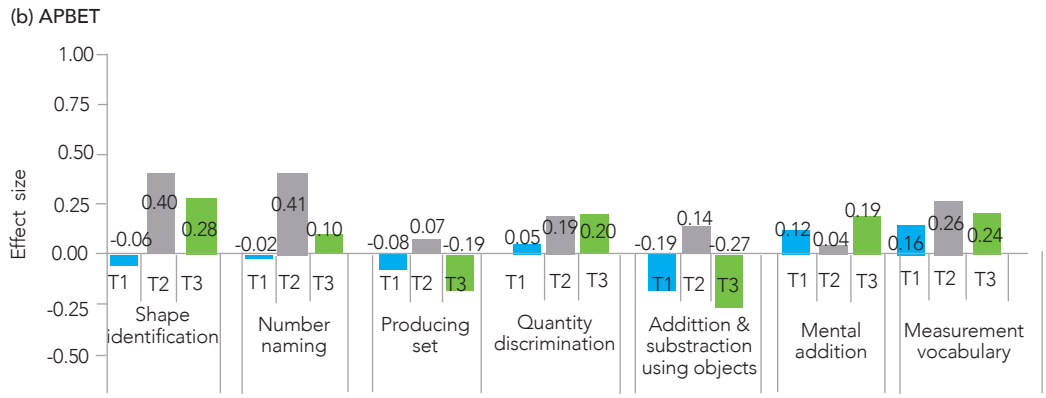
Impact on specific numeracy subdomains:

For public ECDE centers, Tayari was very effective in improving school mean scores in number naming (see Figure 3.5), and to some extent effective in improving scores in shape identification, producing sets, additional and subtraction using objects (though trivial impact for T3), and mental addition (though not for T2). On the other hand, in APBET ECDE centers, Tayari was effective in improving scores in measurement vocabulary, shape identification (though not for T1), quantity discrimination (but trivial for T1), and to a small extent effective in improving scores in number naming (but not for T1), and mental addition (but trivial for T2). However, the intervention was less effective in improving scores in measurement vocabulary and quantity discrimination in public centers, while in APBET centers, the intervention was less effective in content areas of addition and subtraction using objects, and producing sets.

Figure 3.5: Treatment effect sizes on numeracy subdomains – Phases 1 and 2



For public ECDE centers, Tayari was very effective in improving school mean scores in number naming, somewhat effective in improving scores in shape identification, producing sets, additional and subtraction using objects, and mental addition.



3.3 Tayari learning gains in months

The mean gain in TSRI scores between baseline (Wave 3) and endline (Wave 4) for schools in the control and treatment groups are shown in Table 3.2 based on the combined public and APBET dataset. On average, the learning gain for control schools was 5.98 TSRI scores over a one-year period. This translates to a learning gain of approximately 0.22 TSRI scores per week or about 0.89 TSRI scores per month. This is the estimated learning gain for learners attending schools without the Tayari intervention. This calculation assumes that one ECDE academic year is about 27 learning weeks, which also corresponds with the length of time Tayari instructional materials were developed to cover.

A DID value of 2.11 was observed for the T1 schools (Table 3.2). This implies that learners in T1 schools gained an additional 2.38 months of learning compared to their control school counterparts. On average, learners in T2 schools gained 3.5 months and those in T3 schools gained 3.4 months. Taken together, pupils exposed to Tayari model gained about three months when compared to their counterparts in control schools. A future area of research would be to measure if these learning gains will be sustained in later schooling years.

Table 3.2: Learning gains associated with Tayari, combined public and APBET data

Group	Number of schools	Gain in TSRI score*	DID (Tn-T0)	ES	# Learning months gained
Control (T0)	149	5.98	N/A	N/A 0.2	N/A
Treatment 1 (T1)	151	8.09	2.11	5 0.3	2.38
Treatment 2 (T2)	151	9.08	3.10	7 0.3	3.50
Treatment 3 (T3)	140	8.99	3.01	6 **0.3**	3.40
Overall treatment (T1+T2+T3 OOverall treatment	**442**	**8.73**	**2.75**	**3**	**3.11**

Notes: *Gain in TSRI scores between baseline (Wave 3) and endline (Wave 4); DID = Difference in difference (i.e. the difference between the gain in control and treatment group); Tn = Gain in TSRI score for respective treatment group, where n=1, 2, 3 OR all three treatments combined; and T0 = Gain in TSRI score for the control group.

4.0

Tayari Cost-effectiveness

This chapter provides answers to the cost-effectiveness of Tayari. Cost-effectiveness analyses focused on:

- Estimating the cost of the pre-primary school program for public and APBET schools in each treatment package.
- Investigating which activities are driving the cost (labor intensive or capital intensive).
- The incremental cost-effectiveness ratio (ICER) of each treatment package based on costs incurred at county level.

The costing exercise is done by looking at the incremental cost of adding ECDE packages into existing pre-primary school programs in Kenya.

4.1 Unit cost and incremental cost-effectiveness ratio

The unit cost (i.e. cost per learner) and cost-effectiveness ratio for the combined public and APBET data are displayed in Table 4.1.[8]

Table 4.1: Unit cost and incremental cost-effectiveness ratio

Group[1]	Total cost 2 (US$)	#Learners	DID (%)	Std'ized ES	Cost per learner (US$)	ICER 1*	ICER 2*
T1	181,647.50	21,443	2.11*	0.25*	8.47	4.01	3.39
T2	546,687.50	36,184	3.10**	0.37**	15.11	4.87	4.08
T3	284,320.57	14,652	3.01**	0.36**	19.40	6.45	5.39
Overall	1,012,655.57	72,279	2.75**	0.33**	14.01	5.09	4.25

Note: This is combined (public & APBET). 1 Treatment groups; 2 All costs are in USD; DID = Difference-in-Difference; Std'ized ES= Standardized effect size; ICER 1= Increment cost-effectiveness ratio based on DID score; and ICER 2= Increment cost-effectiveness ratio based on standardized effect size for 0.1 standard deviation; ** $p<0.01$; * $p<0.05$.

Based on public and APBET data combined the cost per pre-primary learner is US$8.47, $15.11, $19.40 for each of the interventions respectively and about $14 for combined interventions. This cost is over a two-year period (2016-2017). The results suggest that T1 is the most cost-effective treatment package since it has the lowest ICER based on ICER 1 and 2. In other words, for an additional expenditure of $4.01 over the period of two years using T1 package, policymakers could enhance the learners' scores in public ECDE centers by 1 percentage point (using the effect size, results indicate for a 0.1 standard deviation increase in the learners' scores, governments will spend on average US$3.39 over two years).

[8]The external evaluator's (APHRC) calculations are based on data provided by the implementer (RTI International) at the end of 2 years (2017) of implementation. See also Piper, B., Kwayumba, D., Oyanga, A., & Oyagi, M. (2018). The impact of the Tayari Early Childhood Development and Education programme using a three-phase longitudinal tracer study in Kenya. Prepared for the Children's Investment Fund Foundation. Research Triangle Park, NC: RTI International.

4.2 Comparison of Tayari costs with the costs of other relevant interventions

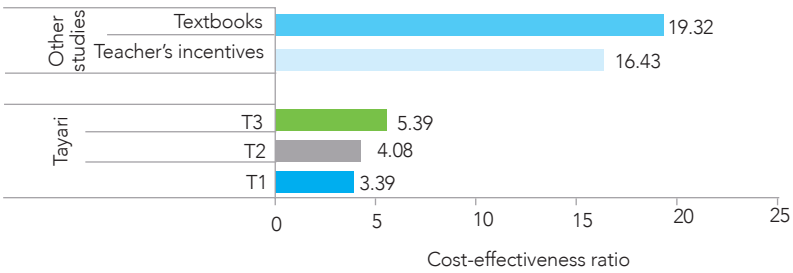
Table 4.2 provides a comparison of Tayari cost-effectiveness with other existing education interventions in Kenya. Tayari study has the lower ICER than the Busia study, after translating their ICER to our base year (2016) using the GDP deflator. From the ICER computations, the Tayari model could be scaled up, especially the T1 package. Policymakers could deliver it in a sustainable manner, and the value policymakers and communities get from this early childhood education program could be worth the resources that are put in to implement it (see also Figure 4.1).

Table 4.2: Comparison of costs between Tayari and other studies

Panel A: Unit cost and cost-effectiveness ratio for Tayari: Nairobi, Laikipia, Uasin Gishu and Siaya (2016-2017)			
Group	Std'ized ES	Unit cost	ICER
T1	0.25	8.47	3.39
T2	0.37	15.11	4.08
T3	0.36	19.40	5.39
Panel B:Unit cost cost-effectiveness ratio for existing educational studies in Kenya such as Kremer et al. (2004), Glewwe et al. (2003) - Busia county in Kenya (Intervention year 2001)			
Main intervention package	Std'ized ES	Unit cost	ICER
Teacher's incentives (in-kind prizes for high scores)	0.07	11.50[a]	16.43[a]
Textbooks	0.04	7.73[a]	19.32[a]

Note: ICER= Increment cost-effectiveness ratio (based on standardized effect size for 0.1 standard deviation), (a) and (b) under Panel B mean that the unit cost and cost-effectiveness ratio of other studies were adjusted to account for the inflation using the GDP deflator taken from the World Bank Development Indicator. The base year cost is 2016. The Busia study had scholarships, teacher incentives, textbooks, deworming, and the focus was children in upper primary school grades.

Figure 4.1: Cost-effectiveness: Comparison of Tayari's ICER 2 with other studies



Tayari treatment packages were more cost-effective when compared to other interventions in Kenya.

5.0 Classroom practices

Overall, the teacher training and classroom instructional support package (T1) had a greater impact on school readiness and was more cost effective than the other two packages. Classroom based support meant that an instructional coach/mentor/curriculum support officer regularly observes the ECDE teacher during a lesson and provides prompt feedback for continuous improvement.

Classroom observations

Teacher focus during numeracy and literacy lessons

- **Literacy:** In both Waves 3 and 4 of data collection (conducted in 2017), the teacher's focus was predominantly on "whole class teaching", and it took more than half of the lesson time. However, the focus on whole class was differentiated by study group especially in Wave 4. In T0 and T1, the proportion of lesson time spent focusing on the whole class was lower than in T2 and T3.

- **Numeracy:** Focus on whole class was dominant. Among the public schools, there was minimal change in the proportion of lesson time spent by teacher focusing on whole class between Waves 3 and 4. Among APBETs T2 and T3, the time spent focusing on whole class significantly increased between Wave 3 and 4.

Teacher actions during numeracy and literacy lessons

Teacher actions were the activities undertaken by the teacher during a lesson. Under this item, the observation tool had 12 literacy items including monitoring learners while on-task, asking questions, reading and listening that emerged among the most dominant in both Waves 3 and 4. The 12 items were categorized into three areas; namely: (1) active academic activity (AAA), such as asking questions, reading and writing; (2) passive academic activity (PAA) such as monitoring learners; and (3) off-task (OT) including disruptive activities, teacher not in the room and teacher not focused. Below are some of the patterns that emerged:

- **Literacy:** In public schools, more time was spent on (AAA) in both waves. Between the two waves, we find increased time spent on AAA activities in T2 and T3, perhaps an indication of the emphasis made by Tayari on active teaching.

  A similar pattern was observed in APBET's T2 and T3 though with a much higher intensity with more time spent on active academic activities. At both time points and in both school types, there was less time spent on active academic activities in T0 and T1 groups, with a considerable amount of time spent on passive academic activities.

- **Numeracy:** Both AAA and PAA activities were evident during lesson times. Though AAA activities were dominant in numeracy lessons, they were not as dominant as they were in literacy lessons. A plausible explanation for the difference might be because numeracy lessons require learners to undertake individual deskwork while the teacher is monitoring; and monitoring is classified as a PAA activity if the teacher does not make any one-on-one interaction while moving around the room.

This is supported by the fact that individual deskwork was one of the dominant activities under student actions in numeracy. We also note that among the APBET, the proportion of time spent on AAA was significantly higher for T2 and T3 groups compared to the T0 group; while among the public schools, the differences are only significant when comparing T2 and T3 with T1. In both school types and study groups, at least 12% of the teacher actions related to off-task activities, and this is on the higher side.

Student actions

In both school types, the dominant student actions in literacy were listening/watching the teacher, answering questions and choral reading while in numeracy they were listening to the teacher and individual deskwork. These activities were classified as AAA and 90% of the student actions in literacy and numeracy were in this category. We observe an insignificant change between Wave 3 and 4 on the proportion of student actions classified as AAA.

6.0 Perspectives of ECDE stakeholders

Participants' knowledge of Tayari objectives and their relevance

Overall, the results show that ECDE teachers had a good knowledge of the program's objectives. The majority of teachers (85%) cited the "improving pupils' learning performance" objective and 73% cited "improving teachers' performance" as an objective.. However, the objective of 'improving pupils school readiness' was cited by only 42% of respondents. Similarly, there was unanimity among ECDE teachers on the relevance of Tayari in view of the ECDE challenges in the targeted areas. Tayari was found innovative by most of the stakeholders interviewed. Specifically, they cited innovations such as the use of locally available resources; better instructional methods; a child-centered approach to learning; and a supportive supervision.

Figure 6.1: Knowledge of Tayari objectives among ECDE teachers

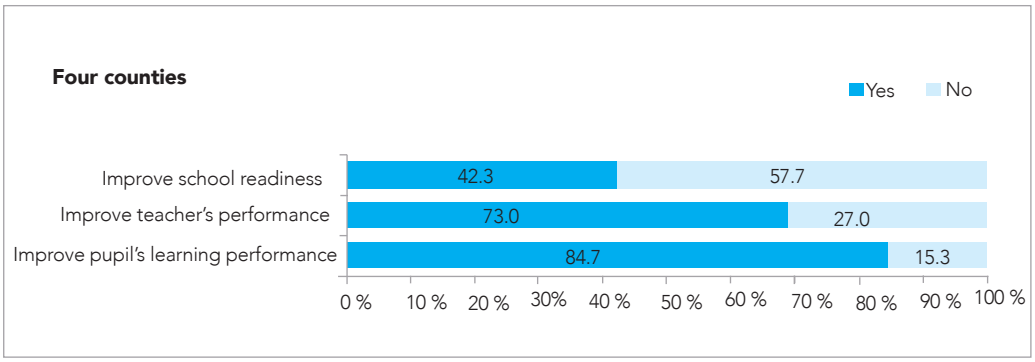
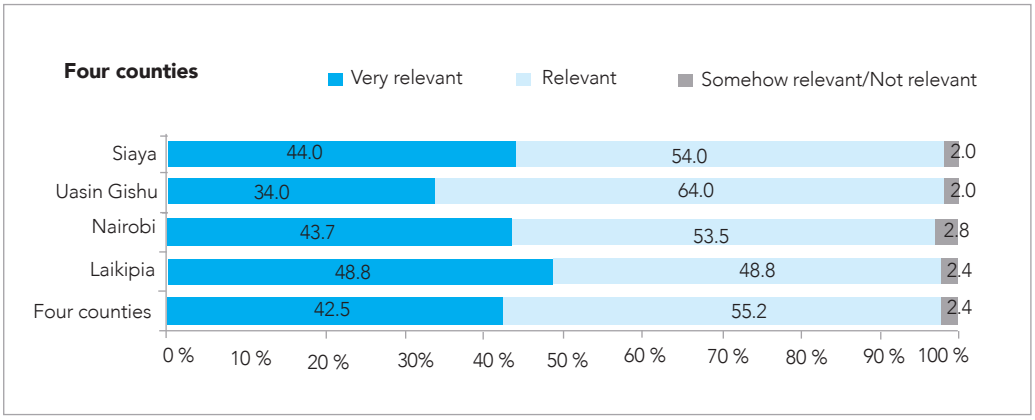


Figure 6.2: Perception of ECDE teachers regarding relevance of Tayari objectives in their schools



Effects of Tayari

Asked about the noticeable effects of the program, most of the stakeholders mentioned positive changes on learners, on teachers as well as on schools. For instance, a majority of the ECDE teachers noted reduced absenteeism from learners and improvement in pupils' numeracy and literacy. Head Teachers reported acquisition of relevant skills for ECDE instruction by teachers and simplified work for teachers as lesson plans and learning materials were provided. At the school level, they noted an increase in enrollment rates, and an improved learning environment with the provision of new instructional materials.

Figure 6.3: Effects of Tayari according to ECDE teachers in the four counties

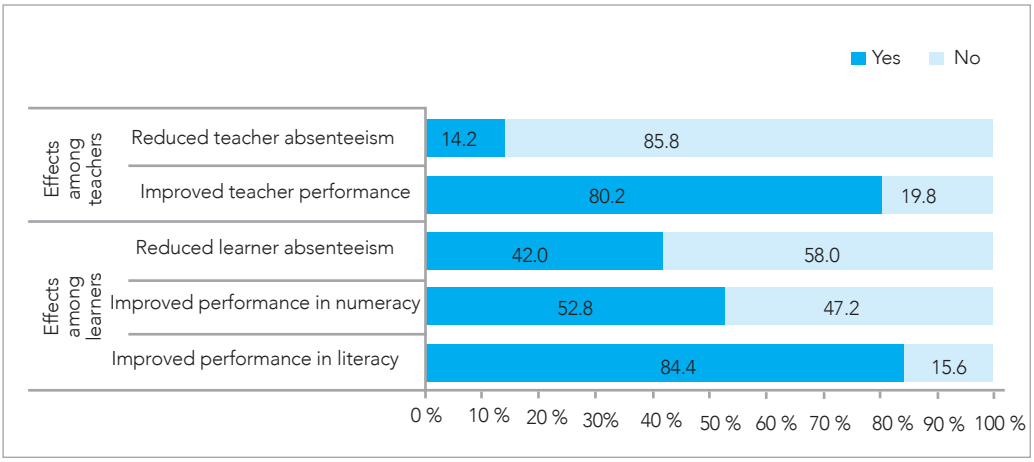
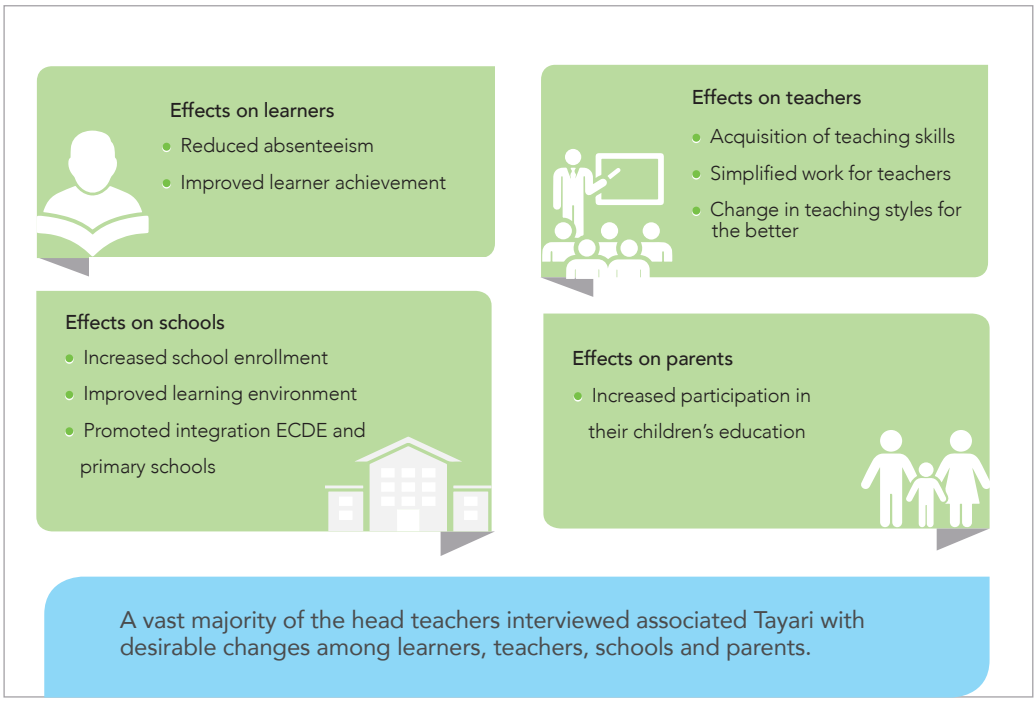


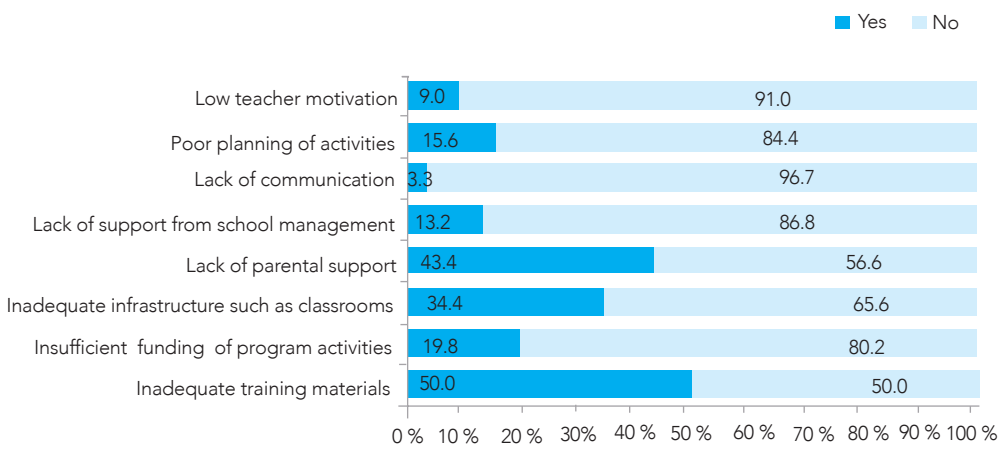
Figure 6.4: Effects of Tayari according to head - teachers



Perceived challenges

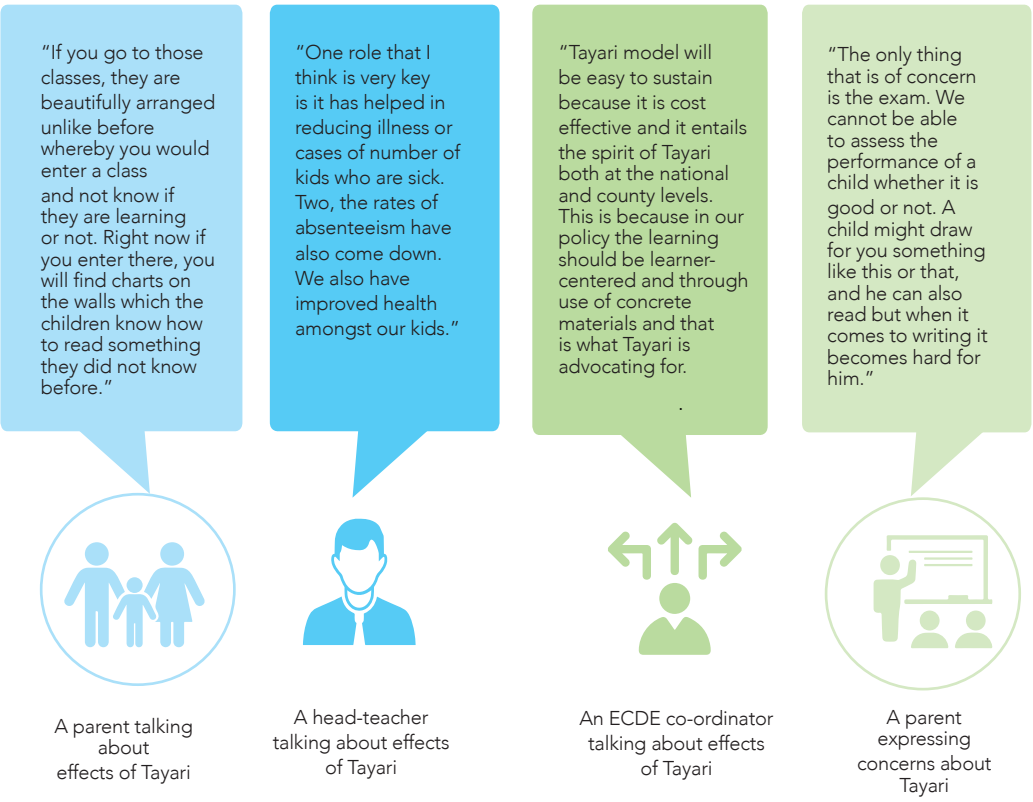
Stakeholders identified areas of improvement. In particular, teachers found some of the Tayari training materials inadequate, e.g. missing the expected contents. In addition, other respondents (Head Teachers and Community Health Assistants (CHAs) considered the resources received from the program to facilitate their transport, as insufficient to properly implement planned program activities. In the same vein, teachers incentives were reportedly low, particularly for those without a contractual engagement with the county government. Those employed by parents were poorly remunerated and this could have affected the implementation of Tayari. High teacher turnover in APBET schools was also identified as a major challenge – quantitative results report turnover of about 20%. There was a general perception among some of the stakeholders (ECDE county coordinators, CHAs) that Tayari had increased their workload as they had to balance between Tayari work and their normal routines – that said, county coordinators were the personnel that provided teachers with the much needed classroom-based mentoring/coaching. Finally, some parents had concerns about the instructional methodology used under Tayari which they perceived was slow and focused mainly on teaching learners how to read at the expense of writing.

Figure 6.5: Perceived challenges of Tayari by ECDE teachers in the four counties



One-half of the ECDE teachers who were interviewed reported inadequate training materials as a key challenge of Tayari. On the other hand, head teachers and ECDE coordinators reported inadequate funding and high teacher turnover in APBET schools as the key challenges.

Figure 6.6: Perceptions of key ECDE stakeholders regarding Tayari



Interactions with non-Tayari schools

Interactions between intervention and control schools in Tayari were reported by 65% of the ECDE teachers - they showed non-Tayari teachers how to develop and use Tayari materials. This happened due to the popularity of Tayari. However, our quantitative results did not detect a threat due to contamination. In any case, it is unlikely that contamination would be an issue in programs with huge investments, such as Tayari.

7.0 Conclusions

This chapter summarises the answers to the evaluation questions spelt out before the commencement of the external evaluation by APHRC.Detailed answers are provided in the final chapter of the longer report (Ngware et al., 2018).

Research question 1:

What is the impact of (i) classroom instruction model (T1&2), and (ii) classroom instruction and the health support package (T3) on school readiness (as measured by learner achievement in numeracy, literacy, and executive functioning)?

The teacher training and classroom instructional model (T1) improved school readiness mean scores by 0.30 and 0.08 standard deviations in public and APBET centers, respectively. Adding in instructional materials (T2) improved school readiness mean scores by 0.34 and 0.52 standard deviations in public and APBET centers, respectively. The T3 package; which included the health component improved school readiness scores by 0.31 and 0.42 standard deviations in public and APBET centers, respectively.

Overall, Tayari had a standardised effect size of 0.33 that was practically important and statistically significant at 5%. These results indicate that at least 62% of schools in the treatment groups scored higher on the school readiness measure than an average school in the control group.

Research question 2:

Does the effect of the interventions vary from public to APBET, length of exposure to the intervention, and learner sex?

- Overall, the magnitude of the impact of the intervention was greater in APBET schools in T2 and T3 groups than in public schools. The impact was least in T1 APBET.
- The impact of the intervention on school mean scores was practically significant even after stratifying by phase. However, the impact of the intervention was of greater significance among Phase 2 schools than among Phase 1 schools, which seemed to contradict the notion that longevity of exposure to the intervention would have an additional advantage. However, it is reasonable to argue that the lower impact on Phase 1 schools may be due to teething problems at the start of the program and exposure to change – teachers were encouraged to operate outside their comfort zones.
- The intervention did not seem to impact differently by learner sex in APBET schools. However, in public schools, there seem to be some better results for girls than for boys, especially in T1 and T3.

Research question 3:

Are health interventions together with classroom instruction models more effective in improving learning outcomes than classroom instruction model alone?

The impact of the packages involving classroom instructional model and provision of instructional materials plus the health component (T3) on school mean scores did not differ much from that of the package involving classroom instructional model (T1) and provision of instruction materials

only (T2). Hence, the health component did not seem to offer additional advantage in terms of improved school readiness overall scores.

Research question 4:

Are interventions cost-effective? What are the costs of the interventions and their incremental effects on assessment scores?

Based on the combined data (Public and APBET centers), results indicate that over a two-year period of participation in pre-primary school, the cost per learner enrolled is US$8.47, $15.11, $19.40 for T1, T2, T3, respectively; and, $14.01 overall. Furthermore, the combined results show that T1 is the most cost-effective since it has the lowest ICER. In other words, for an additional expenditure of $4.01 over the period of two years using T1 package, you can enhance school mean score by a 1 percentage point (using the effect size, results indicate for a 0.1 standard deviation increase in the school readiness mean score, policymakers will spend on average $3.39 over two years).

Research question 5:

Which aspects of Tayari worked well, and what didn't?

Overall, based on the impact on school readiness and cost-effectiveness of the intervention packages, the teacher training and classroom instructional support package (T1) worked better when compared to the other two packages. Classroom based support meant that an instructional coach/mentor/curriculum support officer regularly observes the ECDE teacher during a lesson, and provides prompt feedback for continuous improvement. This interaction and sharing of feedback could have encourage and/or motivated the teacher to adopt and use best teaching practices.

8.0 Implications of the evaluation findings

This chapter outlines recommendations based on the results of the impact evaluation.

Scaling up

From our analysis, the effect sizes of Tayari are encouraging and provide an opportunity to ECDE stakeholders to improve the quality of ECDE services provided to pre-primary children in Kenya. In particular, we find the package that emphasizes on instructional quality to be suitable for scaling up by county governments with the support of the Ministry of Education and development partners.

Teaching approaches and classroom-based teacher mentoring

Tayari emphasizes the acquisition of basic foundational skills in literacy and numeracy that make preschool learners ready for later schooling years. In developing these skills among learners, teachers should adopt a teaching strategy that includes the three sequential and repetitive steps of (i) demonstration, (ii) modelling, and, (iii) follow-up with independent practice. For these steps to lead to learning, they should be combined with active and inquiry-based learner participation during the lessons that go beyond the usual cued-elicitation during QA sessions, the correct exposition of the required skill, for example, correct letter naming or letter sound; additionally, other useful strategies exhibited in Tayari include presenting vocabulary thematically and play activities organized around an appropriate context-relevant theme. Such strategies should be institutionalized within lesson delivery as they constitute critical factors for success in learning. Teacher guides in Tayari were one approach of institutionalizing lesson delivery.

To support the institutionalization of effective teaching and learning strategies inside the classroom, ECDE teachers need classroom-based coaching and mentoring that includes constructive feedback. This aspect is likely key to the success of Tayari. Additionally assessment for learning approaches promoted by Tayari should also be part of the institutionalization of the effective teaching and learning. The emphasis of the assessment should be to diagnose learning difficulties among learners and to establish the level at which they are towards acquiring expected competencies after going through some learning activities. The competencies should take into account learner's context and age.

For literacy, the focus should be to build context and age-appropriate competencies in print awareness, phonological awareness, phonics, reading fluency, vocabulary, reading and listening comprehension, and writing.

For learners to develop competencies in numeracy, it is important that they are exposed to creative play activities on common numerical concepts such as rotation, trajectory, enclosing, containing, connecting and transporting among others. Such play activities should provide opportunities for discussions, explorations and problem solving in small groups. This could lead to development of numerical competence in shape identification, number naming, producing sets, quantity discrimination, putting together (addition), take away (subtraction), mental addition, and measurement.

Learning materials

From the Tayari results, presence of age-appropriate, context-relevant and well-structured teaching and learning materials such as workbooks, teacher guides, textbooks, charts, and other cheap locally-made resources boosted learning outcomes among learners. Such materials provide useful support material for both the teachers and the learners. This was not only because of their physical accessibility but more so because they used appropriate language, were age-appropriate, learner and teacher friendly, well-designed out and provided a step-by-step guide for use. These materials worked well when combined with teacher in-service training that was followed with a structured classroom-based coaching and/or support. It is evident that such materials differed from the traditional resources ECDE teachers were used to before the introduction of Tayari. In view of these, the ECDE stakeholders, especially communities, parents and county governments could invest (financial, labor, or proving locally-available resources) in such materials in order to improve the quality of ECDE services and strengthen the development of the much needed foundational skills among pre-schoolers.

Role of national and county governments

According to the Kenya Constitution 2010, on one hand, county governments are responsible for the development of ECDE services within areas of their jurisdiction. On the other hand, the national government, through the MoE, is responsible for policy guidelines. In addition to the provision of appropriate instructional materials, the national and county governments should prioritise to assign enough ECDE officers (herein referred to as DICECE and/or coaches) and paying for teacher training and classroom-based coaching. Given this governance structure, it is possible for the MoE to integrate best practices from Tayari into the current curriculum reforms. Additionally, in order to improve stability within the teaching force and to provide classroom-based support, the MoE could provide other policy guidelines regarding enhancing access to relevant ECDE teaching and learning materials, qualifications and training of the teaching force, structures for hiring qualified ECDE personnel. It is important to emphasise that Tayari was effective not only because of the provision of appropriate materials, but also because of classroom-based teacher support, without which the program will not be successful.

Additionally, it was evident that the ECDE section of primary schools, especially in public schools, were viewed as a separate "institution" and the working relationships between the primary school and the pre-primary school sections were not effective. This is an issue that could benefit from MoE's clarity on roles and governance structure for these two types of schools. The county governments face grave challenges within the ECDE sector, particularly in relation to the poor state of infrastructure, instability in the teaching force, and importantly; a lack of the much needed relevant teaching and learning materials. To improve the quality of ECDE, the county governments should strongly consider adopting the Tayari-type developed instructional materials as they have been shown to be cost-effective and appropriate for ECDE.

The Tayari evaluators observed concerns with parents, who are key stakeholders in ECDE services provision, regarding the introduction of school-based reforms. The county governments play a role in sensitizing the communities regarding potential investments in ECDE, and their benefits, including allowing communities to participate in decisions that will guide such investments. This is a critical element during the scaling up phase of the Tayari approach.

Language of instruction

Research has consistently provided evidence that pre-primary school learners learn best if taught in their mother tongue or the language with which they are most familiar, which is consistent with the language-of-instruction policy in Kenya (UNESCO, 2008). However, Tayari evaluation showed that the language of instruction policy is not implemented by significant proportions of ECDE centers. Attempts to scale up Tayari should be accompanied by efforts to encourage greater use of mother-tongue instruction wherever possible. Tayari instructions as well as learning materials should consider the language of catchment area, which may include mother tongues in rural areas, and Kiswahili and English in urban or cosmopolitan areas. It is notable that, in practice, the policy on language of instruction may not always hold due to stakeholder interests, and that must not be ignored.

Inclusion of APBET ECDE centers

Tayari findings showed that APBET ECDE centers play an important role in improving school readiness among children in low-resourced urban settings such as those found in Nairobi's informal settlements or slums. Thus, scale up of Tayari should consider support to children in registered low-cost private centers if not the centers themselves. Given the complexities involved in financing private-for-profit ventures such as APBETs using public funds, this support could take the form of provision of teacher training and classroom instructional support, and provision of instructional materials to the registered centers at highly subsidized prices. Other options for support could be explored in consultation with the sector, county governments and development partners. For instance, extending the free primary education capitation grants to target the children in APBET who could be from poor neighborhoods usually underserved by public schools.

Further areas of research

Further research to establish long-term impact on learners and teachers (post-intervention research) is necessary to generate policy-relevant evidence on the value of investments in quality ECDE services, such as Tayari. Currently, we do not know how long the Tayari's social and educational benefits will last post-intervention. It will be important to understand whether the learners exposed to Tayari have better learning outcomes, than those who were not exposed to Tayari beyond their last year of pre-school.

References

Coe, R. (2002). It's the effect size, Stupid: What effect size is and why it is important. Paper presented at the Annual Conference of the British Educational Research Association, University of Exeter, England, 12-14 September, 2002

Cohen, J. (1977). Statistical power analysis for the behavioral sciencies. Routledge

Glewwe, P., Ilias, N., & Kremer, M. (2003). Teacher incentives. In. Cambridge, MA:NBER working paper series

Miguel, E. & Kremer, M. (2004). Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities. Econometrica, 72(1), 159-217. [Retrieved on February 15, 2018 from http://cega.berkeley.edu/assets/cega_research_projects/1/Identifying-Impacts-on-Educationand- Health-in-the-Presence-of-Treatment-Externalities.pdf]

Ngware, M.W., Hungi, N., Kitsao-Wekulo, P., Mutisya, M. & Muhia, N.G. (2016). Tayari Pre-Primary Programme in Kenya: Getting Children Ready for Primary School. Baseline Report. Nairobi: African Population and Health Research Center

Ngware, M.W., Hungi, N., Kitsao-Wekulo, P., Mutisya, M., Njagi, N., Muhia, N.G. & Wambiya, E. (2018). Impact Evaluation of Tayari School Readiness Program in Kenya. Endline Report. Nairobi:African Population and Health Research Center

UNESCO (2008). Mother Tongue Matters: Local Language as a Key to Effective Learning. Paris:

UNESCO

ISBN 978-9966-814-42-5

APHRC CAMPUS, KITISIRU, NAIROBI, KENYA
INFO@APHRC.ORG
@APHRC
WWW.APHRC.ORG