READING ENHANCEMENT FOR ADVANCING DEVELOPMENT (READ) BANGLADESH
COST-EFFECTIVENESS ANALYSIS (CEA)

September 2018

Suggested Citation:

Harris-Van Keuren, C., Bowden, A.B., and Swail, W. S. (2018). *Reading Enhancement for Advancing Development (READ) Bangladesh — Cost-Effectiveness Analysis.* Washington, DC: United States Agency for International Development (USAID).

CONTENTS

LIST OF TABLES AND FIGURES

ACRONYMS

AUEO	Assistant Upazila Education Officer
BAU	Business-as-Usual
BDT	Bangladeshi Taka
CA	Classroom Assistant
CEA	Cost-Effectiveness Analysis
CLV	Community Literacy Volunteers
CRC	Community Reading Camp
CPI	Consumer Price Index
DID	Difference-in-Differences
EPI	Educational Policy Institute
EGRA	Early Grade Reading Assessment
FO	Field Officer
FOI	Fidelity of Implementation
GOB	Government of Bangladesh
GPS	Government Primary School
IAT	Instructional Adjustment Tool
IRB	Institutional Review Board
M&E	Monitoring and Evaluation
MIS	Management Information System
NNPS	Newly Nationalized Primary School
PNGO	Partner Non-Governmental Organization
QED	Quasi-Experimental Design
READ	Reading Enhancement for Advancing Development
RIA	Reading Instruction and Assessment
RIMES	READ Implementation Monitoring Evaluation System
RCT	Randomized Control Trial
SCI	Save the Children International
SLIP	School Level Implementation Plan
SMC	School Management System
SRM	Supplementary Reading Materials
STO-Reading	Senior Technical Officer-Reading
TO	Technical Officer
UEO	Upazila Education Officer
URC	Upazila Reading Coordinator
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

BACKGROUND AND RATIONALE

Bangladesh has made impressive strides with regard to access to basic education and increasing primary enrollment. As of 2010, net enrollment rates for females and males were 95% and 85%, respectively. (UIS, 2018). From 2014 to 2016, the literacy rate of children aged 7 and older increased from 59% to 71% (Bangladesh Bureau of Statistics, 2017). However, more specific research shows these literacy rates are not consistent across all grades. For example, research conducted by the Bangladesh Directorate of Primary Education showed a negligible increase in Bangla scaled scores for grade III between 2011 and 2015. The same study also showed a decrease in grade V scores (Government of the People's Republic of Bangladesh Directorate of Primary Education, 2016).

To help ameliorate these issues, Save the Children International (SCI), with support from the United States Agency for International Development (USAID), structured Reading Enhancement for Advancing Development (READ) with the objective of "Improved reading competencies among grade I, II, and III students in selected READ schools in selected districts." (See Appendix 1 for READ Logic Map).

The Educational Policy Institute (EPI) was contracted with SCI in 2014 and tasked with three primary objectives: to identify the relative effectiveness of READ's intervention taking cost into account; to build up the capacity of READ staff on Cost-Effectiveness Analysis (CEA); and to set a standard and methodology for future work on CEAs. SCI had three rationales for conducting a CEA for READ. First, CEAs are needed among donors and policymakers to identify interventions that achieve the greatest level of impact per unit of investment, informing decision makers about scaling up effective approaches, and identifying new interventions where gaps may currently exist. Second, research capacity was underrepresented in SCI as a whole. This gap affected areas such as advocacy, representation, and making evidence-based decisions. Finally, as SCI increases its role in providing technical assistance to policy makers in contributing to system change and its reputation as a source for reliable knowledge, SCI sought to build its own institutional capacity in conducting CEAs (SCI/EPI 2017).

Implemented between 2013 and 2018, READ included two main components. The first, called CORE, provided reading instruction within the existing literacy block in the government public school schedule. The second, called CORE PLUS, added supplementary reading instruction through community reading camps (CRC). The CRCs operated after school and during summer break and are the "plus" in CORE PLUS.

SCI measured the impact of READ's CORE and CORE PLUS in two different evaluations. The first was called the READ Government Primary School Endline (GPS Endline). This evaluation measured the effect of READ CORE incremental to the government primary school's business-as-usual (BAU). The second was called the READ CORE and CORE PLUS Impact Evaluation (CORE/CORE PLUS). This was a "value added" design that measured the effect of READ CORE PLUS incremental to CORE. Both impact evaluations measured the effect of the intervention on 10 different student literacy outcomes using the Early Grade Reading Assessment (EGRA). While GPS Endline and CORE/CORE PLUS assigned students to receive CORE (i.e., the treatment group in the GPS Endline received CORE and the control group in

CORE/CORE PLUS received CORE), these groups were distinct, meaning the CORE groups contained different students.

To conduct a CEA, the results from the GPS Endline and CORE/CORE PLUS impact evaluation were paired with their implementation costs. Utilizing the ingredients method, a rigorous approach to conducting cost-effectiveness analysis (Levin et al., 2018), READ's costs were calculated from a social perspective. This means that all costs regardless of who pays for them or if resources were donated or volunteered are included. This report presents the total costs for GPS Endline and CORE/CORE PLUS; how the costs were financed by communities; the Government of Bangladesh (GOB), parents, and SCI; the cost per CORE and CORE PLUS student; and the cost per one unit increase in reading comprehension, fluency, and self-reliant readers.

FINDINGS[1][2]

TOTAL COST AND COST BURDEN BY STAKEHOLDER

The total cost for CORE (incremental to BAU) in the GPS Endline was approximately BDT 90,500,000 (USD 1,080,570) and the total cost for CORE PLUS (incremental to CORE) in CORE/CORE PLUS was approximately BDT 185,800,000 (USD 2,218,452). In both the GPS Endline and CORE/CORE PLUS, SCI bore the largest percentage of the total cost at approximately 96%. The GOB incurred approximately four percent of the total cost burden. Parents and communities contributed about one percent or less of the total financial burden of GPS Endline and CORE/CORE PLUS.

AVERAGE COST PER STUDENT

This analysis found that the average per student cost of CORE (incremental to BAU) in the GPS Endline was BDT 12,082 (USD 144). In the CORE/CORE PLUS analysis, the average per CORE student cost was BDT 12,041 (USD 144) and the average cost per CORE PLUS student was BDT 10,239 (USD 122) for an incremental difference of BDT 1,802 (USD 22). The cost estimation for CORE (incremental to BAU) in the GPS Endline is greater than the estimation for CORE in CORE/CORE PLUS arm because CORE (incremental to BAU) in the GPS Endline was implemented longer than CORE in the CORE/CORE PLUS intervention.

COST-EFFECTIVENESS (CE) RATIO

Although READ measured student literacy gains for ten different EGRA outcomes, most of these measure narrowly defined skills (e.g. ending rhyme in words, similar beginning words,

---

[1] GPS Endline and CORE/CORE PLUS costs were converted from Bangladesh taka (BDT) to US dollars (USD) using the currency conversion rate on September 10, 2018. The conversion rate was 1 BDT= 0.01194 USD. See https://www.xe.com/currencytables.
[2] Caution should be given when interpreting the US dollar values provided. The values provided are based upon the currency exchange rate and is not the dollar value of the program. Values are determined by factors such as labor markets and unions. Therefore, the dollar value of a resource (e.g. a teacher) in the US is not necessarily equivalent to the exchange rate of the taka value in dollars.

etc.). For this CEA, the most policy relevant EGRA outcomes are reading comprehension, fluency, and self-reliant reader. These reading skills have wide applicability, generally recognized significance, and alignment with the theory of change. Also, all other secondary outcomes, especially in reading, may mediate the primary outcome or are not as policy relevant. For CORE students in the GPS Endline, this analysis found that a one percentage point increase in reading comprehension costs approximately BDT 447 (USD 5.34) and a one percentage point increase in reading fluency costs approximately BDT 491 (USD 5.86). These results are applicable to all of the CORE students in the GPS Endline and is not restricted to students defined as "readers."

It costs approximately BDT 448 (USD 5.35) for each percentage point gain in students classified as "readers." This means that each additional reader costs approximately BDT 44,850 (USD 536).

Because the impact analysis for CORE/CORE PLUS yielded negative statistically insignificant findings, the CEA findings are not interpretable.

CONCLUSIONS AND IMPLICATIONS

There are two important implications associated with this cost-effectiveness analysis. First, SCI worked diligently to structure READ within the existing GOB education system. The benefit of this approach is that sustainability was a major consideration and incorporated into the design of the program. The drawback to this approach is that working within the GOB education system means that shifts in policy or changes to school structure (i.e., variation to BAU) affect READ and this evaluation. These aspects are critical when considering expanding interventions.

Second, the absence of statistically significant findings in CORE/CORE PLUS should not diminish its value without further consideration. There are at least three potential reasons why the CORE/CORE PLUS results may have been inconclusive. First, there could be statistical reasons. For example, a reduction in sample sizes over time can compromised statistical power. Second, the timeline of delivery was not uniformed. Moving the needle on student achievement outcomes is often not a quick fix and may require more time than a short-term program might allow. Third, the inconclusive findings may be related to dosage or time in practice for the teaching staff. For example, the intervention may have taken some time to "settle in" and the impact may have been measured too soon after teachers were asked to substantially shift the way that they teach and engage students in the classroom. Currently, SCI is building on these lessons learned and exploring new implementation models for CORE PLUS. For example, the CRCs are currently running but they have been adjusted to be much more tailored and targeted in their approach. The CRCs are now:

- focusing exclusively on non-readers;
- conducting diagnostics assessments;
- customizing sessions based on those assessments; and
- providing specific student-level support (SCI, April 2018, pg. 10).

These changes have yielded encouraging results. For example, 20,201 (out of 30,630) grade II children and 15,378 (out of 22,480) grade III children have reached the reader threshold. These

accomplishments were achieved after two months of tailored and targeted support. Additionally, the CRCs are providing literacy support to 1,356 grade I students (SCI, April 2018, pg. 10). These findings serve as evidence for a rigorous causal analysis, especially of the newly tailored CRC component, complete with thorough implementation and cost analyses.

READ INTERVENTION

BACKGROUND

Bangladesh has made considerable positive strides improving access to basic education. From 2014 to 2016, the literacy rate of children aged 7 and older increased from 59% to 71% (Bangladesh Bureau of Statistics, 2017). Despite these gains, challenges still exist. For example, in some regions, inadequate school infrastructure remains a problem, and once students arrive at the school, they are met with teachers who do not have proper teaching and learning materials and may not have been taught appropriate teaching methods. These educational limitations have negatively affected literacy rates in Bangladesh (Innovision, 2018). Research on reading skill development generally suggests that students who fall behind in early grade reading skills progressively worsen in later grades (Crouch, 2012 as cited in Innovision, 2018), poor early grade readers are more likely to repeat grades (Annie E. Casey Foundation, 2010), and achievement gaps continue to impact the overall literacy of a student ten years later (Cunningham et al., 1997).

Because the need to address literacy challenges remains great and the resources available are scarce, policymakers are increasingly turning to CEAs to help inform their policy making decisions. CEAs provide policy makers with a tool to help make cost-effective policy decisions. For example, research in Latin American found that reducing class size is an effective way of increasing students' test scores (Urquiola, 2006). However, when paired with the associated costs, class size reduction may still be less cost-effective than alternative interventions (McEwan, 2012; Loeb and McEwan, 2010; Levin et al., 1987). As the practice of including CEAs into impact evaluations grows, so too does the body of evidence. This allows new CEAs, such as READ's, to fill a valuable gap in Bangladesh and in the global education arena.

OVERVIEW OF READ

Supported by the United States Agency for International Development (USAID) and in close collaboration with the Government of Bangladesh (GOB), SCI designed READ to address Bangladesh's pressing challenges to build students' early grade skills and, by including a CEA, structured its evaluation to contribute to the GOB's policymaking process. With the strategic objective of increasing reading skills among students in grades I, II, and III in selected districts of Bangladesh, READ reached over 5,583 schools and an estimated 1.1 million direct beneficiaries in seven divisions and 19 districts between 2013 and 2018 (DMA, 2018, pg. 11). (See Appendix 1 for READ Logic Map).

SCI designed READ with two components: CORE and CORE PLUS. Emphasis is placed on describing the materials used in CORE and CORE PLUS because CEAs assign a cost to each input based upon their use (i.e., dosage or exposure) in the intervention. All of the resources described below, and shown in Table 1, were provided by SCI.

CORE is a classroom based instruction designed to replace the literacy block within the existing public educational system. The resources used a small area within existing school buildings, with the goal of requiring very little in additional resource over time, and the time dedicated to free student reading time took place within the school day schedule. These design specific elements increased the viability for project sustainability especially in the case of

potential expansion. CORE inputs included interactive reading instruction, increased use of early grade reading assessments, expanded use of relevant and appropriate supplementary reading materials, and strengthened community support for early grade literacy. Teachers were trained on READ pedagogy and used these new strategies and techniques within the government allotted 40 minutes of literacy instruction per day (IPA, 2017, pg. 14).

The second component of the program is called CORE PLUS. In addition to all of the inputs provided to CORE, CORE PLUS received additional resources to support a community-based reading center called a Community Reading Camp (CRC). SCI worked with each CORE PLUS school and the surrounding community to establish a CRC within the school's catchment area. Community members donated these spaces and/or land for the CRC to serve students outside of the normal GPS day and for a portion of the summer. Each camp was assigned 60 students comprised of grade I and II students. CRCs were held once a week for approximately eight months in a year (estimated at between 30 to 32 sessions). Each 90 minute session was led by two community literacy volunteers (CLV) who engaged students in games, lessons, and storytelling as a means of practicing their literacy skills. In each session, the CLVs read a story from the book bank to the children. The CLV then asked questions during and after the reading (IPA, 2017, pg. 14).

The CLVs were hired from the community and trained by SCI and PNGO on READ methods to provide literacy instruction to complement and build upon what was received in the classroom. Each CRC received a trunk which contained scripted lessons for the CLV, book banks and learning materials, posters to create a print rich environment, and games and activities (IPA, 2017, pg. 14). To ensure that the children had access to adequate and diverse reading materials appropriate to their level of reading outside school, each reading camp was provided with a book bank. This was a collection of 70 illustrated books, two alphabet primers, two language games, and guidelines on how to read for children and how to read with children. The children could borrow one book per week. CLVs oversaw the book bank (IPA, 2017, pg. 14).

To provide need-based support to beginner or younger readers and to develop a habit of reading for pleasure among all participating students, CLVs matched pairs of students who live close by but have different levels of literacy skills. Older buddies or those with high levels of fluency and reading comprehension were trained on how to read to the younger readers. The younger reader was encouraged to borrow books from the book bank and read them together with his or her 'reading buddy' who was a more advanced reader. Books were distributed at the reading camp, but the actual reading took place outside the camp, at home or elsewhere in the community (IPA, 2017, pg. 14).

A storytelling session was held twice a month. Storytellers included parents who attended the parenting session, grandparents, and other people from the community. Stories were selected from oral traditions, cultures, books, poems, stories or were made up; stories were determined to be well-suited to the social context (IPA, 2017, pg. 14).

SCI held parent awareness sessions to inform parents of the activities taking place during the CRCs and to encourage student participation. Parents were invited to the camp once a month and were introduced to concrete activities to improve the language development and literacy of their children at home. These 60 to 90 minute sessions were organized for 20 to 30

participating parents. Community members and parents in the CRC community were involved in maintaining program materials, managing the program, and supporting the CLVs (IPA, 2017, pg. 14).

TABLE 1: READ INPUTS	
CORE	**CORE PLUS**
Training (cascaded) on: ➢ Reading instruction and assessment for teachers (basic and refresher, 5+3 days) ➢ Academic supervision training for head teachers, AUEOs, UEOs, and URC instructors (basic and refresher) Formative assessment conducted by teachers, 3x/year Sharing of IAT findings w/ schools and government Reading Corners, supplied with SRM (book banks and book bags), reading time scheduled and moderated Print rich environment SMC orientation and strengthening Sharing reading results (data and findings) at mother gatherings in school Reading Festivals held at upazila level	All of the activities of READ CORE in addition to: **Community Reading Camps:** 20 scripted sessions for grades I, II and III; 28 sessions for grade II and III students Book banks and learning materials Reading Buddy Mentoring (book lending, accompanied reading) Storytelling by community resource people Reading to children Reading-related games and activities Print rich environment set up at every camp session Parent awareness session Training of Community Literacy Volunteers

Source: Innovations for Poverty Actions (IPA). READ CORE AND READ CORE PLUS BANGLADESH ENDLINE REPORT USAID's Reading Enhancement for Advancing Development (READ) Activity November 2017 USAID/Bangladesh: Cooperative Agreement No. AID-388-A-13-00006, pg. 15.

INTRODUCTION TO READ CEA

In 2014, Save the Children International (SCI) contracted with the Educational Policy Institute (EPI), a US-based research firm, to conduct a cost-effectiveness analysis (CEA) on the Reading Enhancement for Advancing Development (READ) intervention, with a focus on the estimation of costs and combining costs with effects. SCI had three primary for this project: to identify the relative effectiveness of READ's intervention taking cost into account; to build up the capacity of READ staff on Cost-Effectiveness Analysis (CEA); and to set a standard and methodology for future work on CEAs (SCI, 2015). Before beginning the project, EPI provided training to SCI on the basics of economic evaluation to explore the ways in which costs and effects can be useful research tools.[3]

The results of CEA analyses described in this report can be used to:

---

[3] The primary textbooks used in the trainings included: Levin, H.M. & McEwan, P.J. (2001). *Cost-Effectiveness Analysis: Methods and Applications, 2nd Edition*. Sage Publications: Thousand Oaks, CA; Levin, McEwan, Belfield, Bowden, & Shand (2018). Economic Evaluation in Education: Cost-Effectiveness Analysis and Benefit-Cost Analysis, 3ʳᵈ Edition. Sage Publications.

- Identify the specific resources needed to implement READ or to replicate the program in new areas;

- Compare READ to other alternative interventions with equivalent outcome domains;

- Understand costs per category (such as personnel, training, and materials) in delivering the program;

- Explore how the cost burden was distributed among various stakeholders in implementing READ; and

- Improve program delivery and fidelity in new projects by presenting and understanding of programmatic ingredients.

This report contains five primary sections—Introduction, Effectiveness of READ, Cost-Effectiveness Methods, Cost-Effectiveness Analysis, and Conclusions and Considerations. This Introduction includes a brief background of Bangladesh's basic education landscape and the use of CEAs in education. It also details the resources used in each arm (i.e., CORE and CORE PLUS) of the READ intervention. Effectiveness of READ describes the project's outcome variables, treatment assignments, and findings for the impact and fidelity of implementation analyses. Cost-Effectiveness Methods contains the research questions and data sources, and a description of the ingredients method. Cost-Effectiveness Analysis details the overall results of the cost analysis and research limitations. The report concludes with a final section providing considerations for future work.

EFFECTIVENESS OF READ[4]

This section describes the effectiveness of READ. Detailing the effects of an intervention is critical to a CEA since the costs associated with the inputs are paired with the effects to generate a cost-effectiveness (CE) ratio. This section begins with a discussion of the outcome variables. Then, a discussion is provided for the intervention and comparison groups, sample sizes, methods and findings for the two impact evaluations (i.e., Government Primary School Endline (GPS Endline) and READ CORE AND CORE PLUS Impact Evaluation (CORE/CORE PLUS)). It also includes a summary of the FOI analysis conducted on CORE/CORE PLUS. (See Appendix 2 for a summary of the FOI analysis).

OUTCOME VARIABLES

---

[4] For more detailed information about the impact analyses and the fidelity of implementation evaluation, please see:
READ CORE PLUS Project Reports: Innovations for Poverty Actions (IPA). READ CORE AND READ CORE PLUS BANGLADESH ENDLINE REPORT USAID's Reading Enhancement for Advancing Development (READ) Activity November 2017 USAID/Bangladesh: Cooperative Agreement No. AID-388-A-13-00006
READ GPS Project Report: Data Management Aid (DMA). ENDLINE EVALUATION OF READING OUTCOMES IN GOVERNMENT PRIMARY SCHOOLS (GPS) USAID's Reading Enhancement for Advancing Development (READ) Activity August 2018
USAID/Bangladesh: Cooperative Agreement No. AID-388-A-13-00006
READ CORE PLUS Fidelity of Implementation Report: French, S. (2018). READ BANGLADESH: An Examination of Fidelity of Implementation. Dhaka: Save the Children International.

To measure if reading competencies were positively impacted, SCI used an Early Grade Reading Assessment (EGRA) tool. For READ, SCI measured the impact of the two READ impact assessments (i.e., GPS Endline and CORE/CORE PLUS) using 10 EGRA indicators. These include accuracy, antonyms, ending rhyme in words, fluency, letter identification, most used words, reader, readers with comprehension, reading comprehension, and similar beginning sounds. Table 2 below provides a definition for each of these outcome variables.[5]

TABLE 2: READ OUTCOME VARIABLES AND DEFINITIONS		
NO.	OUTCOME VARIABLE	DESCRIPTION
1	Antonyms*	The number of antonyms given (for 10 words from a grade II and III Bangla textbook) correctly by the child.
2	Ending rhyme in words	The number of ending rhymes detected (from a Bangla textbook) correctly from a set of 3 words out of which 2 words correspond with the same ending rhyme.
3	Similar beginning sounds	The number of similar beginning sounds detected (from a Bangla textbook) correctly from a set of 3 words out of which 2 words have a similar beginning sounds.
4	Letter Identification	The number of letters (out of all 50 letters of the Bangla alphabet) for which the child either correctly gave the name, the sound, or a word that begins with that letter.
5	Most used words	The number of words (out of 20 of the most frequently used words in children's textbooks) correctly read aloud by the child.
6	Reader	A child who can read the oral reading passage independently, here defined as reading at least 5 words correctly in the first 30 seconds of the sub-test. Readers were allowed to continue reading until they finished the passage or refused to read any further; non-readers were stopped and read the passage by the assessor.
7a	Accuracy (Readers only)	Tested during the oral reading passage sub-test, the percentage of the total words in the passage read correctly by students.
7b	Fluency (Readers only)	Tested during the oral reading passage sub-test, fluency is defined as the number of words read correctly per minute. As assessors marked the child's progress at 30 seconds, this measure is calculated by counting the number of words correct at the 30-second mark and multiplying this number by two.
7c	Comprehension (Readers only)	Children's ability to correctly answer 10 questions following the administration of the oral reading passage sub-test.
7d	Readers with comprehension (generated from the data above;	Children who qualified as readers and answered at least 80 percent of reading comprehension correct. This is a binary variable that includes

---

[5] The outcome variables can be parceled into two groups—emerging literacy skills (also called low order literacy skills) and higher order literacy skills. Emerging literacy skills include five outcome variables— antonyms, frequent words, letter knowledge, rhyming words, and similar beginning sounds. These foundational skillsets are needed for a beginning reader. Higher order literacy skills are those skillsets that develop once the reader meets the threshold as an independent reader. These outcome variables include accuracy, fluency, and reading comprehension. The outcome variable called "reader" is used to identify if a student has met the threshold as an independent reader. The outcome variable called "readers with comprehension" is a composite variable, which was created from several other outcome variables. This outcome measure is coded to be binary (i.e., 1 or 0) from the variables "reader" and "reading comprehension" to indicate that a child is a reader with comprehension. During the assessment, a student needed to meet the requirements to be classified as an independent reader and answer at least 80 percent of the reading comprehension answers correctly to be coded as a "reader with comprehension" (i.e., classified as 1, non-readers were classified as 0)

not directly collected as part of data collection)	all children in the sample, similar to the reader variable. Here, reading comprehension is 1 if the child was a reader and answered at least 80 percent of comprehension questions correctly and 0 otherwise, including non-readers.

* Antonyms was only used in the CORE PLUS analysis.

READ GOVERNMENT PRIMARY SCHOOL ENDLINE

INTERVENTION AND COMPARISON

This endline evaluation of READ's intervention in Government Primary Schools (GPS Endline) measured the reading skills of students who participated in CORE compared to students in non-intervention schools who were provided instruction following "business-as-usual" (BAU). BAU is an evaluation term for a group (e.g., classrooms, schools, districts, etc.) who proceed as they normally would in the absence of the intervention being evaluated. In the case of READ, the BAU group continued to receive the prescribed GOB GPS literacy instruction and served as the "comparison group" for the GPS Endline. The students assigned to CORE received the previously described READ inputs and were considered the "treatment group" in the evaluation.

SAMPLE, TIMELINE, AND METHOD

The READ GPS Endline was structured as a cross-section design. In a repeated cross-sectional study, students are randomly drawn to measure their skills at multiple points in time. For example, the PISA examination is given to a random sample of 15 year old students to generally assess skills among 15 year old children over time. By design, this type of analysis relies upon two different samples of students at each point in time, which is distinct from a longitudinal design where students are followed over time to determine growth or to compare changes in skill development among groups.

To create the sample, SCI selected one district from each region. Treatment schools were then selected from upazilas that received CORE and the comparison schools were selected from neighboring upazilas that did not receive CORE (DMA, 2018, pg. 16). Ultimately, CORE was implemented in six regions (Barisal, Cox's Bazar, Dhaka, Jashore, Rangpur, and Sylhet) which contained six districts and 25 upazilas (DMA, 2018, pg. 46).

The CORE sample consisted of 70 schools (i.e., 35 BAU and 35 CORE). In each school, five boys and five girls in grades II and III were randomly selected creating a sample of 1,186 students at baseline and 1,533 students at endline as shown in Table 3 (DMA, 2018, pg. 16). Baseline data were collected in June and July 2015 and endline data were drawn in March and April 2018 (DMA, 2018). (See Appendix 3 for a visual representation of the timeline).

TABLE 3: CORE AND BAU SAMPLE SIZES FOR EFFECTIVENESS ANALYSES

	GRADE II			GRADE III			
	Treatment (CORE)	Control (BAU)	Total	Treatment (CORE	Control (BAU)	Total	Total Sample
Baseline	349	242	591	355	240	595	1.186
Endline	380	385	765	383	385	768	1,533

Source: Data Management Aid (DMA). ENDLINE EVALUATION OF READING OUTCOMES IN GOVERNMENT PRIMARY SCHOOLS (GPS) USAID's Reading Enhancement for Advancing Development (READ) Activity August 2018 USAID/Bangladesh: Cooperative Agreement No. AID-388-A-13-00006, pg. 16.

To analyze the impact of CORE, correlations were explored and regression models were employed (DMA, 2018, pg. 17). Each regression model included controls for gender, grade, and household asset index. (See bolded variables in Appendix 4).

FINDINGS

The regression analyses, listed below in Table 4, showed that CORE students outperformed BAU students in all literacy outcomes. These relationships were statistically significant at the *p<.001* level. The findings demonstrate differences in all outcome variables including those aligned with emergent literacy skills, decoding, and higher order literacy skills (i.e., confirmation and fluency).

TABLE 4: DIFFERENCE IN LITERACY OUTCOMES BETWEEN TREATMENT AND CONTROL ENDLINE FOR GRADE II & GRADE III

LITERACY OUTCOME	COEFFICIENT	S.ERR	P-VALUE	N
Emergent Literacy Skills				
Percent similar beginning words correct	29.06	1.16	0.00	1,533
Percent ending rhyme in words correct	32.81	1.20	0.00	1,533
Decoding				
Percent letter correct	16.91	0.94	0.00	1,533
Percent frequent/most used words correct	24.93	1.36	0.00	1,533
Confirmation and Fluency				
Percent of students who are self-reliant readers	0.27	0.02	0.00	1,533
Fluency	24.59	1.54	0.00	1,533
Percent of comprehension questions, correctly answered by readers	27.04	1.04	0.00	1,533
Percent who answered more than 8 comprehension questions correctly (all students)	0.34	0.02	0.00	1,533

Source: Data Management Aid (DMA). ENDLINE EVALUATION OF READING OUTCOMES IN GOVERNMENT PRIMARY SCHOOLS (GPS) USAID's Reading Enhancement for Advancing Development (READ) Activity August 2018 USAID/Bangladesh: Cooperative Agreement No. AID-388-A-13-00006.[6]

Exploratory analyses specific to each grade level were also conducted. Investigating these results at grade leveled showed that grades II and III scored 91% and 93% for similar beginning sounds and 91% and 95% for ending rhyme in words (DMA, 2018, pgs. 28-29).

---

[6] At the time of this writing, these findings had not yet been put into the report (DMA, 2018). These data were transmitted to EPI via email from SCI in June 2018.

Decoding skills are represented by letter identification and most used words. Analyses of these two outcomes showed statistically significant differences between BAU and CORE at the *p<.001* level. For example, at endline grade II and grade III CORE students scored 93% and 95% for letter knowledge, and 94% and 96% for most used words. Proficiency in these emerging literacy skills in early grades has been shown to positively impact mathematical literacy, thereby leading to more positive educational success throughout a student's academic career (DMA, 2018, pgs. 26-28).

Higher order literacy skills include accuracy, fluency, and reading comprehension (i.e., comprehension and readers with comprehension). The analysis found these four outcomes to have statistically significant differences at the *p<.001* level between CORE and BAU. Comprehension scores at endline for grade II were 37% (seven percent at baseline) for BAU students and 68% (seven percent at baseline) for CORE students. Grade III analysis revealed similar results. BAU students' scores were 37% (five percent at baseline) and 75% (six percent at baseline) for CORE students (DMA, 2018, pgs. 31-32).

CORE students in both grades II and III scored higher in accuracy than their BAU peers. Because higher order literacy skills can influence learning outside of reading classes, this statistically significant finding may suggest that READ could indirectly impact other educational outcomes and positively affect a student's academic trajectory (DMA, 2018, pg. 7).

In addition, this research (DMA, 2018) also found the percentage of CORE students classified as "readers" increased. For example, the percentage of grade II BAU students who met the threshold as readers increased to 56% (from 50% at baseline) while grade II students in schools assigned to CORE increased to 92% (from 45% at baseline). Grade III results showed a similar trend. The percentage of students who qualified as readers in grade III at BAU schools increased to 81% (from 76% at baseline) and in schools assigned to CORE, this percentage increased to 99% (from 74% at baseline) (pg. 30).

Finally, the exploratory research found that CORE students reported studying longer, were more likely to borrow books from the library, and read with peers (DMA, 2018, pgs. 21, 23, and 24).

More research is recommended to examine the causal impacts of CORE on early reading skills as compared to BAU.

READ CORE AND CORE PLUS IMPACT EVALUATION

INTERVENTION AND COMPARISON

The Impact Evaluation READ CORE and CORE PLUS Impact Evaluation (CORE/CORE PLUS) was designed as a "value added" model. Therefore, the treatment and control groups received the CORE inputs, and the treatment schools had the additional CORE PLUS model. In the case of READ, the value added aspect was the CRC, or the "plus" in CORE PLUS. As previously described, the CRCs were community reading centers that included activities and games, parent awareness sessions, reading buddies, and storytelling in a print rich environment.

SAMPLE, TIMELINE, AND METHOD

CORE/CORE PLUS was designed as a longitudinal study (i.e., a study that follows the same students over time). Conducted in 6 regions of Bangladesh (Barisal, Chittagong, Dhaka, Khulna, Rangpur, and Sylhet), baseline data were collected in May and June 2015 and endline data were drawn in July 2017 (IPA, 2017, pgs. 10 and 19). (See Appendix 3 for a visual representation of the timeline).

The treatment and control groups consist of 140 schools equally parceled into 70 treatment schools (i.e., CORE PLUS) and 70 control schools (i.e., CORE). These schools were selected from the initial 805 GPS schools designated to receive the READ intervention. From these 805 schools, 80 were randomly selected to receive CORE PLUS and the remaining 725 remained were assigned to CORE. The final treatment sample was generated by randomly selecting 70 CORE PLUS schools. To select the control group, SCI selected 70 schools within the same upazilas as the treatment schools, among the 725 GPS schools receiving the CORE intervention (Diazgranados et al., 2015, pg. 8).

Within each treatment and control school, 20 grade I students were randomly selected. Because some of the schools had less than 20 students in grade I, the final baseline sample consisted of 1,185 students assigned to CORE and 1,134 students assigned to CORE PLUS. (Diazgranados et al., 2016, pg. 11). These students were assessed as grade I students in 2015, and again as grade III students in 2017. Due to attrition, the endline samples consisted of 768 students in 70 GPS schools receiving CORE as the control group and 687 students in 70 GPS schools receiving CORE PLUS as the treatment group (IPA, 2017, pg. 18). See Figure 1.

FIGURE 1: CORE/CORE PLUS STUDY DESIGN AND SAMPLING PLAN
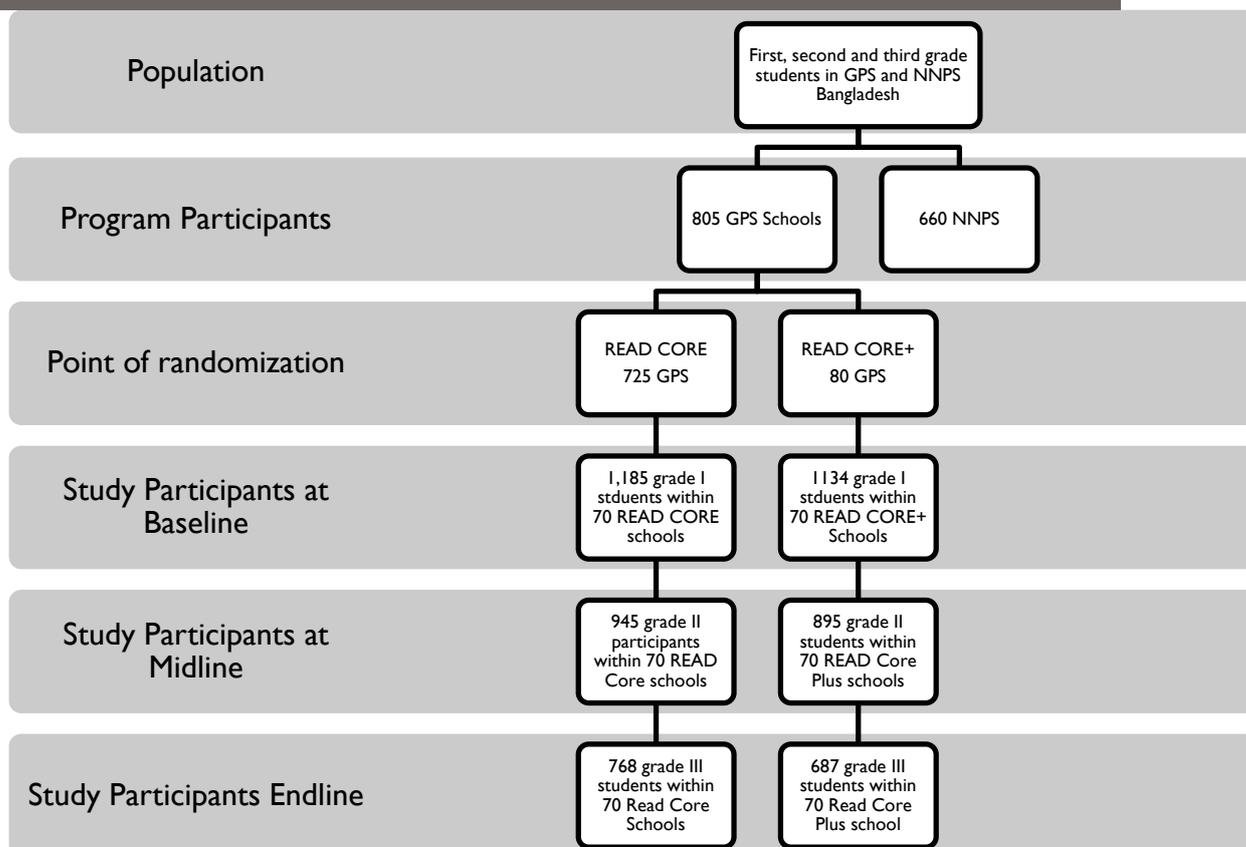
Population	First, second and third grade students in GPS and NNPS Bangladesh
Program Participants	805 GPS Schools 660 NNPS
Point of randomization	READ CORE 725 GPS READ CORE+ 80 GPS
Study Participants at Baseline	1,185 grade I stduents within 70 READ CORE schools 1134 grade I stduents within 70 READ CORE+ Schools
Study Participants at Midline	945 grade II participants within 70 READ Core schools 895 grade II students within 70 READ Core Plus schools
Study Participants Endline	768 grade III students within 70 Read Core Schools 687 grade III students within 70 Read Core Plus school

Source: Innovations for Poverty Actions (IPA). READ CORE AND READ CORE PLUS BANGLADESH ENDLINE REPORT USAID's Reading Enhancement for Advancing Development (READ) Activity November 2017 USAID/Bangladesh: Cooperative Agreement No. AID-388-A-13-00006, pg. 18.

Controlling for gender and household assets, multilevel models with school random effects and division fixed effects were used to measure the endline differences between CORE and CORE PLUS. Because floor and ceiling effects exist on some of the outcomes (e.g., accuracy, alphabet knowledge, fluency, most used words, phonemic awareness, and vocabulary), Tobit regressions (Tobin, 1958) were used to obtain a more precise estimate of impacts for those outcomes (IPA, 2017, pg. 26).

FINDINGS

As shown in Table 5, the RCT did not find a statistically significant difference in CORE PLUS (as measured by $p<0.05$) (IPA, 2017, pgs. 28 and 29). Negative coefficients could indicate that the value added design of the CRCs in CORE PLUS was not different enough in its design or implementation from CORE to impact the outcome measures.

While the RCT did not find a statistically significant difference between CORE and CORE PLUS, the results did show that students in both groups improved their literacy skills from baseline (grade I) to endline (grade III) (IPA, 2017). However, these results should be read with caution. The gains in literacy skills may be due to student maturation overtime and not as a

result of the READ intervention, and the analysis lacks a valid comparison group. With these limitations noted, there are four outcomes discussed here.

The first encouraging outcome was for emerging literacy skills. IPA (2017) found the largest gains were for similar beginning sounds, ending rhyme in words, and most used words. For similar beginning sounds, students in CORE and CORE PLUS schools identified approximately 90% correctly at endline (as compared to approximately 35% at baseline for CORE and CORE PLUS) (pg. 29). Ending rhyme in words and most used words showed very similar trends with over 85% correct at endline (as compared to approximately 35% at baseline) (IPA, pgs. 30 and 31). These gains suggest that both groups may have benefited from READ.

Second, IPA (2017) showed that CORE and CORE PLUS demonstrated gains in higher order literacy skills. Specifically, SCI found that the percentage of students in CORE schools who accurately answered five or more comprehension questions correctly increased at baseline from 10% to 88% at endline (pg. 7). Similarly, the percentage of students in CORE PLUS schools who could answer five or more comprehension questions correctly increased from nine percent at baseline to 86% at endline (pg. 7).

Third, the number of independent readers increased fivefold. In CORE and CORE PLUS more than 90% of the readers met the threshold for independent readers.

Finally, this analysis (IPA, 2017) also included exploratory subgroup analyses. For example, the research found that boys and students in lower socio-economic status (SES) did not gain as much skills in comprehension, similar beginning sounds and similar ending sounds as compared to girls and other SES groups (pg. 7). Additionally, the READ program seemed equally effective for students regardless of participation in early childhood development (ECD) programs (pg. 8). Finally, the district of Rangpur out performed other districts in similar beginning sounds, ending rhyme words, most used words, letter identification, and independent reader. This may suggest that some aspect of READ was different in Rangpur than in other districts (pg. 7) and offer evidence for a more detailed FOI and cost analysis in the future focusing on geographic variation.

TABLE 5: DIFFERENCE IN LITERACY OUTCOMES BETWEEN READ CORE AND READ CORE PLUS STUDENTS CONTROLLING FOR GENDER AND ASSET INDEX

LITERACY OUTCOME	COEFFICIENT	S.ERR	P-VALUE	N
Emergent Literacy skills				
Percent similar beginning words correct	-0.01	0.02	0.68	1,731
Percent ending rhyme in words correct	-0.01	0.02	0.43	1,731
Percent listening comprehension answered correctly by non-readers (Story 1)	-0.05	0.05	0.29	154
Percent listening comprehension answered correctly by non-readers (Story 2)	0.02	0.07	0.74	122
Decoding				
Percent letter correct	-0.01	0.01	0.42	1,731
Percent frequent/most used words correct	-0.01	0.02	0.51	1,731
Percent antonym correct	-0.02	0.02	0.30	1,731
Confirmation and fluency				
Percent of students who are self-reliant reader (Story1)	-0.02	0.02	0.47	1,731
Accuracy score with missing for non-readers (Story 1)	0.01	0.01	0.22	1,577
Fluency (Story 1)	1.01	2.53	0.69	1,577
Percent of comprehension questions, correctly by readers (Story 1)	0.01	0.01	0.71	1,577
Percent who answered more than 8 comprehensions correctly (all students) (Story 1)	-0.03	0.03	0.41	1,731
Percent of students who are self-reliant reader (Story 2)	-0.02	0.02	0.27	1,528
Accuracy score with missing for non-readers (Story 2)	0.00	0.01	0.48	1,406
Fluency (Story 2)	1.29	3.21	0.69	1,406
Percent of comprehension questions, correctly by readers (Story 2)	-0.01	0.02	0.73	1,528
Percent who answered more than 8 comprehensions correctly (Story 2) (all students)	-0.05	0.04	0.28	1,528

Source: Innovations for Poverty Actions (IPA). READ CORE AND READ CORE PLUS BANGLADESH ENDLINE REPORT USAID's Reading Enhancement for Advancing Development (READ) Activity November 2017 USAID/Bangladesh: Cooperative Agreement No. AID-388-A-13-00006, pgs. 28-29.

COST-EFFECTIVENESS METHODS

This section details the READ CEA. Included in this section are the research questions, data sources, and method. It also includes a more detailed discussion of the specific steps involved in the ingredients method.

RESEARCH QUESTIONS AND DATA TYPES

To evaluate the costs and effects associated with READ, the following research questions were designed:

- What is the cost of CORE incremental to the BAU comparison group?
    - What is the cost to obtain a one unit increase in reading achievement for students who received CORE?

- What is the cost of CORE PLUS incremental to the CORE control group?
    - What is the cost to obtain a one unit increase in reading achievement for students who received CORE PLUS?

To answer these research question, EPI evaluated the READ project from different perspectives and through different lenses. These are noted below:

Document Review—EPI conducted a review of previous SCI interventions related to literacy in Bangladesh. Most notably, the intervention involving PROTEEVA, a preschool literacy program, which had been implemented in some of the GPS schools. This provided EPI with important historical background to better understand how READ contributed to wider SCI objective of advancing literacy skills in pre-primary and primary students in Bangladesh and to be mindful that this prior SCI intervention could impact the current READ analysis.

READ Impact Studies—EPI reviewed the CORE/CORE PLUS baseline (Diazgranados et al., 2015), CORE/CORE PLUS midline (Diazgranados et al., 2016), CORE/CORE PLUS endline (IPA, 2017), and Government Primary School endline (DMA, 2018). These reports were of critical importance to EPI given the CEA was based on the results of the endline analysis.

READ CORE/CORE PLUS FOI Analysis (Qualitative)—The FOI analysis conducted by French (2018) for the CORE/CORE PLUS arm of the READ intervention was qualitative in nature. While the scope of this FOI analysis was limited and did not include detailed quantitative information, these findings informed EPI on some of the variation in implementation that SCI may have witnessed in the field and the possible effect on the CORE/CORE PLUS impact findings (French, 2018).

CORE/CORE PLUS FOI Data (Quantitative)—Quantitative FOI data were provided to EPI via SCI's proprietary data collection system called RIMES (READ Implementation Monitoring Evaluation System) or data were transmitted directly to EPI via email. For RIMES, SCI or their PGNOs collected and uploaded these data directly into the online system. Data

that were transmitted directly to EPI were done so most commonly using pre-formatted Excel spreadsheets. EPI evaluated these data extensively to inform the CEA.

CORE/CORE PLUS Price Data—SCI provided EPI with all price data and quantities that were used in the calculations. From the onset of the project, it was decided to use Bangladesh Taka and for SCI to provide cost data gathered in the field.

Taken together, these different types of data provided EPI with information regarding the wider READ intervention and SCI's previous work in Bangladesh.

INGREDIENTS METHOD

The CEA of the READ program utilizes the ingredients method (Levin et al., 2018). The method is widely considered to be a rigorous approach to conducting cost-effectiveness analysis (Rice, 1997; McEwan, 2002; Ross et. al, 2007; Harris, 2008) and the demand for rigorous cost-effectiveness studies that utilize the ingredients method has increased recently from the U.S. Department of Education's Institute for Education Sciences, the U.S. White House Office of Management and Budget, and USAID (Sparks, 2012; Bowden, 2014).

The ingredients method is rooted in the economic concept of opportunity cost. Every resource that is used in delivering an intervention has an associated economic value. Thus, the next best use for a resource is the opportunity cost of using that resource for a particular activity. In practice, this means that cost calculations include donated items and volunteer time. For example, the CRCs rely upon donated space to deliver CORE PLUS. In this analysis, a market value (i.e., estimated rent) was assigned to these donated spaces because the space was required for the program to operate. By using space for the intervention, the space was not available for any other (or the next best) alternative use. Thus, the ingredient is included as a cost, and documented as a cost that is borne by the community or families rather than the school. The CRC locations, even when not being used for teaching, housed trunks and teaching materials and were unavailable to be used for other purposes.

Additionally, the cost estimated here include all resources regardless of who paid for them because the intention of economic evaluation is to estimate the cost associated with replicating the production of effects of an intervention. Even though a resource, such as the CRC space, was donated by external stakeholders, the resource has a value that contributed to the production of the effect. This resource may not be donated in another context and thus would not be replicated successfully without including it in an estimation of the total cost to produce an effect. Therefore, to ensure the completeness of a cost estimate for expansion or replication, all resources are assigned an economic value and are used in cost calculations (Levin et al., 2018).

As shown in Table 6, there are four primary phases in conducting a cost-effectiveness analysis—preparation, implementation, analysis, and documentation. Within these four phases, there are four main steps involved in the ingredients method. These include identifying and collecting ingredients data, pricing ingredients, cost estimation, and cost-effectiveness (Levin et al., 2018). The following sub-sections discuss the four steps of the ingredients method and their application to the READ CEA.

Source: Adapted from Levin et al., 2018.

TABLE 6: COST-EFFECTIVENESS ANALYSIS PHASES AND INGREDIENTS METHOD STEPS	
PHASES	**INGREDIENTS METHOD STEPS**
Phase 1. Preparation	1.a. Define the program being evaluated
	1.b. Describe the effectiveness estimation strategy
	1.c. Establish a framework for the cost-effectiveness analysis
Phase 2. Implementation	2.a. Ingredients Method Step One (Part 1): Identifying ingredients
	2.b. Ingredients Method Step One (Part 2): Collecting ingredients data
Phase 3. Analysis	3.a. Ingredients Method Step Two: Pricing ingredients
	3.b. Ingredients Method Step Three: Cost estimation
	3.c. Ingredients Method Step Four: Cost-effectiveness
	3.d. Finalize data and analyses
Phase 4. Documentation	4.a. Reporting results

STEP 1—IDENTIFYING INGREDIENTS

The first step in the ingredients method is to identify the resources used in the intervention. Early in the project, EPI and SCI created cost categories to reflect READ's inputs. This project included the following cost categories— personnel, training, equipment and materials, facilities, other inputs, and management and oversight. These are shown in Table 7. Each category includes a brief description of the individual ingredients.

In the case of the CEA for READ, resources that are used for both BAU and CORE or CORE PLUS are excluded from this analysis. For example, GPSs organize mother's gatherings. These events would occur even if the READ program were not taking place. Therefore, while mother's gatherings were incorporated in READ as part of literacy instruction, these costs are excluded since they are not unique to this intervention. Only inputs unique to the intervention (i.e., CORE and CORE PLUS – those resources that are above and beyond BAU) were included in the CEA.

The personnel category includes the ingredients such as salary and benefits data for applicable staff. For example, a description of the average government public school assistant teacher was created in terms of education and years of experience and the average government salary was assigned. For parents participating in READ specific activities, a stay at home mother was assumed to be the parent participating in these activities and the price per hour was calculated similar to the price of a household worker. Schools assigned to CORE PLUS had the additional cost of the community literacy volunteers, who were employed through the READ program.

The training category includes the average cost for each training participant for each year and each type of training. For example, CORE and CORE PLUS assistant teachers and head teachers were trained on pedagogical instruction strategies for READ. Teachers were trained together to ensure that they received the same information with the same delivery mechanism.

The average cost for each training participant includes facility usage, food or beverages served, per diems, resources used during the training, etc.

Equipment and materials include all resources used in the implementation of READ. For all schools assigned to CORE and CORE PLUS, these equipment and materials include assessment sheets, instructional materials for teachers (not provided during training), learning materials for classroom use, registers, and SRM. Schools assigned to CORE PLUS had the additional costs associated with the CRC trunks which contained over 44 different items such as scripted lessons for the CLV, book banks and learning materials, posters to create a print rich environment, and games and activities.

Facilities includes those spaces where READ activities took place. In CORE and CORE PLUS schools, this includes the space provided for the reading corner in the schools. CORE PLUS schools had the additional cost associated with the CRC.

The category called other includes the expenses associated with the upazila reading festivals and was applicable to both CORE and CORE PLUS schools.

Management and oversight include personnel, facilities, materials and equipment (e.g., computers and laptops, furniture, logistics, motorcycles, and utilities). These management and oversight costs were described as equal for CORE and CORE PLUS schools, meaning that more management and oversight from SCI or PGNOs was not required for CORE PLUS over CORE or vice versa. Therefore, management and oversight costs incurred by SCI were applied equally among CORE and CORE PLUS schools. Determining the point of delineation between an intervention and management and oversight responsibilities is not clearly defined in CEA literature. In this research, EPI defined the point of delineation as "individuals whose activities directly influence the implementation of the intervention." As with the implementation price data, the management and oversight prices were provided by SCI.

TABLE 7: READ CATEGORY DESCRIPTIONS AND INGREDIENTS	
CATEGORY	**INGREDIENTS**
Personnel	Directorate of Primary Education
	Head Teachers
	Assistant Teachers
	School Management Committee/Parent Teacher Association or "Mother's Gatherings"
	Guest Storyteller
	Parents Awareness Session
	Reading Buddy
	Community Literacy Volunteers (CLV)
Training	Basic Academic Supervision (main and refresher)
	Instructional Adjustment Tools (main and refresher)
	Reading Instruction and Assessment (main and refresher)
	Coaching (teacher training, master training, coaching assistants/technical officers)

	M&E/MIS Training
	Community Literacy Volunteer (CLV)
Equipment and Materials	Supplementary Reading Material
	Instructional Materials/Teacher Resource Book
	Learning Materials (chart, card, primer, etc.)
	Book Bag
	Register
	Assessment Sheet
	Community Reading Camp Trunk (44 different types of materials)
Facilities	Reading Corner
	Land/spaces used for Community Reading Camp (CRC)
Other	Reading Festival
Management and Oversight	Personnel (Project Coordinator, Senior Technical Officer (STO)-Reading, Senior Technical Officer (STO)-M&E; Technical Officer (TO); Classroom Assistant (CA))
	Facilities (district and regional office space)
	Equipment and Materials (computers, laptops, motorcycles, furniture, logistics, etc.)
	Utilities (electricity, gas, water, internet, etc.)

STEP 2A—COLLECTING INGREDIENTS DATA

Once approved by institutional review board (IRB), EPI worked with SCI to draft, test, and refine the data collection instruments. (See Appendix 5 for a copy of the data collection tools). Because the studies were conducted on students younger than the age of 18 years of age, informed verbal consent of the head teacher at each READ treatment and control school was obtained. In addition, SCI and the PGNOs obtained verbal consent from each student before beginning interviews. Obtaining consent consists of informing the head teachers and students about the objectives of the study, their role, and the estimated interview time. All students were given a unique identification number by SCI to maintain anonymity (SCI, May 2018).[7] After the IRB was approved, the instruments were finalized, and consent was obtained, SCI PNGOs collected the specified data during the time of READ's implementation (i.e., 2015 through 2017).

Because CEAs estimate the cost to produce an impact on an outcome of interest, the analyses are intended to include resources that are actually used in delivering the intervention to reflect implementation (Levin et al., 2018). For example, in the READ intervention, meetings with GOB officials happened less regularly than originally designed. This CEA uses data from

---

[7] See Save the Children International. (2015). IRB Protocol. Submitted by Silvia Diazgranados through Harvard University,

implementation where available to estimate the costs associated with the actual delivery of READ rather than by design.

READ Price and usage data were collected from head teachers, assistant teachers, community literacy volunteers, and PNGOs. Special attention was paid to the units of each ingredient to minimize data collection errors.

The collected data were uploaded into RIMES. This READ specific data collection system created by SCI allows data to be collected from the field by SCI or their partner NGOs, entered with cellular devices through the internet, cleaned, and utilized for analysis. RIMES is a rich dataset that includes information on events, schools, and teachers, and student impact data. SCI provided EPI with data, as well as access to RIMES. In instances where question arose, EPI worked with the SCI READ implementation team and other program staff to estimate the usage of resources.

STEP 2B—PRICING INGREDIENTS

All of the price data, inclusive of implementation and management and oversight, were provided by SCI either through the online data tracking system RIMES or via email. Using Excel, EPI created one price worksheet and estimated the price for all CORE and CORE PLUS ingredients. For example, the price for the 44 items in the CRC trunks were costed out for the year in which the data were provided (e.g., 2015 prices) and then adjusted for inflation. EPI utilized CEIC as its source for Bangladesh's consumer price indices (CPI).[8] When the original price, or the nominal price, for an item is adjusted for inflation it is said to be expressed in real terms. In this research, all of the costs are expressed in 2017 real Bangladesh taka (BDT).

Additionally, equipment and materials that are used over time are amortized. Amortization is a necessary adjustment to appropriately account for the amount of resource used. This analysis utilized a five percent discount rate for all ingredients that have a useful life beyond one year. Then, each year of use is added to the cost of the program. For example, SRM and teacher instructional materials were amortized over three years using an amortization discount rate of five percent.

Estimating the total cost for a student participating in READ requires a present value calculation to account for multiple years of participation in the program. This calculation is important because costs that are incurred in the future are less of a burden than costs that are incurred today. Thus, costs beyond year one must be discounted back to the start of the program to accurately reflect the value of the program in full. This is because deferring project costs until later years allows the organization, in this case SCI, to have access to the resources for a longer period of time (Levin et al., 2018). This step is often missed in a CEA but is important to ensure accurate calculations. This analysis used a three and a half percent

---

[8] See https://www.ceicdata.com/en/bangladesh/consumer-and-producer-price-index-annual/bd-consumer-price-index

discount rate was used to calculate present value back to the time at which the program started. (See Appendix 6 for a detailed description of the data).

STEP 3—COST ESTIMATION

Costs are the product of the quantity of ingredients multiplied by the price value of each unit of ingredient. During implementation, the amount of an ingredient employed can differ dramatically from the way the program is designed and from year to year. Thus, it is important when possible to reflect as much as possible the ingredients, their descriptions, and quantities that correspond to what was delivered to students.

Within READ, a good example of an ingredient that is not as simple as one number multiplied by another is the time personnel devote to meetings about reading instruction through READ. The program is designed to include meetings between the head teacher and each assistant teacher three times per month throughout each school year. However, implementation data in the first year showed that on average head teachers provided feedback twice a month. These important data were collected through regular interviews conducted by PGNO staff with the READ head teachers. During the following year, head teachers provided instructional feedback to assistant teachers, on average, two and a half times per month. Thus, there is variation in costs due to these meetings in the form of increases in the head teacher time to provide feedback and in the assistant teachers in receiving feedback. This means that each year's implementation will have a specific average cost estimate. Data on variation in staff time allocated to READ is of particular importance because personnel time is typically the costliest category in educational interventions.

The average cost per student is intended to reflect the amount of total resource invested toward each student on average. While this also seems straightforward, the number of students who receive a program and the number of students a program is designed to serve are often not the equal. Also, attrition and mobility occur over time. These fluctuations in the number of students who receive a program create challenges for accurately estimating costs. In this analysis, for example, the CORE PLUS evaluation suffered serious attrition between the baseline and endline analyses. In addition to the is a limitation created by this attrition to detect an effect of the program, attrition also creates a cost estimation issue because the number of students served varied over time and from site to site.

An additional challenge in this analysis was that the effectiveness analyses followed a sample over time, which became substantially smaller than the actual number of students served by the program. For example, out of the millions of students served, the evaluation of the CORE (as compared to BAU) arm of READ had a sample size of 763 students. In the CORE as compared to CORE PLUS analysis, the sample size of CORE was 768 students and CORE PLUS was 687 students. These samples were each about 60% to 65% of the original sample.

In addition to estimating the total cost of a program, it is also important to understand how those costs were financed. Rarely does 100% of the cost burden fall on just one constituency group. Instead, various stakeholders such as parents, local school districts, federal agencies, etc. often share the societal cost of an intervention (Levin et al., 2018). In this analysis, EPI examined the distribution of the costs of CORE and CORE PLUS among communities, GOB, parents, and SCI. For clarity, a few examples are provided. The opportunity cost associated

with spaces provided for the CRCs was borne by communities because they were provided by community members or organizations. The time head teachers dedicated to providing feedback to teachers on READ instruction was allocated to the GOB, given that this activity took place during school hours and it is incremental to the intervention. The time parents spent participating in reading festivals was allocated to parents, and the costs for equipment and materials used in CORE and CORE PLUS (e.g., resources used by assistant teachers, community literacy volunteers, head teachers, and students) were assigned to SCI given the organization paid for these. Whoever bore the burden, whether the resource was donated, reallocated, or purchased, was assigned the associated cost of the input or activity.

STEP 4— COST-EFFECTIVENESS

The fourth and final step of the ingredients method is to pair costs with effects and generate a single CE ratio. This ratio is a tool for policymakers to use when selecting from alternative interventions with equivalent outcomes. For example, if provided with CE ratios for three math interventions targeting upper secondary students, policy makers could select the least costly alternative for a given level of effectiveness. To pair costs with effectiveness, the average per student cost is divided by the effect. The CE ratio then provides the cost per one unit increase in math (Levin et al., 2018). Cost-effectiveness can then be compared among alternative interventions with the same outcome measures (i.e., reading comprehension among grade III students). The CE ratios for CORE and CORE PLUS are discussed in more detail in the Cost-Effectiveness Analysis section.

COST-EFFECTIVENESS ANALYSIS

This section discusses the costs and effects associated with the two impact evaluations (i.e., GPS Endline and CORE/CORE PLUS) for SCI's READ intervention in Bangladesh. The costs and effects of CORE (incremental to BAU) in the GPS Endline and the costs and effects of CORE PLUS (incremental to CORE) in CORE/CORE PLUS are discussed. The section begins by detailing the cost findings for the GPS Endline and CORE/CORE PLUS inclusive of ingredients, per student costs, other description of costs (e.g., stakeholder burden), and sensitivity analysis. The section then describes the cost-effectiveness of the GPS Endline and CORE/CORE PLUS and concludes by noting the limitations associated with the cost analysis, effect estimations, and CE ratios.

READ GOVERNMENT PRIMARY SCHOOL ENDLINE COST ESTIMATES

TOTAL COST

The total cost is derived by multiplying the average cost per school assigned to CORE which is BDT 2,585,532 by the number of treatment schools being served by CORE (n=35). The total cost for the CORE intervention (i.e., from 2015 to 2017) was approximately BDT 90.5 million. See Table 8.

TABLE 8: TOTAL COST OF CORE INCREMENTAL TO BAU (2015-2017) (৳ BDT)	
Average Total Cost per CORE School (৳ BDT)	2,585,532
CORE Treatment Schools (n)	35
Total Cost of CORE (৳ BDT)	90,493,619

Notes:
a) Real 2017 Bangladesh Average Prices in BDT.
b) Material related costs are amortized over 3 years at 5.0 percent depreciation.
c) Management and oversight related costs are amortized equally across both CORE and CORE PLUS.
d) Equipment related costs utilized for management and oversight are amortized at 5 years at 5.0 percent depreciation.

AVERAGE COST PER STUDENT

To relate these costs to the effectiveness evaluation, we apply the average total cost per school estimate to the number of students served to obtain the average cost per student. This is the cost estimation used in the cost-effectiveness (CE) ratio below. As shown in Table 9, with 214 students served, the cost for each CORE student was approximately BDT 12,082. The number of students served represents the unique count of students in grades I, II, and III from 2015 to 2017. The reason all three grades are included in the students served count is because SCI and the partner PNGOs trained grades I, II, and III READ teachers at the same time. Therefore, students who were not in the impact sample still benefited from the READ inputs.

TABLE 9: CORE AVERAGE COST PER READ PARTICIPANT INCREMENTAL TO BAU (2015-2017) (৳ BDT)	
Average Total Cost per CORE school (৳ BDT)	2,585,532

CORE Student Participation (n)	214
Average Cost per Student (৳ BDT)	12,082

Notes:
a) Real 2017 Bangladesh Average Prices in BDT.
b) Material related costs are amortized over 3 years at 5.0 percent depreciation.
c) Management and oversight related costs are amortized equally across both CORE and CORE PLUS.
d) Equipment related costs utilized for management and oversight are amortized at 5 years at 5.0 percent depreciation.

COSTS BY CATEGORY

The costs by category for CORE (incremental to BAU) are shown below in Figure 2. (See also Appendix 7 for a category breakdown of BDT). Approximately 86% of the overall CORE costs stem from oversight and management costs related directly to READ's implementation. Recall that EPI defined the point of delineation as "individuals whose activities directly influence the implementation of the intervention."

Training CORE personnel accounted for about nine percent of the total cost. As previously described, these trainings included basic academic supervision (main and refresher), instructional adjustment tools (main and refresher), reading instruction and assessment (main and refresher), coaching (teacher training, master training, coaching assistants/technical officers), and M&E/MIS training.

The percentage of the total costs allocated for CORE personnel (i.e., Directorate of Primary Education Officials, head teachers, and assistant teachers) is estimated at three percent. All of the equipment and materials needed to implement CORE (e.g., assessment sheets, book bags, registers, supplementary reading materials, etc.) accounted for around one percent. Similarly, facilities include the spaces where the books were located in the schools and the category called "other" which pertains to reading festivals both represented less than one percent of the total costs.

CORE (incremental to BAU)

Personnel 3.2%
Training 9.3%
Equipment and Materials 0.6%
Facilities 0.6%
Other 0.4%
Management and Oversite 85.9%
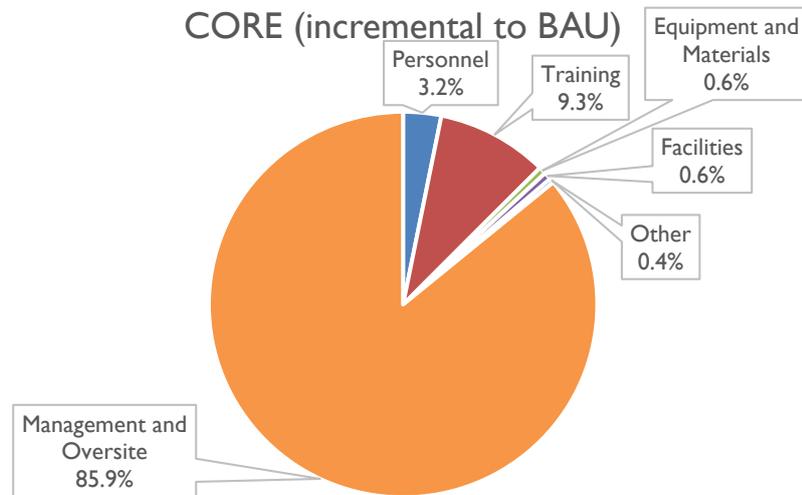
SENSITIVITY TESTING

This evaluation conducted a sensitivity test on the costs associated with the reading corners in the schools. If the assumption is made that there is no opportunity cost associated with the reading corners, the average cost per student declines from BDT 12,082 to BDT 12,007 for a difference of BDT 75.

READ CORE AND **CORE PLUS IMPACT EVALUATION COST ESTIMATES**

To estimate the incremental cost of CORE PLUS, the cost of CORE as delivered within the context of the effectiveness evaluation must be established. Thus, the analyses below find slight differences in the costs of READ CORE related to the RCT evaluation and the GPS Endline evaluation discussed above. The intent is to reflect as closely as possible the contrast between the CORE PLUS and CORE arms as delivered to estimate effects.

TOTAL COST

The total cost for CORE was approximately BDT 180 million and the total cost for CORE PLUS was estimated at BDT 186 million for the duration of the intervention (i.e., 2015 to 2017). These numbers were derived by multiplying the average cost per school by the number of schools in the intervention. For CORE, the average cost per school was BDT 2,576,731. See Table 10 below. This estimate differs from the total cost estimates for CORE (incremental to BAU) because schools assigned to the CORE evaluation arm of READ (incremental to BAU) implemented READ five months longer than schools assigned to the RCT arm of READ (i.e., CORE as compared to CORE PLUS).

The average total cost per CORE school was multiplied by 70 to obtain the total cost of BDT 180,371,182. For CORE PLUS, the average cost per school of BDT 2,653,861 was also

multiplied by 70 schools to obtain the total cost of BDT 185,770,266. The incremental difference of CORE PLUS is BDT 5,399,084.

TABLE 10: TOTAL COST OF CORE PLUS INCREMENTAL TO CORE (2015-2017) (৳ BDT)		
	CORE (Control)	CORE PLUS (Treatment)
Average Total Cost per CORE or CORE PLUS School (৳ BDT)	2,576,731	2,653,861
CORE or CORE PLUS Treatment Schools (n)	70	70
Total Cost of CORE or CORE PLUS (৳ BDT)	180,371,182	185,770,266
Incremental Difference (৳ BDT)	5,399,084	

*Slight variation due to rounding.
Notes:
a) Real 2017 Bangladesh Average Prices in BDT.
b) Material related costs are amortized over 3 years at 5.0 percent depreciation.
c) Management and oversight related costs are amortized equally across both CORE and CORE PLUS.
d) Equipment related costs utilized for management and oversight are amortized at 5 years at 5.0 percent depreciation.

AVERAGE COST PER STUDENT

Table 11 shows the average cost per student for CORE and CORE PLUS, and the incremental cost of CORE PLUS per student. To estimate the average cost per student, the average total cost per school is divided by the average number of students served per school. For CORE, BDT 2,576,731 was divided by the average number of students served per school from 2015 to 2017 (n=214) to calculate the average cost per student of BDT 12,041.

For CORE PLUS, two calculations were needed. First, the average total cost of the in-school portion of the intervention (i.e., CORE) was divided by the average number of students served to obtain an average per student price for the programming provided in school. Then, the total cost of the CRC portion of the intervention (i.e., the plus in CORE PLUS) was divided by the total number of CRC students served to obtain a per student cost for the CRC. Two calculations were necessary because the CRC served a subsample of the students within a given school. These two numbers were then summed together for an average cost per student

The in-school programming for CORE PLUS is approximately BDT 2,576,731 per school. This amount was divided by 257 students for an average per student cost of BDT 10,026. The CRC costs were approximately BDT 77,130 per CRC. This amount was divided by the average number of student participants per CRC (n=362) for a per student cost of BDT 213. The per student cost for the in-school and CRC portions of CORE PLUS were then summed for a total of BDT 10,239. Note that the average cost per student for CORE PLUS is less than the estimations for CORE despite total costs for CORE PLUS being higher. The reason for this difference is because CORE PLUS served a larger number of students. The incremental difference of CORE PLUS per student served is approximately BDT 1,802. This is the cost estimation used in the cost-effectiveness (CE) ratio below.

TABLE 11: CORE PLUS AVERAGE COST PER READ PARTICIPANT INCREMENTAL TO CORE

(2015-2017) (৳ BDT)						
	CORE (CONTROL)	**CORE PLUS (TREATMENT)**		**IN-SCHOOL PORTION**		**CRC PORTION**
Total Cost per CORE or CORE PLUS school (৳ BDT)	2,576,731	2,653,861	=	2,576,731	+	77,130
Total Student Participation (n)	214			257		362
Average Cost per Student (৳ BDT)	12,041	10,239	=	10,026	+	213
Incremental Difference between CORE and CORE PLUS (৳ BDT)		1,802				

Notes:
a) Real 2017 Bangladesh Average Prices in BDT.
b) Material related costs are amortized over 3 years at 5.0 percent depreciation.
c) Management and oversight related costs are amortized equally across both CORE and CORE PLUS.
d) Equipment related costs utilized for management and oversight are amortized at 5 years at 5.0 percent depreciation.

COSTS BY CATEGORY

Figure 3 below displays the costs for CORE and CORE PLUS. (See also Appendix 8 for a breakdown of BDT by category). Personnel costs were slightly higher for CORE PLUS, as compared to CORE, due to the additional staff required to implement the CRCs (i.e., guest storytellers, parent awareness sessions, and CLVs). No costs were allocated to reading buddies given the assumption that the shared reading took place during the time of the camps. In CORE, the percentage of the total costs allocated to personnel was approximately three percent and in CORE PLUS the percentage allocated to personnel was about four percent.

More equipment and materials were needed to implement CORE PLUS due to the CRCs. In CORE, the percentage of total costs devoted to equipment and materials was about a half of one percent while in CORE PLUS the percentage was one percent. This percentage difference represents the cost of the CRC trunks.

The amount of training needed to train the staff required to implement CORE PLUS varied minimally compared to CORE. Training for CORE and CORE PLUS personnel each required about 9% to 10% of the total cost.

For schools assigned to CORE, the percentage of total costs derived from facilities was about half of one percent. For CORE PLUS schools, this percentage is one point two percent. This difference is due to the opportunity costs allocated to the CRC spaces. The category other, which represents the reading festivals held in the upazilas, was the same for both CORE and CORE PLUS schools at about one percent of the total costs.

The percentage of total costs related to management and oversight for schools assigned to CORE PLUS was 86% and the percentage of total costs related to management and oversight for school assigned to CORE was 84%.

CORE

- Personnel, 3.0%
- Training, 9.3%
- Equipment and Materials, 0.6%
- Facilities, 0.5%
- Other, 0.4%
- Management and Oversite, 86.2%

CORE PLUS

- Personnel, 4.1%
- Training, 9.6%
- Equipment and Materials, 1.0%
- Facilities, 1.2%
- Other, 0.4%
- Management and Oversite, 83.7%
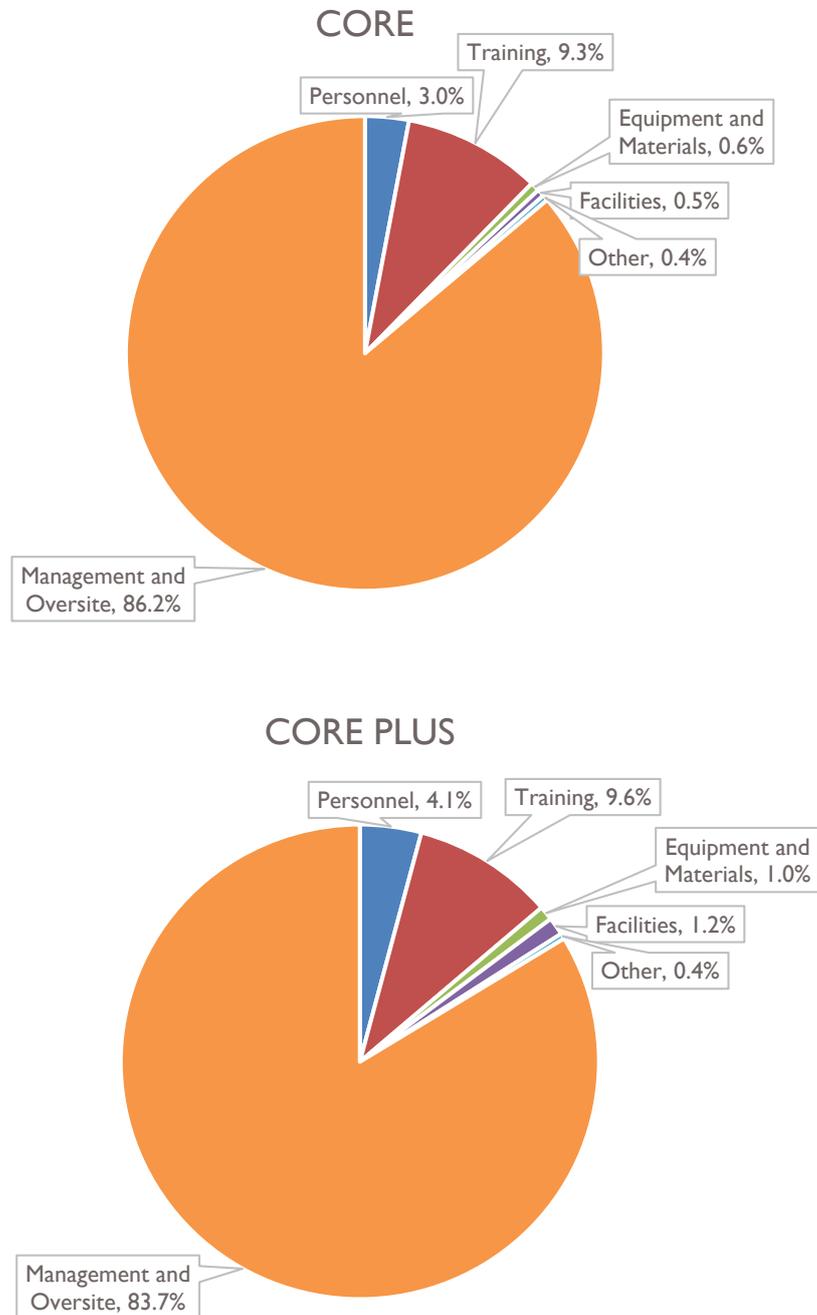
COST PER STAKEHOLDER

In addition to estimating total cost, this research also evaluated the distribution of the costs, or burden, on stakeholders such as communities, the GOB, parents, and SCI. Costs borne to schools and the GOB were bundled together as one stakeholder. The results are shown in Table 12. The cost borne to stakeholders for CORE PLUS varied slightly to CORE.

Communities and parents bore a slightly higher percentage of the total costs of CORE PLUS as opposed to CORE. For example, in CORE, communities carried less than one half of a percent and in CORE PLUS, communities borne about one percent of the total cost. This difference is due the costs of the CRC facilities, and the opportunity cost for guest storytellers. Similarly, parents incurred a slightly higher percentage of the total costs of CORE PLUS due to their opportunity cost for their participation in parent awareness sessions. For both CORE and CORE PLUS, SCI carried the majority of the financial burden. For CORE, SCI carried 96% of the burden and for CORE PLUS, they held 95% of the total cost burden. For CORE and CORE PLUS, the GOB remained relatively constant at approximately four percent of the total cost burden.

TABLE 12: CORE AND CORE PLUS—STAKEHOLDER COST PER SCHOOL (2015-2017) (৳ BDT)											
Ingredient	Total	Community	GOB	Parent	SCI		Total	Community	GOB	Parent	SCI
Personnel Total	**356**						**392**				
Directorate of Primary Education Officials			19						16		
Head Teachers			66						55		
Assistant Teachers			271						226		
SMC/PTA		-						-			
Guest Storyteller		-						4			
Parents Awareness Session				-						48	
Reading Buddy				-						-	
Community Literacy Volunteers					-						44
Equipment and Materials Total	**74**						**89**				
Supplementary reading materials (SRM)					33						28
Instructional materials/ Teachers resource book/ training manual					3						3
Learning materials (chart, card, primer, etc.)					4						4
Book bags in the school					8						7
Registers					1						1
Assessment sheet					24						20
CRC all Materials (Trunks)					-						28
Facilities-Total	**61**						**105**				
Reading corner in schools			61						50		
Land/ space uses for CRC		-						54			

Ingredient	Total	Community	GOB	Parent	SCI	Total	Community	GOB	Parent	SCI
Other Total	**47**					**39**				
Reading Festivals-Upazila		16	16	16			13	13	13	
Training Total	**1,124**					**975**				
Basic Academic Supervision Training					69					58
Instructional Adjustment Tools (IAT)					182					151
Reading Instruction & Assessment (RIA)					242					201
Coaching					142					118
School Management Committee (SMC) Orientation					443					369
Instructional Change Tool (ICT) Orientation					6					5
M&E/MIS Training					40					33
Community Literacy Volunteer (CLV) Training					-					39
Overhead	**10,379**					**8,643**				
All					10,379					8,643
Total Per Student	**12,041**	**16**	**432**	**16**	**11,577**	**10,242***	**71**	**360**	**61**	**9,751**
SLIP Money			56 (+/-)					56 (+/-)		
Net Cost per Student	**12,041**	**16**	**432**	**16**	**11,577**	**10,242***	**71**	**360**	**61**	**9,751**
Portion of Net Cost per Student (percent)		**0.1 percent**	**3.6 percent**	**0.1 percent**	**96.2 percent**		**0.7 percent**	**3.5 percent**	**0.6 percent**	**95.2 percent**

*Difference of 3 BDT (10,242-10,239) due to rounding.
Notes:
a) Real 2017 Bangladesh Average Prices in BDT.
b) Material related costs are amortized over 3 years at 5.0 percent depreciation.
c) Management and oversight related costs are amortized equally across both CORE and CORE PLUS.
d) Equipment related costs utilized for management and oversight are amortized at 5 years at 5.0 percent depreciation.
e) Total cost per student reflects the present value at 3.5 percent discount rate.

This research evaluated the average per student cost by varying the number of student participants and the implementation time of the CRCs.

While the number of students served, on average per CRC, was obtained from SCI RIMES data, the number appears to be higher than anticipated. For this sensitivity test, EPI divided the average number of student CRC participants in half to assess how sensitive the findings are to student count fluctuations. EPI found that if the average cost per student served per CRC is reduced from BDT 362 to BDT 181, the average cost per student served in the CRCs increased from BDT 213 to BDT 426. Overall, the incremental difference of CORE PLUS (as compared to CORE) decreased to BDT 1,588 (from BDT 1,802) or by 12%. This may suggest that the CRC pricing is relatively insensitive to changes in student CRC participation counts.

These findings point to low incremental cost of CORE PLUS (as compared to CORE). As previously discussed, the bulk of the financial burden is due to the management and oversight costs associated with READ's implementation. While speculative and subject to deeper analysis, SCI may consider if the cost associated with this aspect of READ's implementation is justified or if other management and oversight options exists that may be more cost-effective and impactful in terms of providing valuable feedback to assistant and head teachers. (See the Limitations of Costs discussed below).

COST-EFFECTIVENESS RATIOS OF GPS ENDLINE AND CORE/CORE PLUS

Table 13 details the results of the CE ratios for select READ outcomes. This analysis calculated CE ratios for six of the more prominent reading outcomes targeted by READ to illustrate how a cost-effectiveness ratio can be used to examine a program's efficiency. The best approach is to select the most policy relevant outcome based upon the theory of change. All other secondary outcomes, especially in reading, may mediate the primary outcome or are not as policy relevant. This analysis uses similar beginning sounds, ending rhyme in words, letter identification, most used words, fluency and comprehension.

The GPS Endline CE ratios varied from BDT 368 to BDT 715. For example, a one percentage point increase in ending rhyme in words costs approximately BDT 368 and a one percentage point increase in letter identification costs approximately BDT 715. These differences should be interpreted with caution as the total cost of the intervention is being applied to narrow outcomes. Given the wider applicability and generally recognizable meanings, the most likely outcomes to be policy relevant are reading comprehension, fluency, and self-reliant readers. A one percentage point increase in reading comprehension cost BDT 447 and a one percentage point increase in fluency cost about BDT 491. These results are applicable to all of the CORE students in the GPS impact evaluation and is not restricted to just students defined as "readers."

It costs approximately BDT 448 for each percentage point gain in students classified as "readers." This means that each additional reader costs approximately BDT 44,850 (USD 536).

The CORE/CORE PLUS CE ratios are not easily interpretable because the effectiveness estimates reported were not determined to be statistically significantly different from chance and most of the coefficients were negative. A CE ratio that is negative is not interpretable and should not be used to

compare CORE/CORE PLUS to other interventions. In addition, there are comparability issues between these two studies due to differences in approaches to estimating effectiveness and limitations in establishing causality.

LITERACY OUTCOME	GPS Endline CORE (Incremental to BAU)			CORE/CORE PLUS CORE PLUS (Incremental to CORE)		
Emergent Literacy Skills	Cost	Regression Coefficient	CE Ratio	Cost	Regression Coefficient	CE Ratio
Percent similar beginning words correct	12,082	29.06	416	1,802	-0.01	-
Percent ending rhyme in words correct	12,082	32.81	368	1,802	-0.01	-
Decoding						
Percent letter correct	12,082	16.91	715	1,802	-0.01	-
Percent frequent/most used words correct	12,082	24.93	485	1,802	-0.01	-
Confirmation and Fluency						
Percent of students who are self-reliant readers	12,082	26.94	448	1,802	-0.02	-
Fluency	12,082	24.59	491	1,802	1.29	1,394
Percent of comprehension questions, correctly answered by readers	12,082	27.04	447	1,802	0.01	360,309

READ CEA IN CONTEXT

While the READ CEA fills an important gap in the local Bangladesh context, situating it within the global community is a challenge. Attempts have been made to construct "league tables." The objective of these tables is to compile CEAs from various contexts into a single comprehensive tool (McEwan, 2012). However, these efforts have been met with notable hurdles. For example, as previously discussed in this research, experimental and non-experimental evaluations are fundamentally not comparable. Therefore, assimilating these two types of evaluations into a single table is erroneous.

However, even when one type of evaluation form is selected, for example RCTs, often the research papers lack the information necessary to conduct the needed adjustments. A common obstacle is that papers report CEA results in US dollars and lack information about the local currency (McEwan, 2012). This missing detailed information prohibits the necessary calculations into a single currency to allow for the comparison.

However, the most pressing question for CEAs relates to external validity. Whether the incremental costs and effects of an intervention in one context can be generalized to another context is the most fundamental question for any CEA comparison (McEwan, 2012).

Take for example, a USAID funded literacy software package called Vernacular. Vernacular was designed to address literacy instruction challenges found in Zambian community schools (USAID, ND, pg. 5). Using the ingredients method, the authors found the cost for one percentage point increase in comprehension is USD 250 (pg. 20). However, the CEs were highly sensitive to the cost fluctuations of the computer tablets. Subsequent simulations provided in the paper show that using much less expensive tablets decreased the cost for one percentage point increase in comprehension to USD 40 and, if the tables were used across four classes with four students per tablet and three years of use, the same CE ratio decreases to USD 5.50 (pgs. 20-21). Comparing this study to READ is problematic for a host of reasons. For example, it does not provide information on the local currency or detailed information the costs per category. Also, the authors note that the sample is not representative of the general population but more specifically, it represents community schools in close proximity to Lusaka. This means that the authors question the generalizability of the intervention within Zambia and therefore drawing cross-country conclusions would be ill advised.

The most reliable and accurate CE comparisons take place within an intervention designed for this purpose within a specific context. EPI suggests a causal analysis of the impact of READ that includes corresponding analysis of costs and implementation. This would provide valid information regarding the effects, efficiency, and replicability of READ and more directly contribute to policy making decisions in Bangladesh.

LIMITATIONS OF COSTS

While steps were taken to ensure rigor, this research is not without limitations. They are as follows.

Some of the fidelity of implementation endline data showed wide variation. As a result, EPI, in conjunction with SCI, worked together to make assumptions regarding these aspects of the implementation. While EPI made every effort to diligently detail each assumption and confer with SCI on the accuracy of these assumptions, they still may not reflect the actual usage of resources or implementation at the site level.

Some of the ingredients data were collected from SCI budgets and not from external market sources such as indices and government reports. The ingredients method states that price data be gathered from external market sources because budgetary data may not be reflective of market values (Levin et al, 2018).

Cost and pricing data from CORE schools in the CORE/CORE PLUS arm of the intervention were applied to the CORE schools in the GPS Endline. While both groups of schools are CORE, resource usage may have varied between the two arms of the intervention.

The oversight and management data were estimations from GPS that were previously designated as NNPS. As a result, these estimations may not reflect the average per school cost due to unforeseen variation in the oversight and management needs of previous NNPS converted to GPS (as compared to schools that had always been designed at GPS). Also, these data were obtained from one SCI PNGO and may not represent the average per school estimation across the READ sample.

LIMITATIONS OF EFFECTS

The effectiveness analyses conducted by SCI each have limitations that are noteworthy in CEA. First, both analyses are limited in inference and thus do not provide rigorous, internally valid, estimates of

the impacts GPS Endline and CORE/CORE PLUS on reading skill development. Another limitation is that there are many outcomes being measured without adjusting for the increased likelihood of finding an effect erroneously when testing for multiple outcomes. Future analyses would be improved by setting out a rigorous causal design that focused on one or two primary outcomes of interest and conducting the implementation carefully to maintain the design of the evaluation. One example is that the GPS report relies upon a repeated cross-section design for sampling and reports regression results that compare performance in grade III students without adjusting for prior achievement levels. While the analysis options were limited, future evaluations must be protected so that the effects are detectable and precise estimates of changes in student learning due to the program.

CONCLUSIONS & CONSIDERATIONS

This cost-effectiveness analysis evaluated the costs associated with the SCI READ interventions delivered and evaluated for effectiveness in Bangladesh. Four important aspects of this evaluation are noted below for consideration.

First, SCI worked diligently to structure READ within the existing GOB education system. The benefit of this approach is that sustainability was a major consideration and incorporated into the design of the program. The drawback to this approach is that working within the GOB education system means that shifts in policy or changes to school structure (i.e., variation to BAU) affect READ and this evaluation. These aspects are critical when considering expanding interventions.

The cost estimates reported here reflect a large investment from SCI for oversight and management. The involvement of SCI was likely critical for this initial delivery of READ. The program was newly designed and tailored to the Bangladesh context at the time the evaluation was conducted. Thus, the estimates listed here may not reflect the resource allocation required to sustain the program over time. If the program's oversight were changed, the costs and effects would require additional examination.

Second, the absence of statistically significant findings on the CORE/CORE PLUS arm of READ should not diminish its value without further consideration. There are at least three potential reasons why the CORE/CORE PLUS results may have been inconclusive. First, there could be statistical reasons. For example, the reduction in sample sizes over time may have compromised statistical power. Second, the timeline of delivery was not uniformed. Moving the needle on student achievement outcomes is often not a quick fix and may require more time than a short-term program might allow. Third, the inconclusive findings may be related to dosage or time in practice for the teaching staff. For example, the intervention may have taken some time to "settle in" and the impact may have been measured too soon after teachers were asked to substantially shift the way that they teach and engage students in the classroom. EPI recommends exploring the effects of READ further.

Third, as SCI continues to retrospectively evaluate READ and use the valuable findings and lessons learned to structure future literacy interventions, it may be beneficial to the SCI Bangladesh team to foster a dialog with organizations that have had similar interventions. Take for example, Pratham's READ India intervention. READ India was structured as an RCT, it was implemented in government public schools, and it contained in-school and out-of-school components (Banerjee et al., 2010; Poverty Action Lab 2011; Banerjee et al., 2016). Engaging in cross contextual conversations may provide deeper insight to Pratham and SCI (as compared to individual retrospection and analysis) and could lead to increased efficiency in scale up efforts in both countries. The lessons to be learned from READ can go far in informing future SCI interventions and contributing to the continued positive improvements in the lives of the Bangladeshi children.

Finally, EPI suggests a causal analysis of the impact of READ that includes corresponding analysis of costs and implementation. This would provide valid information regarding the effects, efficiency, and replicability of READ. High quality implementation evaluations are important because CEAs rely on detailed dosage, or exposure data, to calculate the costs for all of the resources used. An abbreviated qualitative implementation analysis was conducted on READ but a more comprehensive

quantitatively focused implementation analysis could inform a more detailed cost analysis (e.g. investigating geographic variation).

For example, currently SCI is exploring new READ implementation models with encouraging results. Qualitative evidence provides support for community interest in the community reading camps and local investment in the program (French, 2018). Additionally, more tailored and targeted approaches to the CRCs have yielded 20,201 (out of 30,630) grade II children and 15,378 (out of 22,480) grade III children reaching the reader threshold (SCI, April 2018). Using the recommendations previously suggested, these encouraging findings serve as evidence for a rigorous causal analysis, especially of the newly tailored CRC component, complete with thorough implementation and cost analyses.

REFERENCES

Annie E. Casey Foundation. (2010). Early Warning: Why Reading By the End of Third Grade Matters. Baltimore, MD, USA: Annie E. Casey Foundation. Retrieved from: http://www.aecf.org/m/resourcedoc/AECF-Early_Warning_Full_Report-2010.pdf

Banerjee, A., Banerji, R., Duflo, E., Glennerster, R., and Khemani, S. (2010). Pitfalls of Participatory Programs: Evidence from a Randomized Evaluation in Education in India. American Economic Journal: Economic Policy, 2:1, 1–30. Retrieved from: https://economics.mit.edu/files/3117

Banerjee, A., Banerji, R., Berry, J., Duflo, E., Kannan, H., Mukerji, S., Shotland, M., and Walton, M. (2016). Mainstreaming an Effective Intervention: Evidence from Randomized Evaluations of "Teaching at the Right Level" in India. Retrieved from: https://www.povertyactionlab.org/sites/default/files/publications/TaRL_Paper_August2016.pdf

Bangladesh Bureau of Statistics (2017). Report on Bangladesh Sample Vital Statistics 2016. Retrieved from: http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/6a40a397_6ef7_48a3_80b3_78b8d1223e3f/SVRS_REPORT_2016.pdf

Bowden, A.B. (2014). Estimating the Cost-Effectiveness of a National Program that Impacts High School Graduation and Postsecondary Enrollment. Columbia University. Retrieved from: http://academiccommons.columbia.edu/catalog/ac:176175

Crouch, L. (2012). Why Early Grade Reading: An Economist's Perspective. Presentation given at 'All Children Reading Workshop', Kigali, Rwanda, 28 February 2012.

Cunningham, A.E., and Stanovich, K.E. (1997). Early reading acquisition and its relation to reading experience and ability 10 years later. Developmental Psychology, Vol 33(6), Nov 1997, 934-945. Retrieved from: http://dx.doi.org/10.1037/0012-1649.33.6.934

Data Management Aid (DMA). ENDLINE EVALUATION OF READING OUTCOMES IN GOVERNMENT PRIMARY SCHOOLS (GPS) USAID's Reading Enhancement for Advancing Development (READ) Activity August 2018 USAID/Bangladesh: Cooperative Agreement No. AID-388-A-13-00006

Diazgranados, S., Gertsch, L., Guajardo, J., & Hossain, A. (2016). READ Core and READ Core Plus: Bangladesh Midline. Dhaka: Save the Children International.

Diazgranados, S., Hossain, A., Gertsch, L., & Guajardo, J. (2015). Read Core and Read Core Plus: Bangladesh Baseline. Dhaka: Save the Children International.

Educational Policy Institute. (2015). READ Project Notes.

Educational Policy Institute (2017). Intervention notes taken in Dhaka.

French, S. (2018). READ BANGLADESH: An Examination of Fidelity of Implementation. Dhaka: Save the Children International.

Government of the People's Republic of Bangladesh Directorate of Primary Education (2016). The National Student Assessment of 2015 Grades 3 and 5. Retrieved from:

https://dpe.portal.gov.bd/sites/default/files/files/dpe.portal.gov.bd/publications/321cf422_f7b1_469c_a4f4_66fedc8a4e0f/NSA percent202015 percent20Report.pdf

Harris, D. N. (2008). Toward Policy-Relevant Benchmarks for Interpreting Effect Sizes: Combining Effects with Costs. *Educational Evaluation and Policy Analysis*, 31(1), p. 3-29.

Innovations for Poverty Actions (IPA). READ CORE AND READ CORE PLUS BANGLADESH ENDLINE REPORT USAID's Reading Enhancement for Advancing Development (READ) Activity November 2017 USAID/Bangladesh: Cooperative Agreement No. AID-388-A-13-00006

INNOVISION Consulting Ltd. Evaluation Report: Khagrachari USAID's Reading Enhancement for Advancing Development (READ) Activity July 2018 USAID/Bangladesh: Cooperative Agreement No. AID-388-A-13-00006 *INNOVISION Consulting Ltd.*

Levin, H. M. (1975). Cost-effectiveness analysis in evaluation research. In M. Guttentag, & E. L. Struening (Eds.), *Handbook of evaluation research (Volume 2)*. Beverly Hills, CA: Sage.

Levin, H.M., Glass, G.V., and Meister, G.R. (1987). Cost-effectiveness of computer-assisted instruction. *Evaluation Review*, 11 (1), 50–72.

Levin, H. M. (2013). Cost-Effectiveness Evaluation in Education. In Marvin Alkin (Ed.), *Evaluation Roots: A Wider Perspective of Theorists' Views and Influences*, Second Edition, p. 180-188. Thousand Oaks: Sage Publications.

Levin, H.M. & McEwan, P.J. (2001). *Cost-Effectiveness Analysis: Methods and Applications, 2nd Edition*. Sage Publications: Thousand Oaks, CA.

Loeb, S. and McEwan, P.J. (2010). Education reforms. *In*: P.B. Levine and D.J. Zimmerman, eds. *Targeting investments in children: fighting poverty when resources are limited*. Chicago: University of Chicago Press, 145–178.

McEwan, P.J. (2002). Are cost-effectiveness methods used correctly? In Levin, H.M. & McEwan, P.J. (Eds.), *Cost-Effectiveness and Educational Policy: 2002 Yearbook of the American Education Finance Association* (p.37-53). Eye on Education: Larchmont, NY.

McEwan, P.J. (2012). Cost-effectiveness analysis of education and health interventions in developing counties. *Journal of Development Effectiveness,* 4 (2), p. 189-213.

Poverty Action Lab. (2011). What helps children to learn? Evaluation of Pratham's Read India program in Bihar & Uttarakhand. Retrieved from: https://www.povertyactionlab.org/sites/default/files/publications/Read%20India%2C%20What%20helps%20children%20to%20learn.pdf

Rice, J.K. (1997). Cost analysis in education: Paradox and Possibility. *Educational Evaluation and Policy Analysis*, 19(4), p. 309-317.

Ross, J.A., Barkaoui, K., & Scott, G. (2007). Evaluations that consider the cost of educational programs: The contribution of high quality studies. *American Journal of Evaluation*, 28(4), p. 477-492.

Save the Children International. (April 2018). Quarterly Performance Monitoring Report—USAID's Reading Enhancement for Advancing Development (READ) Activity January 2018-March 2018. Dhaka: USAID.

Sparks, S.D. (2012). OMB pushes more-rigorous program evaluations. *Education Week: News in Brief*, June 6th, 2012.

Tobin, J. (1958). Estimation of Relationships for Limited Dependent Variables. *Econometrica*, 26(1), p. 24-36. Retrieved from: https://web.sonoma.edu/users/c/cuellar/econ411/Tobin.pdf

Save the Children International/Educational Policy Institute. Contract Agreement. Tender Ref: RFP/SCI/BDCO/FY-17/00031; Contract No. Contract/SCI/BDCO/FY-17/00005.

UNESCO Institute for Statistics (UIS). (2018). Retrieved from: http://uis.unesco.org/country/BD

Urquiola, M.S. (2006). Identifying class size effects in developing countries: evidence from rural schools in Bolivia. *Review of Economics and Statistics*, 88 (1), p. 171-177.

USAID. (ND). Vernacular Evaluation Report: A Cost-Effectiveness Study of ICE in Zambian Community Schools. Retrieved from: http://idd.edc.org/sites/idd.edc.org/files/Vernacular%20Zambia%20RCT%20Evaluation%20Report.pdf

APPENDIX 1: READ LOGIC MAP
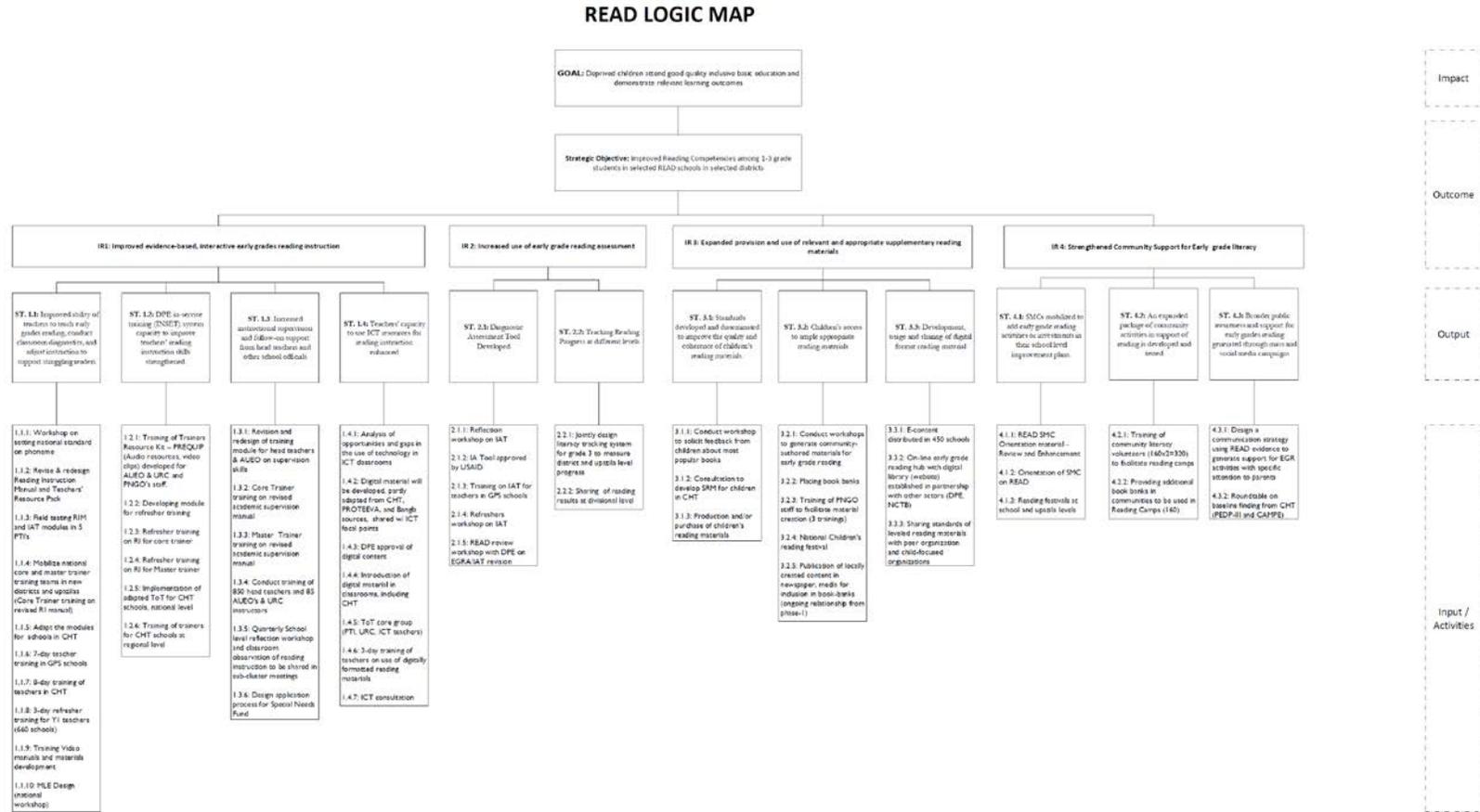
Source: Provided to EPI from SCI email on or around April 9, 2015.

APPENDIX 2: FIDELITY OF IMPLEMENTATION FINDINGS

French (2018) conducted an FOI evaluation on the CORE PLUS arm of READ. Findings from this analysis are presented here to provide additional information about the delivery of READ that may relate to the results of the impact analysis. Specifically, because CEAs rely heavily on how an intervention was implemented, this analysis provides insightful qualitative information about implementation and school-level decisions that could have adjusted READ from how it was designed. The FOI analysis was conducted on a sub-sample (i.e., 11 GPS schools in three districts) of the overall RCT sample (pg. 12).

First, French (2018) found that in some instances buy-in to READ in the schools and the purpose of the CRCs lagged. In the schools, some teachers needed additional time to understand, accept, and implement READ and in the communities, some community members did not understand the purpose of the camps and therefore, did not initially send their children. However, in both cases, teachers' and community members' acceptance of READ increased substantially once the purpose was clarified.

Second, the FOI analysis (French, 2018) found that the respondents showed a high level of enthusiasm about READ. This enthusiasm was witnessed in their use of materials in the classroom, request for more training, and suggested ideas to SCI about READ. For example, teachers suggested that the print rich materials be located in classrooms other than those that just receive the intervention. Teachers believed that this might generate greater interest and excitement for reading throughout the school.

However, French (2018) also found that some larger schools did not have enough READ materials. The shortage of materials included supplementary reading materials (SRM) and print rich environment supplies. In instances where there was a shortage of SRMs, students shared books. In instances where there was not enough print rich environment supplies, schools and teachers needed to decide which in which areas of the school the materials would be hung. This led to some classrooms being filled with READ's print rich materials and other classrooms being sparsely decorated. The delay some schools experience in receiving the READ materials may have contributed to a delay in READ's implementation or, if the materials did not arrive, READ not being implemented as designed for the duration of the intervention in these schools (French, 2018).

Fourth, larger schools need more support from the classroom assistants (CA). CAs are critical to the success of the READ intervention. They visit schools and provide assistant teachers with support as they implement the READ pedagogy and conduct the instructional assessment tool (IAT). As scheduled, the CA visited each school once a week. However, larger school requested that CAs visit more often and provide support (French, 2018). This positive request demonstrates the importance teachers placed on CAs and their desire to implement READ in a more complete manner than they would without the CAs.

Fifth, the reading corners may not have been used as designed. For example, the FOI research found that in some schools students were not allowed to take books home in an attempt to keep the READ materials "safe" and "newer" (French, 2018 pg. 17) and some schools opted to allow

struggling readers to check out books or older students (i.e., in grade III) who might better care for the books than their younger grade I and grade II peers (French, 2018).

Sixth, interestingly, French (2018) found that assistant teachers reported that they did not have enough time available in their day for free reading. Given that the GOB allocated time in the school day schedule for free reading, more research on this is warranted.

Seventh, the teachers felt that they did not receive enough training on READ. The FOI study revealed that teachers expressed enthusiasm for the READ trainings and that they were beneficial. However, they emphasized the need for more refresher trainings to help them use the READ strategies and materials as planned. This level of enthusiasm suggests that attendance could be well attended should future READ trainings be held (French, 2018).
Finally, with regard to the CRCs, French (2018) found that CRC attendance was dependent upon the weather. CRCs that were in non-sheltered locations were necessarily cancelled or if the CRC was in a sheltered location, attendance would wane during the rainy season.

These eight findings, albeit on a limited research sample, may help explain the inconclusive CORE PLUS findings and serve to inform SCI about implementation and school level READ adjustments for future projects.

APPENDIX 3: CORE AND CORE PLUS TIMELINES

The Bangladesh education calendar begins in January and ends in December with breaks in December, January, and February.

CORE IMPLEMENTATION TIMELINE						
School Type	**Intervention Arm**	**2015**		**2016**	**2017**	**2018**
		J F M A M J J A S O N D		J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A
CORE	BAU	B				E
	CORE	B				E

Testing-Baseline and Endline	Break-No School	Read Implemented

READ CORE AND CORE PLUS IMPLEMENTATION TIMELINE						
School Type	**Intervention Arm**	**2015**		**2016**	**2017**	**2018**
		J F M A M J J A S O N D		J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A
CORE PLUS	CORE	B			E	
	CORE PLUS	B			E	

Testing-Baseline and Endline	Break-No School	Read Implemented

Note: CRCs ran for some portion of the summer months.

APPENDIX 4: CORE VARIABLES

KEY VARIABLES (SOCIO-DEMOGRAPHIC, EDUCATION BACKGROUND, HOME LEARNING ENVIRONMENT AND READING ASSESSMENT)	
SOCIO-DEMOGRAPHIC VARIABLES*	**EDUCATION BACKGROUND VARIABLES**
• Age • **Sex** • Number of family members • **Household assets**	• ECD (pre-primary education) • Change of School • Grade repetition
HOME LEARNING ENVIRONMENT VARIABLES	**READING ASSESSMENT VARIABLES**
• Reading time • House tutor • Chores • Story-telling and family members reading to the children and encouraging them to study • Children seeing their family members read • Availability of other reading materials	• **Alphabet knowledge** • **Identifying most used words** • **Detecting similar beginning sounds** • **Detecting rhyming sounds** • **Vocabulary (most used words in grade level Bangla book)** • **Reading fluency** • **Reading accuracy** • **Reading comprehension**

*Grade was also controlled for.

Source: Data Management Aid (DMA). ENDLINE EVALUATION OF READING OUTCOMES IN GOVERNMENT PRIMARY SCHOOLS (GPS) USAID's Reading Enhancement for Advancing Development (READ) Activity August 2018 USAID/Bangladesh: Cooperative Agreement No. AID-388-A-13-00006, pgs. 17-18.

APPENDIX 5: DATA COLLECTION INSTRUMENTS

READ Cost-Effectiveness Study

Interview Protocol

To the interviewer: This document will serve as a guide for you to conduct interviews with individuals affiliated with programs and evaluations included in our study. Some of the interviews will be iterative, meaning that you will develop additional questions as you obtain answers to the questions suggested below. Please take clear notes and be sure to be kind and considerate. Smile! It will come through in your voice.

Document Check

Be sure that you have given the individual a copy of the informed consent document and that you have a signed copy of the participant's rights form on file before conducting the interview. We may be able to send an email and ask them to respond by email.

Introduction

READ Cost-Effectiveness Study

Describe study briefly

All responses will be anonymous and confidential as per IRB protocol

Describe Ingredients method

Our main interest is to figure out what resources (or "ingredients") were used to implement the program, e.g., amount of training, and materials needed to deliver the program.

Provide cooking example to help to explain the reason why we are asking for details. Remember we need to identify resources needed for successful replication.

Program name: READ School and Community Based Intervention

Site served: Interview date:

Start time: End time:

Interviewer name: Tel. number called:

Interviewee name: Current position:

Opening Questions

What is your current connection with READ?

How many students are served at this site? Can you please provide number of students served from each grade level?

Please provide a general description of the activities READ entailed at your site. Did the activity serve the entire class, or some sub-set of students? Were students pulled out of class?

Over how many weeks did the program occur? How often did each activity occur? For how long each time? When? Was it all during the school day, or at least in part during times outside of regular school hours, like nights, weekends, or summers?

Where did each activity occur? Specifically, were the students in their regular classrooms, or some other location?

Who was directly involved in each activity? Were any personnel required above and beyond what would be required for ordinary classroom instruction?

Personnel

The questions listed below are intended to gather detailed data on personnel.

We are interested in all personnel involved in the program – planning, implementing (i.e., actually delivering the services), supervising, or volunteering.

School

Administration

What was the principal's role in the program? (meetings, professional development, scheduling, student selection, etc.)

How much time did the principal spend on the program during the evaluation period?

What are the principal's qualifications? (e.g., degree, years of experience) How long has the principal (or other administrators involved in the program) been at the school? Does tenure at the school impact the principal's ability to administer the program effectively?

Teachers

Were teachers involved the program? How so?

How much time did the teacher spend on the program during the evaluation period?

Were teachers asked to identify students to participate in the program? How did they identify students? About how much time did this take?

How were teachers selected to participate in the program?

Can you think of any special qualifications or characteristics about the teachers selected to implement the program? Did the program require teachers to have a particular level of experience to successfully implement it?

Volunteers

Were any volunteers involved?

How often did they volunteer and for how long?

Did the volunteers need any special qualifications, or experience?

Other School-level Personnel

Were there any other personnel at the school involved in providing the program?

Ask for quantities and descriptions of each if necessary.

District

Were there any personnel in the school district involved in the implementation of the program?

If so, who was involved in the program at the district level? Role in the program? Time spent on the program? (hours per week, percentage, etc.) If appropriate, ask about background requirements (qualifications, years of experience) for the position.

Was there anyone else who was part of the program at the district level?

At the district level, what office space and equipment was provided for people who worked on the program?

What percentage of the time was that space used by the program? (Try to identify the square feet of the space)

What training did the individuals in these positions receive? Did training occur in multiple years? Did the individuals in these positions provide training to others?

Training

Was any training provided by the program to any of the personnel before and during the evaluation period?

Who did the training? What were the trainers' qualifications?

How were personnel trained before and during the evaluation period?

> Duration? Timing - was it during the school day or after-school/summer training? What facilities were used and where? If off site - lodging, travel, per diem? What materials and equipment were used?

How often are the personnel required to renew the same level of training?

Materials and equipment

What materials, such as student workbooks, teacher manuals, and school or office supplies, were required for the program?

How many of each were required?

How often did they need to be replaced - for each, was it something that you needed to purchase once, or did it need to be replenished on a regular basis?

Did the program require the use of computers?

If so, how many computers were required, for how long, and how often?

Were the computers in any sort of specialized location, like a lab, or were they located in the classroom?

Did the program receive any contributed donations of materials, supplies, or equipment? If so, what donated materials were used by the program?

Facilities

Did the program take place in any location besides the regular classroom, or did it require the use of the classroom beyond the time ordinarily used for class?

> If so, what spaces were required - for instance, a smaller classroom or office for small-group instruction or tutoring? How often were these spaces used, and how large were they?

At the school level, what office space and equipment were provided for people who work on the program? (Try to identify the square feet of the space)

What percentage of the time was that space used by the program?

Did the program require use of any other office space, storage space, or meeting space at the school for administration or training purposes? If so, what spaces, how large were they, and how often?

Other questions

Did the program involve any travel for personnel or students? If so, who traveled, to where, using what mode of transportation, how often?

Did the program provide any additional goods or services to student participants, for example, as rewards or incentives for performance? This may include small prizes, food, field trips, movie tickets, etc.

Did the program require any inputs from students' families? For example, did parents need to come in for additional conferences?

Are there any other aspects of the program - including resources paid for by the school and other donated goods and services - that we haven't covered?

Do you have any additional cost or budget data about this program?

Do you have any idea how much of the program cost was paid for by different agencies?

APPENDIX 6: DESCRIPTION OF DATA

The portion of the READ program (i.e., CORE as compared to BAU and CORE as compared to CORE PLUS) being evaluated was implemented from 2015 to 2017. The prices used are average national Bangladesh prices and are expressed in 2017 BDT unless otherwise noted. EPI utilized CEIC as the consumer price indices (CPI). All prices, years of purchase, and usage were provided by SCI. The categories of ingredients include personnel, training, equipment and materials, facilities, other, management and oversight, and school level improvement plans (SLIP) money.

1. Personnel

The personnel included in this analysis include individuals at the ministry level and school level. At the ministerial level, there are Directorate of Primary Education Officials. At the school level, there are head teachers, assistant teachers, guest storytellers, parents, and community literacy volunteers.

1.1. Directorate of Primary Education Officials
This study included time spent by Directorate of Primary Education Officials in RAC, M&E TEG, and ICT Sub-Committee meetings. For RAC meetings, there were three held in each 2015, 2016, and 2017. The cost for each meeting was 39,228 BDT. This per school cost was applied to the CORE and CORE PLUS arms of the intervention. The M&E TEG and ICT Sub-Committee meetings were also held 3 times in each 2015, 2016, and 2017. The cost per meeting was 13,394 BDT. This per school amount was also applied to the CORE and CORE PLUS arms of the intervention.

1.2. Head Teacher
The time spent by head teachers pertains to the READ specific academic supervision provided to assistant teachers. Academic supervision is comprised of the head teacher spending 45 minutes observing an assistant teacher in the classroom and then providing 15 minutes of feedback to the assistant teacher. Head teachers with B.com/BA/B.SC or similar degree and 10 years of experience make on average 46,084 BDT per month for 12 months or 553,003 BDT per year. Each head teacher works for 1,800 BDT per hour per year and therefore, makes, on average, 307 BDT per hour.

Per SCI, in 2015, each head teacher provided academic supervision two times a month for each month READ was implemented. In 2016, each head teacher provided academic supervision 2.5 times on average for each month READ was implemented. In 2017, each head teacher provided academic supervision on average 2.5 times per month for each month the project was implemented.

1.3. Assistant Teacher
The time spent by assistant teachers is comprised of reading instruction, IAT assessment, time dedicated to the reading corner, and feedback from the head teacher. Assistant teachers with a B.com/BA/B.Sc or similar degree and 10 years of experience earn on average 35,837 BDT per month for 12 months or 430,045 BDT per year. Each assistant teacher works 1,800 BDT per hour per year and therefore, makes, on average, 239 BDT per hour.

The 40 minutes of READ instruction per school day was not included in the analysis as this would take place in the absence of READ, meaning that it is not unique to the intervention. No additional time was allocated for time in the reading corner. It is assumed that the reading corner was utilized during instruction time.

Time allocated by assistant teachers for receiving academic feedback is assumed to match the time spent by head teachers providing academic supervision.

Time for IAT assessment was calculated at 2 assistant teachers, for 2 days, 6 hours per day, 3 times per year for each year of the intervention multiplied by the Assistant Teacher per hour price.

1.4. School Management Committee/Parent Teacher Association
No time was allocated for SMC/PTA time as it is assumed that these meetings would take place in the absence of READ. Not unique to the intervention.

1.5. Guest Storyteller
This is a component specific to CORE PLUS schools. Assuming each of the CORE PLUS schools had one CRC. Assuming that the guest storytellers read stories two times per month for 30 minutes for each month READ was implemented. Assuming the same price as a tutor 56 BDT per hour.

1.6. Parent Awareness Sessions
This is unique to CORE PLUS schools. Assuming the price of a domestic worker or 16 BDT per hour. One 90 minute session per month with 30 parents per session for each month the CRCs were being held across all years.

1.7. Community Literacy Volunteers (CLV)
If the CLV was not working, he/she was paid an honorarium of 726 BDT for 16 hours per month of work (45 BDT per hour). If the CLV was working, it is assumed that they are paid the same as a tutor, 56 BDT per hour. Because the tutor wages are higher than the honorarium, we used this figure to provide a more conservative estimate. Two CLV per CRC each work 1.5 hours each session, once a week for each month READ was being implemented each of the three years.

2. Training

Training on READ was not separated by intervention arm (i.e., CORE teachers and staff did not receive a different training than CORE PLUS teachers and staff). Therefore, prices and costs are not separated by CORE and CORE PLUS schools.

2.1. Basic Academic Supervision
   2.1.1. <u>Main</u>
      SCI provided a total head count of 234 and a per participant price of 3,057 BDT. Assuming one head teacher per school (n=140) and the remaining participants as government officials. To obtain a per school price, the math consisted of (234*3,057

BDT)/140 schools= 5,110 BDT. This was assumed for the three years READ was
implemented. This per school price was applied to the CORE arm of the intervention.

2.1.2. Refresher
The costs for the refresher training are wrapped into the main training.

2.2. Instructional Adjustment Tool (IAT)
2.2.1. Main
Using a per participant price of 2,020 BDT. Average number of participants per school
was 2.5 for each participant at each school for each of the three years.

2.2.2. Refresher
The costs for the refresher training are wrapped into the main training.

2.3. Reading Instruction & Assessment (RIA)
2.3.1. Main
Using a SCI provided per participant price of 5,942 BDT with 3 participants from each
READ school for each of the three years.

2.3.2. Refresher
The costs for the refresher training are wrapped into the main training.

2.4. Coaching
2.4.1. Teacher Training
Using a per participant price of 3,349 BDT. Assuming that each head teacher from
each READ school attended for each of the three years.

2.4.2. Master Training
Using a per school price of 7,272 BDT for each READ school for each of the three
years. Assuming one participant from each READ school.

2.4.3. Coaching Assistants/Technical Officers (CA/TO)
Using a per school price of 1,402 BDT for each READ school for each of the three
years. Assuming one participants from each READ school.

2.5. School Management Committee (SMC) Orientation
Using a per participant price of 3,270 BDT for each of the 10 members of the SMC for each
READ school for each of the three years.

2.6. Instructional Change Tool (ICT) Orientation
Per SCI, assuming that only 0.11 of the attendees were for one READ school at a per
participant price of 4,408 BDT. Therefore, the math consists of: 0.11*4,408 BDT for each of
the three years.

2.7. *M&E/MIS Training*

Per RIMES, assuming one participant per school at a per participant price of 2,947 BDT for each READ schools for each of the three years.

2.8. *Community Literacy Volunteer (CLV) Training*

    2.8.1. <u>Basic</u>

        Two participants for each CORE PUS school with a per participant price of 725 BDT for each of the three years.

    2.8.2. <u>Refresher</u>

        Two participants for each CORE PUS school with a per participant price of 994 BDT for each of the three years.

    2.8.3. <u>Coaching Assistants/Technical Officers (CA/TO)</u>

        One participant for each of the CRCs with a per participant price of 1,401 BDT for each of the three years.

3. Equipment and Materials

3.1. *Supplementary Reading Materials (SRM)*

Each batch of SRM 205 contained leveled books at a cost 6,305 BDT per package. Each READ school received one batch. SRMs were amortized over 3 years at 5 percent.

3.2. *Instructional Materials/Teacher Resource Book*

Instruction materials are not part of the training costs. Each READ teacher (1 head teacher and 3 assistant teachers) received one resource book. Each book has a per unit price of 57 BDT. Instructional materials were amortized over 3 years at 5 percent.

3.3. *Learning Materials*

Learning materials are not part of the training costs. Each READ school received one batch of student learning materials. This batch included charts, cards, primers, etc. Each batch had a per unit price of 859 BDT. Learning materials were amortized over 3 years at 5 percent.

3.4. *Book Bag*

Each READ school received one book bag at a per unit price of 1,640 BDT. Book bags were amortized over 3 years at 5 percent.

3.5. *Registers*

Each READ school received 2 registers per year at a per unit price of 50 BDT.

3.6. *Assessment Sheet*

Each READ school received one assessment sheet per student in grades 1, 2 and 3, 3 times per year for 3 years. Assumed 40 students per grade. Total of 360 per school three times per year per unit cost of 5 BDT.

3.7. *CRC Materials (trunks)*

CRC materials are specific to CORE PLUS schools. These materials were contained in trunks and each CRC received one trunk. The total price per trunk and the 44 different

types of materials was estimated at 9,245 BDT. Trunks and their materials were amortized over 3 years at 5 percent.

4. Facilities

4.1. Reading Corner

All READ schools allocated space for a reading corner. SCI estimated the price at 670 BDT per month. Each corner takes up approximately 20 square feet per school. It is assumed that this space is used only for the reading corner and is not a shared space.

4.2. Land/space used for CRC

CRC space is specific to CORE PLUS schools. SCI estimates that the rent of such a space at 558 BDT per month for 12 months for 3 years. It is assumed that the space is used only for CRC and is not a shared space.

5. Other

5.1. Reading Festivals-Upazila

All READ schools were invited to Reading Festivals at the upazila level. Held each February, three students from each school from each READ school are invited. Each school was assigned 3,441 BDT per school per year.

6. Management and Oversight

The costs in the planning year (i.e., 2014) were amortized across 2015, 2016, and 2017.

6.1. Personnel

6.1.1. Project Coordinators

The number and salaries associated with project coordinators varied over time. 2014: 6 at 52,170 BDT per month for 9 months; 2015: 7 at 50,244 BDT per month for 12 months; 2016: 7 at 48,667 BDT per month for 12 months; 2017: 11 at 47,000 BDT per month for 12 months.

6.1.2. Senior Technical Officer (STO) Reading

The number and salaries associated with senior technical officers-reading varied over time. 2014: 6 at 33,792 BDT per month for 10 months; 2015: 7 at 31,821 BDT per month for 12 months; 2016: 7 at 32,269 BDT per month for 12 months; 2017: 11 at 31,000 BDT per month for 12 months.

6.1.3. Senior Technical Officer (STO)-M&E

The number and salaries associated with senior technical officers-M&E varied over time. 2014: 6 at 33,792 BDT per month for 10 months; 2015: 7 at 31,821 BDT per month for 12 months; 2016: 7 at 32,269 BDT per month for 12 months; 2017: 11 at 31,000 BDT per month for 12 months.

6.1.4. Technical Officer (TO)

The number and salaries associated with project coordinators varied over time. 2014: 12 at 29,642 BDT per month for 10 months; 2015: 30 at 27,913 BDT per month for 12 months; 2016: 30 at 27,513 BDT per month for 12 months; 2017: 36 at 26,500 BDT per month for 12 months.

6.1.5. Classroom Assistant (CA)
        The number and salaries associated with project coordinators varied over time. 2014: 210 at 13,043 BDT per month for 10 months; 2015: 300 at 12,282 BDT per month for 12 months; 2016: 320 at 12,319 BDT per month for 12 months; 2017: 400 at 13,328 BDT per month for 12 months.

6.2. *Materials and Equipment*
6.2.1. Computers and laptops, furniture, logistics, and motorcycles
        Total prices for these items were provided by year. 2014: 1,766,914 BDT; 2015: 2,524,106 BDT; 2016: 86,348 BDT; 2017: 192,365 BDT. These costs were amortized over 5 years at 3 percent.

6.3. *Facilities*
6.3.1. Office Rent-District Office
        District office rental space costs varied over time. 2014: 6 locations at 15,058 BDT per month for 10 months; 2015: 12 locations at 13,398 BDT per month for 12 months; 2016: 24 locations at 4,762 BDT per month for 12 months; 2017: 24 locations at 13,000 BDT per month for 12 months.

6.3.2. Office Rent-Regional Office
        Regional office rental space costs varied over time. 2014: 2 locations at 17,785 BDT per month for 10 months; 2015: 12 locations at 15,073 BDT per month for 12 months; 2016: 12 locations at 16,719 BDT per month for 12 months; 2017: 12 locations at 16,905 BDT per month for 12 months.

6.4. *Utilities*
6.4.1. Electricity, gas, internet, water
        Utility costs varied over time and correspond to district office space. 2014: 6 locations at 2,846 BDT per month for 10 months; 2015: 12 locations at 2,791 BDT per month for 12 months; 2016: 24 locations at 2,645 BDT per month for 12 months; 2017: 24 locations at 2,567 BDT per month for 12 months.

7. **School Level Improvement Plans (SLIP) Money**
    SLIP money are funds provided by the GOB to schools for their discretionary use. The funds used specifically for READ varied by year. 2015: 4,519 BDT; 2016: 8,499 BDT; 2017: 7,671 BDT per READ school.

APPENDIX 7: CORE—COST BY CATEGORY

This table corresponds to Figure 2 in the report.

CORE COST BY CATEGORY (৳ BDT)	
CATEGORY	**CORE**
Personnel	85,029 (3.2 percent)
Training	248,960 (9.3 percent)
Equipment and Materials	16,460 (0.6 percent)
Facilities	16,748 (0.6 percent)
Other	10,327 (0.4 percent)
Oversight and Management	2,305,987 (85.9 percent)
Total	2,683,511

Notes:
a) Real 2017 Bangladesh Average Prices in BDT.
b) Material related costs are amortized over 3 years at 5.0 percent depreciation.
c) Management and oversight related costs are amortized equally across both CORE and CORE PLUS.
d) Equipment related costs utilized for management and oversight are amortized at 5 years at 5.0 percent depreciation.
e) Total costs reflects the present value at 3.5 percent discount rate.

APPENDIX 8: CORE PLUS—COST BY CATEGORY

This table corresponds to Figure 3 in the report.

CORE AND CORE PLUS COST BY CATEGORY (৳ BDT)		
CATEGORY	**CORE**	**CORE PLUS**
Personnel	76,269 (3.0 percent)	110,098 (4.1 percent)
Training	240,467 (9.3 percent)	254,499 (9.6 percent)
Equipment and Materials	15,909 (0.6 percent)	25,753 (1.0 percent)
Facilities	12,949 (0.5 percent)	32,375 (1.2 percent)
Other	9,982 (0.4 percent)	9,982 (0.4 percent)
Oversight and Management	2,221,155 (86.2 percent)	2,221,155 (83.7 percent)
Total	2,576,731	2,653,861

Notes:
a) Real 2017 Bangladesh Average Prices in BDT.
b) Material related costs are amortized over 3 years at 5.0 percent depreciation.
c) Management and oversight related costs are amortized equally across both CORE and CORE PLUS.
d) Equipment related costs utilized for management and oversight are amortized at 5 years at 5.0 percent depreciation.
e) Total costs reflects the present value at 3.5 percent discount rate.