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| NUMERACY BOOST CROSS-SITE ANALYSIS DRAFT 5  Clara Pava, Pamela Mendoza, and Shirin Lutfeali  September 2018 |

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# Executive Summary

In October 2017 Numeracy Boost was endorsed by Save the Children International (SCI) as its latest Common Approach[[1]](#footnote-1). Data collected from implementing sites including Bangladesh, Egypt, Ethiopia, Malawi and Pakistan on student learning outcomes as well as on student background, has provided a deeper understanding on children's foundational math skills and trends in math acquisition for site specific recommendations based on the data. This study brings together the datasets so far available from these sites to explore questions related to the numeracy skills of children and their association to gender, participation in community numeracy activities, and the home numeracy environment.

In terms of gender, we find that differences at baseline, whenever present, favour boys over girls and by endline some of these differences become statistically insignificant for Numeracy Boost and Comparison students. We recommend to explore ways through which we can support girls in our programs beyond what regular schooling might bring as there does not seem to be currently a difference between comparison and Numeracy Boost sites in bringing girls on par. Furthermore, there does not seem to be a strong trend between gender and speed and accuracy on basic operations across sites but this can be further explored as more datasets become available- for this analysis we had access to three that contained this information.

For participation in community activities, we find weak evidence of a positive association between participation and higher numeracy skills of children. This relationship was significant in Bangladesh, but not so in Malawi. We suggest that future midline and endline data collections include questions about participation in community activities to have more robust evidence on how they might influence student outcomes.

Finally, for the Home Numeracy Environment (HNE) we find that there is a positive relationship between reading materials or numeracy interactions and numeracy skills in six out of seven datasets explored. However, we find this relationship for only one skill in the majority of the cases. This could be happening in part beacuse the HNE questionnaire is limited in capturing those reading materials and activities that influence the numeracy skills of children. A next recommended step from this analysis is to conduct a review of the reading materials and numeracy practices that are included in the HNE questionnaire to pilot additional activities and materials that could be influencing math acquisition in children.

# Introduction

Numeracy Boost (NB) was developed following Save the Children’s experience implementing Literacy Boost in Malawi and Nepal in 2009. As part of that intervention, teachers were only trained on literacy, but student assessments included both a literacy and numeracy component. It was a happy surprise to find that endline results showed students making gains in both literacy *and* numeracy. The question had to be asked: how much more would students benefit if teachers were provided with direct math training in addition to literacy support? That is where NB comes in-Save the Children’s early grades math intervention. NB focuses on supporting teachers, students, and communities to improve and strengthen foundational math skills. It is based on expert input, research on how children learn math, and best practices in early math education.

In October 2017, NB was endorsed by Save the Children International (SCI) as the latest Common Approach. In the span of six years, when NB was first piloted in Malawi and Bangladesh, Pakistan, Egypt, and Ethiopia have also included NB in their Basic Education programming. NB has been implemented in humanitarian settings-in Child Friendly Spaces in Jordan and in refugee camps in Thailand. Data collected from these sites on student learning outcomes as well as student background, including socio-economic standing, gender, and parental involvement at home, has provided a deeper understanding on children's foundational math skills and trends in math.

This cross-site analysis answers several important questions around early grades math in SC programs across five countries as a first step in better understanding what we can learn in terms of the relationship between gender, community activities participation, the Home Numeracy Environment, and the numeracy skills of children.

# Research Questions

This study explores six research questions across three topic areas with the objective to capitalize on the findings to make evidence based programming recommendations and decisions.

1. Gender

1A. Are there gender differences across the different subtasks at baseline and do these change by endline?

1B. Are there differences at baseline in the accuracy and speed in addition and subtraction problems of boys and girls?[[2]](#footnote-2)

1. Community activities participation

Is participation in more Numeracy Boost activities associated with higher numeracy outcomes at endline?

1. Home Numeracy Environment

3A. Are home numeracy interactions associated with children's numeracy skills?

3B. Are reading materials associated with children's numeracy skills?

3C. Are changes in the HNE associated to changes in children’s numeracy skills?

# Research Methods

## Data

This study uses baseline and endline data collected by Save the Children. Datasets included in the analysis met two criteria: 1) the data was collected using Save the Children’s Numeracy Boost assessment tool and 2) the data could be used to answer at least one of the research questions in this study. Using this criteria, we use datasets for a total of 5 countries: Bangladesh, Egypt, Ethiopia, Malawi, and Pakistan. Table 1 presents a summary of each NB dataset included in this analysis. The information contained in each dataset varied for which we used 8 datasets to examine research question 1A, 3 datasets to answer research questions 1B and 2, and 7 datasets to investigate research questions 3A and 3B.

**Table 1. Baseline and endline samples by country[[3]](#footnote-3)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Country | Site | Baseline | | Endlinea | |
| **Year** | **Sample size** | **Year** | **Sample Size** |
| [Bangladesh](https://savethechildren1.sharepoint.com/what/education/ResourceLibrary/Bangladesh%202014%20LB%20NB%20Endline%20Report%20Final%20(3).pdf) | Meherpur Sadar and Gangni | 2013 | 1,531 | 2014 | 1,274 |
| [Egypt](https://resourcecentre.savethechildren.net/node/12383/pdf/final_nb_endline_report_26.09_2017.pdf) | Assuit | 2015 | 280 | 2017 | 223 |
| [Ethiopia 1](https://savethechildren1.sharepoint.com/:w:/r/what/education/_layouts/15/Doc.aspx?sourcedoc=%7B60B6774A-0BD9-4217-8DA5-A8F256539670%7D&file=2016%2001%2004%20Ethiopia%20West%20Showa%20NB%20Endline%20Report_FINAL.docx&action=default&mobileredirect=true&DefaultItemOpen=1) | West Showa | 2014 | 660 | 2015 | 529 |
| [Ethiopia 2](https://savethechildren1.sharepoint.com/what/education/ResourceLibrary/Year%202%20Sponsorship%20Numeracy%20Boost%20Results%20Ethiopia%20West%20Showa.pdf#search=ethiopia%20numeracy%20boost) | West Showa | 2016 | 660 | 2017 | 558 |
| [Malawi 1](https://savethechildren1.sharepoint.com/what/education/ResourceLibrary/NB%20Malawi%20Zomba%20Endline%20Report%20Final.pdf#search=malawi%20zomba%20numeracy%20boost) | Zomba | 2012 | 600 | 2013 | 423 |
| [Malawi 2](https://savethechildren1.sharepoint.com/:w:/r/what/me/Evaluations/_layouts/15/Doc.aspx?sourcedoc=%7B8EA005FB-73D4-4D82-A2F3-C63E813DFBD4%7D&file=Malawi%20NB%20%20Endline%20Results%202016_17.docx&action=default&mobileredirect=true) | Zomba | 2016 | 600 | 2017 | 495 |
| [Pakistan 1](https://savethechildren1.sharepoint.com/what/me/Evaluations/Evaluations/Numeracy%20Boost%20Pakistan%20Quetta%20Endline%202014.pdf#search=pakistan%20quetta%20numeracy%20boost) | Quetta | 2014 | 540 | 2016 | 281 |
| [Pakistan 2](https://savethechildren1.sharepoint.com/what/me/Evaluations/Evaluations/Numeracy%20Boost%20IKEA%20CHAON%20II%20Pakistan%20Lodhran%20and%20Shaheed%20Benazir%20Abad%20Endline%202016.pdf#search=pakistan%20lodhran%20and%20shaheed%20endline) | Lodhran and Shaheed | 2014 | 702 | 2014 | 599 |

a. In Egypt different children were assessed at baseline and at endline

In Table 2 below, we present the average values for some demographic characteristics for these sites at baseline. It is important to highlight that these datasets are not a representative sample of the children in these countries or even in the sites; rather it is a sample of some of the early grade children in the sites at the time the data was collected. Students are on average between 8 and 9 years old, approximately half of the students are female, and most of them were attending 2nd grade.

**Table 2. Demographic characteristics by country**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Country | Site | Grade | Female | Age |
| Bangladesh | Meherpur Sadar and Gangni | 2 | 49% | 8.3 |
| Egypt | Assuit | 3 | 51% | 8.9 |
| Ethiopia 1 | West Showa | 2 | 50% | 9.6 |
| Ethiopia 2 | West Showa | 3 | 49% | 9.7 |
| Malawi 1 | Zomba | 2 | 51% | 8.7 |
| Malawi 2 | Zomba | 2 | 51% | 8.7 |
| Pakistan 1 | Quetta | 2 | 50% | 9.1 |
| Pakistan 2 | Lodhran and Shaheed | 2 | 47% | 7.9 |

## Numeracy skills measurement

For the purpose of this study, we consider the 13 numeracy skills that currently make part of the Numeracy Boost assessment. The assessment covers three conceptual areas: numbers and operations, geometry, and measurement which are divided into a number of different subtests. Numbers and operations includes 10 measures: one-to-one correspondence, number identification, place value, skip counting by 2s, skip counting by 5s, pattern recognition, missing numbers identification, timed addition, timed subtraction, and word problems. Geometry includes one measure: shape identification. Finally, measurement includes two measures: measuring objects and time identification.

**Table 3. Numeracy Boost Assessment Elements**

|  |  |  |
| --- | --- | --- |
| **Area** | **Measure** | **Scoring out of** |
| **Numbers and Operations** | One to one correspondence | 22 |
| Number identification | 12 |
| Place value | 3 |
| Skip counting by 2s | 7 |
| Skip counting by 5s | 7 |
| Pattern recognition | 5 |
| Missing numbers identification | 8 |
| Timed addition | 10 |
| Timed subtraction | 10 |
| Word problems | 3 |
| **Geometry** | Shape identification | 5 |
| **Measurement** | Measuring items | 4 |
| Time identification | 3 |

Although the number of measures in each NB assessment varies from country to country, most datasets considered for this study included at least 10 numeracy skills in their assessments, with the exception of the most recent data from Malawi that only included 5 measures (see Table 4).

**Table 4. Numeracy skills by country**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Measure** | **Bangladesh** | **Egypt** | **Ethiopia 1** | **Ethiopia 2** | **Malawi 1** | **Malawi 2** | **Pakistan 1** | **Pakistan 2** |
| **One to one** |  |  | X | X | X |  | X | X |
| **Number Identification** | X | X | X | X | X | X | X | X |
| **Place value** | X | X | X | X | X |  | X | X |
| **Skip 2s** |  |  | X | X |  |  |  |  |
| **Skip 5s** | X | X | X | X | X |  | X | X |
| **Pattern recognition** |  | X | X | X |  |  | X | X |
| **Missing value** | X | X | X | X | X |  | X | X |
| **Addition** | X | X | X | X | X | X | X | X |
| **Subtraction** | X | X | X | X | X | X | X | X |
| **Word problems** | X |  | X | X | X |  | X | X |
| **Shapes** | X | X | X | X | X | X | X | X |
| **Measurement** | X | X | X | X | X | X | X | X |
| **Time** | X | X | X | X | X |  | X | X |
| **Total** | **10** | **10** | **13** | **13** | **11** | **5** | **12** | **12** |

## Analyses

To investigate our research questions, this report uses multivariate regression models to explore relationships between numeracy skills, student background characteristics and the Home Numeracy Environment. Due to the correlation of student error terms within schools, we estimate cluster-corrected Huber-White estimators for each model; in which students are considered to be clustered in schools (see Appendix A).

# IV. Results

## Differences between boys’ and girls’ numeracy skills

The eight datasets considered for this analysis included information about the children’s gender which allowed us to explore the differences between the numeracy skills between boys and girls. We explored whether there are differences at baseline, whether these change at endline, and also whether there are differences between the accuracy and speed of boys and girls when answering addition and subtraction timed questions.

We find that at baseline there are statistically significant differences between boys and girls in 11 out of the 13 subtasks considered and in the majority of the cases these differences favour boys (Figure 1). For the time and one-to-one correspondence subtasks no statistically significant differences are found across datasets at baseline.

**Figure 1. Number of datasets (of 8) displaying gender differences by numeracy skill at baseline**

1/ This graph shows the statistically significant differences between boys and girls at baseline. For instance, the 2 in purple in measurement means that in 2 of the datasets considered boys scored above girls, and the difference is statistically significant. Significant differences are shown at a <5% level

For seven of the datasets considered, students were followed from baseline to endline and there was a comparison group which allowed us to see whether the pattern found at baseline changes after exposure to Save the Children’s Numeracy Boost program. We find that NB and comparison students follow a similar pattern where significant differences between boys and girls at baseline are no longer present at endline (Figure 2). For some subtasks however, the baseline differences remained and for some others, where there was no difference at baseline, there are new differences favouring boys at endline. The results speak to the need to further efforts on having equalizing effects in the numeracy skills of children through the NB program, beyond what children would have as part of their regular schooling.

**Figure 2. Number of datasets displaying changes from baseline to endline on gender differences by numeracy skill. Numeracy Boost and Comparison Students**

2. A. Numeracy Boost

Significant differences are shown at a <5% level

2. B. Comparison students

Significant differences are shown at a <5% level

The third analysis with respect to gender looked at whether there are differences between the accuracy and speed between boys and girls when answering subtraction and addition questions. We defined accuracy as the percentage of questions the child answered correctly of those attempted, and speed as the percentage of questions attempted during this task. For answering this question we used the three datasets for which the number of questions attempted was available: Ethiopia 1, Egypt, and Pakistan 1.

We find that there is not a common trend across these three datasets, but rather that the relationship between speed and accuracy seems to be context specific with girls being slower than boys were statistically significant differences exist (Figure 3). In one of the sites, Pakistan 1, girls are significantly more accurate and slower than boys in both addition and subtraction. In a second one, Ethiopia 1, boys are significantly more accurate and faster than girls. Finally, in the third one, Egypt, there are no significant differences in the accuracy and speed between boys and girls in these subtasks.

**Figure 3. Differences in accuracy and speed in addition and subtraction of girls vs. boys (in datasets where significant differences exist)**

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

## Participation in community activities and numeracy skills

Participation in community activities give children the opportunities to practice numeracy skills outside school so that learning can be strengthened through fun to increase children’s motivation and engagement. Only the datasets from Bangladesh and Malawi included information on these variables. For this analysis, we consider participation in three activities: attending math camps, book bank borrowing, and having a reading buddy.

Overall, we find inconclusive evidence that community action participation is associated with stronger numeracy skills. Participation in community NB activities is, on average, positively associated with numeracy skills in one of these two countries. Data analyzed from the Numeracy Boost program in Bangladesh shows that there is a positive relationship, suggesting that children with more self-reported participation in community activities have stronger numeracy skills. Most of the students in Bangladesh (80-90%) reported attending a math camp or having a reading buddy, and 65% of the children reported borrowing a book. Figure 4 shows that the higher the number of NB activities the child participates in, the higher the estimated scores for six different numeracy skills, particularly higher order math skills such as subtraction and word problems. For example, a child who reported doing one of these activities has an estimated score of 77% correct on subtraction, while a child who reported doing all four has an estimated score of 88% correct.

In contrast, both datasets from Malawi show a lack of correlation between community activities and higher numeracy competencies. Students that attended more activities did not necessarily score higher on the variety of numeracy skills and this finding holds across a four-year timespan.[[4]](#footnote-4) Interestingly, the dataset from 2013 shows that half of the NB children attended a numeracy camp and less than 20% of the students borrowed a book. Similarly, the more recent dataset reports that around 50-65% of the children participated in community activities. This result suggests that the lack of relation could be driven by the low participation rates as this is a core component of the NB program.

**Figure 4. Participation in Numeracy Boost Activities in Bangladesh**

Statistical significance: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05

Available datasets from NB sites do not provide enough evidence to conclude whether participation on community activities is positively associated with stronger math skills, i.e. whether these activities can contribute to build children’s numeracy skills. Countries implementing the NB common approach should collect information about children’s participation in community activities to gain insights into how the different program components at a community level interact with numeracy skills. Additionally, further research could explore fidelity of implementation and community involvement and its association with children’s participation in activities outside the school.

## Home Numeracy Environment and numeracy skills

The third set of questions in this cross-site analysis explored the relation between the Home Numeracy Environment – reading materials and math practices at home – and the numeracy skills of children.[[5]](#footnote-5) At baseline, we find that either reading materials or numeracy interactions are positively associated with at least one baseline numeracy skill in 6 out of the 7 sites considered, but for most of the numeracy measures, there is no statistical relation between the Home Numeracy Environment and math performance in the datasets (see Appendix B5). Specifically, reading materials are positively associated with at least one baseline numeracy skill in 6 out of 7 sites. Of the seven country samples included in this analysis, reading materials in Ethiopia 1 and Bangladesh are a strong predictor for five of the numeracy skills assessed, including higher-order skills such as subtraction and word problems. Figure 5 shows that the more reading materials, the higher the estimated score in skip count by 5’s, a measure pertaining to number and operations and considered an important precursor to multiplication and division skills.

**Figure 5. Predicted skip count by 5’s baseline scores by country and reading materials**

This analysis finds mixed results about the relationship between numeracy interactions and children’s math skills. Numeracy interactions are positively associated with at least one baseline numeracy skill in Ethiopia 1 and Egypt and negatively associated with one baseline numeracy skill in Pakistan 2 and Ethiopia 2. Figure 6 shows that more numeracy interactions are positively associated to higher order skills predicted baseline scores in Ethiopia. For instance on average, one numeracy activity is associated with a 0.5 percentage point increase in the word problems score. Interestingly, this finding holds in this site across 7 out of 13 numeracy skills including some of the higher order skills. For the other sites, Bangladesh and Malawi, numeracy interactions was not significantly associated to numeracy skills.

**Figure 6. Predicted baseline scores by numeracy skill in Ethiopia 1**

For the following analyses, we considered five datasets that have HNE variables and students were followed from baseline to endline to see whether reading materials are predictors of numeracy skills at endline for Numeracy Boost students. We find mixed evidence about how reading materials or numeracy interactions are associated to endline numeracy skills (see Appendix B6). Specifically, reading materials are positively associated with at least one endline numeracy skill in 3 out of 5 sites. Of the five country samples included in this section, reading materials in Ethiopia 1 and Bangladesh are only a common predictor for shapes and measurement endline scores. Numeracy interactions are positively associated with at least one endline numeracy skill in Bangladesh and Ethiopia 2 and negatively associated in Malawi and Pakistan. The results do not show that numeracy interactions are a common predictor of any of the numeracy skills.

Finally, for the same five datasets we explore whether the change in the Home Numeracy Environment leads to higher gains in numeracy skills (see Appendix B7). We find no significant associations between the change in the reading materials and numeracy skills gains, with the exception of two numeracy skills – pattern recognition and shapes – in Ethiopia 1. Additionally, we find weak and mixed evidence on the relationship between changes in numeracy interactions and gains. An increase in numeracy interactions is positively associated to higher score gains in only 2 numeracy skills in Bangladesh and negatively associated to 3 numeracy skills gains in Ethiopia and 2 numeracy skills gains in Malawi.

# Conclusions and Recommendations

Using eight Save the Children Numeracy Boost datasets across five countries, this analysis investigated questions related to the relationship between gender, participation in community activities, the Home Numeracy Environment and the numeracy skills of children.

In terms of gender, we find that whenever there were significant differences at baseline between boys and girls, these favoured boys in the vast majority of the cases. By endline, some of these differences were statistically insignificant. However, we do not find different results between Numeracy Boost and Comparison students suggesting that the equalizing changes we see cannot be attributed to the Numeracy Boost program. We recommend to explore ways through which we can support girls in our programs for them to come on par with their male counterparts and have an equalizing effect on the numeracy skills of children beyond what regular schooling might bring. In terms of the relationship between gender, speed and accuracy, we find that girls respond to less addition and subtraction problems in the same time than boys. However, we find that whether girls are less or more or equally accurate than boys in solving these operations problems is site specific. This can be further explored as more datasets become available- for this analysis we had access to just three that contained this information.

For participation in community activities, we find inconclusive evidence of the positive association between increased participation and higher numeracy skills of children. For one of the two datasets explored, Bangladesh, the relationship was positive, and for Malawi, it was not significant. We suggest that future midline and endline data collections include questions about participation in community activities to have more robust evidence on how they might influence student outcomes.

Finally, forthe Home Numeracy Environment we find that there is a relationship between reading materials or numeracy interactions at baseline in six out of seven datasets explored. However, this relationship is for only one skill in the majority of the cases. For endline scores the result is similar with positive associations in reading materials and positive and negative associations for numeracy interactions for Numeracy Boost students depending on the site. Likewise the evidence for higher changes in HNE gains leading to higher positive changes in numeracy skills is weak with a couple of numeracy skills being associated with a positive change in reading materials in one site and numeracy interactions with positive and negative changes in others. This could be happening in part as the current Home Numeracy Environment questionnaire is limited in capturing those reading materials and activities that influence the numeracy skills of children. A next recommended step from this analysis is to conduct a review of the reading materials and numeracy practices that are included in the HNE questionnaire and piloting some additional home numeracy activities questions that might be facilitating the acquisition of numeracy skills.

# Appendix A. Regression Specifications

For the first research question (Q1A) we define the following form:

Where represents the outcome variable of interest in this case each numeracy skill. The term *Female* is the independent variable of interest for the first research question and the term *X* is a vector of student characteristics. Student characteristics vary on the information for each country, but it generally includes demographic information (age), educational background (grade repeaters, ECD background), and family characteristics (household size, SES index, and HNE index). Finally, is random error term associated with student *i* in school *j*.

For the first research question (Q1B), we define a similar model to the previous one but the outcome variables were the following:

**Accuracy:** the percentage correct out of total attempted in an addition and subtraction timed subtask

**Speed:** total attempted in an addition and subtraction timed subtask

For the analysis of the second research question (Q2), we use the following specification:

Where represents each numeracy skill, the variable *Dosage* refers to the number of NB activities that the student *i* has participated in and the term *X* is a vector of student characteristics. Only three datasets included information about NB activities, Bangladesh and Malawi. The NB activities considered for the creation of the *Dosage* variable were attending math camps, book bank borrowing, and having a reading buddy.

The regression for the third research question (Q3) takes the following form:

Where represents each numeracy skill, the variable *Reading materials* refers to the number of books in the household, *HNI* consists on the number of activities which caregivers and their children engage in which support development either through direct or indirect activities. Finally, the term *X* is a vector of student characteristics, in this case, the model includes demographic information (age, gender), educational background (grade repeaters, ECD background), and family characteristics (household size and SES).

# Appendix B. Regression Results

## B1. Differences between numeracy skills of boys and girls at baseline

Table B1.1. Girls’ beta coefficient from multivariate regressions at baseline by country and numeracy skill. Numeracy Boost students

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Numeracy skill** | **Bangladesh** | **Ethiopia 1** | **Ethiopia 2** | | **Malawi 1** | **Malawi 2** | **Pakistan 1** | **Pakistan 2** |
| **One to one correspondence** |  |  | 0.003 | 0.001 | |  |  | -0.052 |
|  |  | (0.007) | (0.012) | |  |  | (0.043) |
| **Number Identification** | -0.041\* |  | -0.048\* | -0.012 | | -0.016 |  | -0.371\*\*\* |
| (0.016) |  | (0.019) | (0.045) | | (0.027) |  | (0.105) |
| **Place value** | -0.084\*\*\* |  | 0.066 | -0.022 | |  |  | -0.021 |
| (0.021) |  | (0.047) | (0.035) | |  |  | (0.153) |
| **Skip 2s** |  |  | -0.080 |  | |  |  |  |
|  |  | (0.050) |  | |  |  |  |
| **Skip 5s** | -0.184\*\*\* |  | -0.060 | -0.017 | |  |  | 0.008 |
| (0.034) |  | (0.048) | (0.037) | |  |  | (0.155) |
| **Pattern recognition** |  |  | -0.027 |  | |  |  | -0.031 |
|  |  | (0.057) |  | |  |  | (0.114) |
| **Missing value** | -0.055\* |  | -0.040 | -0.023 | |  |  | -0.122 |
| (0.025) |  | (0.034) | (0.023) | |  |  | (0.118) |
| **Addition** | -0.077\*\*\* |  | -0.009 | -0.033 | | 0.030 |  | -0.050 |
| (0.021) |  | (0.017) | (0.059) | | (0.049) |  | (0.034) |
| **Subtraction** | -0.114\*\*\* |  | -0.013 | -0.069 | | -0.034 |  | -0.044\* |
| (0.027) |  | (0.013) | (0.050) | | (0.045) |  | (0.021) |
| **Word problems** | -0.043\* |  | -0.020 | 0.023 | |  |  | -0.084 |
| (0.021) |  | (0.039) | (0.053) | |  |  | (0.102) |
| **Shapes** | -0.042\* |  | 0.006 | -0.069\* | | -0.003 |  | 0.184 |
| (0.016) |  | (0.034) | (0.030) | | (0.054) |  | (0.112) |
| **Measurement** | -0.037\* |  | 0.015 | -0.040 | | -0.050 |  | 0.192 |
| (0.018) |  | (0.028) | (0.039) | | (0.040) |  | (0.108) |
| **Time** | -0.020 |  | 0.000 | -0.060 | |  |  | -0.037 |
| (0.018) |  | (0.028) | (0.034) | |  |  | (0.064) |

Standard errors in parentheses. Coefficients from multivariate regressions that control for child’s age, household size, educational background, home numeracy environment, and SES.

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

Table B1.2. Girls’ beta coefficient from multivariate regressions at baseline by country and numeracy skill. Comparison students

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Numeracy skill** | **Bangladesh** | **Ethiopia 1** | **Ethiopia 2** | **Malawi 1** | **Malawi 2** | **Pakistan 1** | **Pakistan 2** |
| **One to one correspondence** |  | -0.001 | -0.001 | 0.003 |  | 0.004 | 0.013 |
|  | (0.004) | (0.001) | (0.004) |  | (0.002) | (0.044) |
| **Number Identification** | -0.049\*\* | -0.087\*\* | -0.113\*\*\* | 0.050 | 0.005 | 0.038 | -0.160 |
| (0.015) | (0.033) | (0.027) | (0.035) |  | (0.049) | (0.152) |
| **Place value** | -0.053\* | 0.031 | -0.08 |  |  | -0.043 |  |
| (0.026) | (0.063) | (0.089) |  |  | (0.086) |  |
| **Skip 2s** |  | -0.042 | -0.137 | -0.005 |  |  | 0.144 |
|  | (0.077) | (0.080) | (0.037) |  |  | (0.179) |
| **Skip 5s** | -0.135\*\*\* | -0.016 | -0.152\*\* |  |  | -0.122 | 0.024 |
| (0.037) | (0.065) | (0.050) |  |  | (0.067) | (0.148) |
| **Pattern recognition** |  | -0.075 | -0.149\*\* | -0.0169 |  | 0.000 | -0.070 |
|  | (0.050) | (0.047) | (0.0311) |  | (0.054) | (0.112) |
| **Missing value** | -0.008 | -0.054 | -0.201\*\* | -0.013 | 0.027 | 0.150\* | -0.050 |
| (0.019) | (0.043) | (0.063) | (0.048) | (0.057) | (0.064) | (0.027) |
| **Addition** | -0.094\*\* | -0.031 | -0.068\* | 0.010 | 0.009 | -0.016 | -0.036 |
| (0.035) | (0.026) | (0.026) | (0.058) | (0.072) | (0.028) | (0.021) |
| **Subtraction** | -0.085\* | -0.040\*\* | -0.090\*\*\* | -0.096 |  | -0.023 | 0.032 |
| (0.035) | (0.013) | (0.019) | (0.062) |  | (0.015) | (0.123) |
| **Word problems** | -0.043 | -0.095 | -0.175\*\*\* | -0.050 | -0.060 | -0.055 | 0.179 |
| (0.029) | (0.061) | (0.048) | (0.037) | (0.063) | (0.073) | (0.109) |
| **Shapes** | -0.049\* | -0.073\* | -0.106\*\*\* | -0.008 | -0.064 | 0.061 | 0.215\* |
| (0.024) | (0.032) | (0.029) | (0.055) | (0.038) | (0.065) | (0.098) |
| **Measurement** | -0.005 | -0.096 | -0.094\*\*\* | -0.019 |  | -0.115\*\* | 0.060 |
| (0.023) | (0.062) | (0.019) | (0.029) |  | (0.040) | (0.143) |
| **Time** | -0.037 | -0.064\* | -0.032 |  |  | -0.065 |  |
| (0.022) | (0.026) | (0.025) |  |  | (0.075) |  |

Standard errors in parentheses. Coefficients from multivariate regressions that control for child’s age, household size, educational background, home numeracy environment, and SES.

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

## B2. Differences between the numeracy skills of boys and girls at endline

Table B2.1. Girls’ beta coefficient at endline from multivariate regressions by country and numeracy skill for children present at baseline and endline. Numeracy Boost students

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Numeracy skill** | **Bangladesh** | **Ethiopia 1** | **Ethiopia 2** | **Malawi 1** | **Malawi 2** | **Pakistan 1** | **Pakistan 2** |
| **One to one correspondence** |  | 0.003 | 0.005 | 0.001 |  | -0.002 | -0.003 |
|  | (0.003) | (0.007) | (0.001) |  | (0.003) | (0.002) |
| **Number Identification** | -0.045\*\* | -0.019 | 0.003 | 0.014 | -0.005 | -0.085 | -0.129 |
| (0.016) | (0.012) | (0.011) | (0.047) | (0.071) | (0.049) | (0.067) |
| **Place value** | -0.043\* | 0.028 | 0.001 | 0.000 |  | -0.355\*\* | -0.266\* |
| (0.017) | (0.023) | (0.029) | (0.039) |  | (0.128) | (0.114) |
| **Skip 2s** |  | -0.030 | -0.037 |  |  |  |  |
|  | (0.024) | (0.022) |  |  |  |  |
| **Skip 5s** | -0.149\*\*\* | -0.014 | 0.001 | 0.063 |  | -0.112 | -0.116 |
| (0.022) | (0.021) | (0.020) | (0.057) |  | (0.066) | (0.075) |
| **Pattern recognition** |  | 0.036 | -0.099\* |  |  | -0.093 | -0.137 |
|  | (0.036) | (0.039) |  |  | (0.056) | (0.090) |
| **Missing value** | -0.035 | -0.063\* | -0.035 | -0.013 |  | -0.000 | -0.070 |
| (0.022) | (0.026) | (0.040) | (0.038) |  | (0.057) | (0.089) |
| **Addition** | -0.030\* | 0.002 | 0.01 | -0.025 | -0.025 | -0.155\* | 0.015 |
| (0.014) | (0.022) | (0.029) | (0.048) | (0.060) | (0.069) | (0.109) |
| **Subtraction** | -0.073\*\* | -0.035 | -0.018 | -0.064 | -0.068 | -0.168\*\* | 0.021 |
| (0.022) | (0.022) | (0.030) | (0.050) | (0.060) | (0.065) | (0.129) |
| **Word problems** | -0.045\* | -0.027 | -0.029 | -0.032 |  | -0.222\* | -0.013 |
| (0.022) | (0.039) | (0.033) | (0.052) |  | (0.089) | (0.111) |
| **Shapes** | -0.01 | -0.015 | -0.004 | -0.023 | -0.020 | -0.048 | -0.034 |
| (0.016) | (0.015) | (0.017) | (0.039) | (0.041) | (0.056) | (0.077) |
| **Measurement** | -0.015 | -0.028 | -0.033 | 0.013 | 0.009 | -0.108 | -0.114 |
| (0.014) | (0.019) | (0.022) | (0.053) | (0.031) | (0.069) | (0.111) |
| **Time** | 0.009 | -0.091\* | -0.055 | -0.013 |  | -0.298\*\* | -0.137 |
| (0.008) | (0.039) | (0.047) | (0.035) |  | (0.114) | (0.150) |

Standard errors in parentheses. Coefficients from multivariate regressions that control for child’s age, household size, educational background, home numeracy environment, and SES.

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

Table B2.2. Girls’ beta coefficient at endline from multivariate regressions by country and numeracy skill for children present at baseline and endline. Comparison students

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Numeracy skill** | **Bangladesh** | **Ethiopia 1** | **Ethiopia 2** | **Malawi 1** | **Malawi 2** | **Pakistan 1** | **Pakistan 2** |
| **One to one correspondence** |  | 0.001 | 0.000 | -0.009 |  | 0.012 |  |
|  | (0.001) | (0.010) | (0.013) |  | (0.009) |  |
| **Number Identification** | -0.047\*\* | 0.007 | -0.062 | 0.115\* | 0.005 | 0.023 | -0.018 |
| (0.017) | (0.036) | (0.032) | (0.045) | (0.081) | (0.035) | (0.067) |
| **Place value** | -0.021 | -0.047 | -0.149 | 0.022 |  | -0.080 | -0.196 |
| (0.014) | (0.067) | (0.079) | (0.030) |  | (0.089) | (0.132) |
| **Skip 2s** |  | -0.017 | -0.093 |  |  |  |  |
|  | (0.051) | (0.048) |  |  |  |  |
| **Skip 5s** | -0.167\*\*\* | 0.039 | -0.089\*\*\* | 0.047 |  | 0.031 | -0.111 |
| (0.031) | (0.054) | (0.024) | (0.057) |  | (0.087) | (0.069) |
| **Pattern recognition** |  | 0.022 | -0.114 |  |  | 0.190\* | 0.060 |
|  | (0.100) | (0.065) |  |  | (0.081) | (0.090) |
| **Missing value** | 0.000 | -0.012 | -0.144\*\* | 0.024 |  | 0.202\*\* | 0.035 |
| (0.026) | (0.074) | (0.047) | (0.022) |  | (0.063) | (0.110) |
| **Addition** | -0.019 | -0.048 | -0.088\* | 0.070 | -0.013 | -0.002 | -0.004 |
| -0.015 | (0.038) | (0.041) | (0.051) | (0.058) | (0.042) | (0.131) |
| **Subtraction** | -0.055 | -0.095\*\* | -0.160\*\*\* | 0.088 | 0.053 | -0.004 | -0.074 |
| (0.028) | (0.034) | (0.040) | (0.044) | (0.059) | (0.027) | (0.111) |
| **Word problems** | -0.028 | -0.004 | -0.124\* | -0.005 |  | 0.131 | 0.044 |
| (0.016) | (0.077) | (0.058) | (0.048) |  | (0.074) | (0.102) |
| **Shapes** | -0.009 | -0.076 | -0.053 | -0.078 | -0.041 | 0.209\*\* | 0.005 |
| (0.018) | (0.052) | (0.042) | (0.044) | (0.044) | (0.066) | (0.076) |
| **Measurement** | -0.027\* | -0.014 | -0.043 | -0.073 | -0.032 | 0.063 | -0.216 |
| (0.012) | (0.048) | (0.040) | (0.039) | (0.057) | (0.050) | (0.118) |
| **Time** | -0.016 | -0.204\* | -0.204\*\*\* | -0.023 |  | -0.031 | 0.328\* |
| (0.014) | (0.090) | (0.054) | (0.035) |  | (0.079) | (0.148) |

Standard errors in parentheses. Coefficients from multivariate regressions that control for child’s age, household size, educational background, home numeracy environment, and SES.

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

## B3. Accuracy vs. speed of boys and girls

Table B3. Girls’ beta coefficient at baseline on accuracy and speed

|  |  |  |  |
| --- | --- | --- | --- |
| **Numeracy skill** | **Egypt** | **Ethiopia 1** | **Pakistan 1** |
| **Addition. Accuracy** | -0.055 | -0.073\*\* | 0.152\*\* |
| (0.054) | (0.028) | (0.047) |
| **Subtraction. Accuracy** | -0.063 | -0.077\*\* | 0.173\*\* |
| (0.038) | (0.027) | (0.063) |
| **Addition. Speed** | 0.09 | -0.025\*\* | -0.070\*\*\* |
| (0.043) | (0.009) | (0.021) |
| **Subtraction. Speed** | 0.065 | -0.040\*\*\* | -0.076\*\* |
| (0.044) | (0.008) | (0.024) |

Standard errors in parentheses. Coefficients from multivariate regressions that control for child’s age, household size, educational background, home numeracy environment, and SES.

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

## B4. Participation in community activities and numeracy skills

Table B4.1 Bangladesh endline numeracy skills multivariate regressions

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Variable | Number identification | | Place Value | Skip 5s | Missing value | Addition | Subtraction | Word problems | Shapes | Measurement | Time |
|  |  | |  |  |  |  |  |  |  |  |  |
| NB dosage | 0.020\*\* | | 0.01 | 0.028\* | 0.024\* | 0.016\* | 0.037\*\* | 0.023\* | 0.019\* | 0.01 | 0.002 |
|  | (0.008) | | (0.008) | (0.012) | (0.012) | (0.007) | (0.011) | (0.011) | (0.008) | (0.007) | (0.006) |
|  |  | |  |  |  |  |  |  |  |  |  |
| Child’s age | -0.023\*\*\* | | -0.012 | -0.028\* | -0.033\*\*\* | -0.008 | -0.015 | -0.014 | -0.012 | -0.003 | -0.012\*\* |
|  | (0.006) | | (0.008) | (0.011) | (0.008) | (0.007) | (0.010) | (0.008) | (0.007) | (0.009) | (0.004) |
|  |  | |  |  |  |  |  |  |  |  |  |
| Female | -0.047\*\* | | -0.045\* | -0.146\*\*\* | -0.038 | -0.028\* | -0.074\*\*\* | -0.0457\* | -0.011 | -0.016 | 0.008 |
|  | (0.015) | | (0.017) | (0.021) | (0.022) | (0.014) | (0.022) | (0.021) | (0.016) | (0.014) | (0.008) |
|  |  | |  |  |  |  |  |  |  |  |  |
| Time spent on chores | -0.004 | | -0.008 | -0.008 | -0.012 | -0.012 | 0.004 | -0.006 | -0.010 | 0.010 | -0.004 |
|  | (0.011) | | (0.010) | (0.019) | (0.014) | (0.007) | (0.013) | (0.013) | (0.008) | (0.010) | (0.008) |
|  |  | |  |  |  |  |  |  |  |  |  |
| Number of household member | -0.006 | | -0.005 | -0.003 | 0.001 | 0.006 | -0.007 | -0.007 | -0.002 | 0.005 | -0.002 |
|  | (0.007) | | (0.005) | (0.009) | (0.008) | (0.005) | (0.010) | (0.007) | (0.006) | (0.005) | (0.004) |
|  |  | |  |  |  |  |  |  |  |  |  |
| Ever repeated a grade | -0.005 | | -0.001 | -0.017 | -0.025 | 0.012 | 0.020 | 0.019 | 0.002 | 0.002 | -0.003 |
|  | (0.015) | | (0.015) | (0.026) | (0.018) | (0.010) | (0.017) | (0.016) | (0.016) | (0.014) | (0.012) |
|  |  | |  |  |  |  |  |  |  |  |  |
| ECD attendance | 0.010 | | 0.012 | 0.008 | 0.017 | 0.020 | 0.004 | 0.024 | 0.012 | 0.000 | -0.006 |
|  | (0.017) | | (0.014) | (0.025) | (0.023) | (0.013) | (0.017) | (0.021) | (0.017) | (0.015) | (0.011) |
|  |  | |  |  |  |  |  |  |  |  |  |
| Standardized N of possessions | 0.002 | | 0.004 | -0.003 | -0.003 | 0.001 | -0.006 | -0.026\*\* | 0.006 | 0.000 | -0.005 |
|  | (0.006) | | (0.006) | (0.011) | (0.008) | (0.004) | (0.008) | (0.008) | (0.006) | (0.006) | (0.005) |
|  |  | |  |  |  |  |  |  |  |  |  |
| Standardized N of reading materials | 0.021 | | 0.011 | 0.033 | 0.013 | 0.004 | 0.003 | 0.004 | -0.001 | 0.013 | -0.011 |
|  | (0.014) | | (0.014) | (0.025) | (0.020) | (0.014) | (0.020) | (0.015) | (0.014) | (0.011) | (0.013) |
|  |  | |  |  |  |  |  |  |  |  |  |
| N of HLE interactions | 0.000 | | 0.001 | -0.004 | 0.001 | 0.000 | 0.002 | 0.003 | -0.001 | 0.000 | 0.001 |
|  | (0.002) | | (0.001) | (0.003) | (0.002) | (0.001) | (0.002) | (0.002) | (0.002) | (0.002) | (0.001) |
|  |  | |  |  |  |  |  |  |  |  |  |
| Constant | 1.046\*\*\* | | 0.981\*\*\* | 1.096\*\*\* | 0.933\*\*\* | 0.972\*\*\* | 0.933\*\*\* | 0.584\*\*\* | 0.815\*\*\* | 0.849\*\*\* | 1.055\*\*\* |
|  | (0.063) | | (0.074) | (0.094) | (0.083) | (0.074) | (0.091) | (0.084) | (0.069) | (0.084) | (0.044) |
|  |  | |  |  |  |  |  |  |  |  |  |
| N | 739 | | 739 | 739 | 739 | 739 | 739 | 739 | 739 | 739 | 739 |

Standard errors in parentheses

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

Table B4.2 Malawi 1 endline numeracy skills multivariate regressions

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Variable | One to one correspondence | Number id | Skip 5s | Missing value | Addition | Subtraction | Word problems | Shapes | Measurement | Time |
|  |  |  |  |  |  |  |  |  |  |  |
| NB dosage | 0.001 | 0.001 | 0.028 | 0.019 | 0.010 | 0.060 | -0.055 | -0.054 | -0.007 | 0.038 |
|  | (0.002) | (0.079) | (0.066) | (0.035) | (0.078) | (0.111) | (0.091) | (0.069) | (0.086) | (0.034) |
|  |  |  |  |  |  |  |  |  |  |  |
| Child’s age | 0.001 | 0.002 | 0.014 | 0.013 | 0.034\* | 0.021 | 0.045\* | 0.00 | 0.025 | 0.002 |
|  | (0.000) | (0.012) | (0.017) | (0.013) | (0.017) | (0.015) | (0.017) | (0.017) | (0.015) | (0.011) |
|  |  |  |  |  |  |  |  |  |  |  |
| Female | 0.001 | 0.008 | 0.059 | -0.017 | -0.025 | -0.064 | -0.035 | -0.025 | 0.018 | -0.015 |
|  | (0.001) | (0.046) | (0.058) | (0.038) | (0.049) | (0.052) | (0.051) | (0.038) | (0.054) | (0.036) |
|  |  |  |  |  |  |  |  |  |  |  |
| Time spent on chores | 0.000 | -0.004 | -0.015 | -0.001 | -0.022 | 0.039 | -0.003 | 0.025 | 0.023 | 0.003 |
|  | (0.001) | (0.038) | (0.027) | (0.030) | (0.042) | (0.052) | (0.050) | (0.034) | (0.044) | (0.037) |
|  |  |  |  |  |  |  |  |  |  |  |
| Number of household member | 0.000 | 0.004 | -0.013 | 0.004 | -0.001 | 0.006 | 0.001 | 0.005 | -0.015 | -0.010 |
|  | (0.000) | (0.010) | (0.008) | (0.006) | (0.012) | (0.012) | (0.013) | (0.008) | (0.015) | (0.009) |
|  |  |  |  |  |  |  |  |  |  |  |
| Ever repeated a grade | -0.003\* | 0.017 | 0.029 | 0.007 | 0.082 | 0.098\* | 0.049 | 0.043 | 0.111 | -0.023 |
|  | (0.001) | (0.026) | (0.050) | (0.021) | (0.048) | (0.038) | (0.076) | (0.035) | (0.056) | (0.039) |
|  |  |  |  |  |  |  |  |  |  |  |
| ECD attendance | 0.001 | 0.011 | -0.011 | 0.089\*\* | -0.002 | 0.016 | -0.027 | 0.001 | -0.006 | 0.028 |
|  | (0.001) | (0.045) | (0.032) | (0.027) | (0.061) | (0.061) | (0.056) | (0.041) | (0.058) | (0.033) |
|  |  |  |  |  |  |  |  |  |  |  |
| Speaks language of instruction | (0.001) | 0.046 | 0.150\*\* | 0.018 | 0.162\*\* | 0.163 | 0.051 | 0.075 | 0.049 | -0.039 |
|  | (0.000) | (0.052) | (0.054) | (0.029) | (0.061) | (0.089) | (0.084) | (0.044) | (0.078) | (0.027) |
|  |  |  |  |  |  |  |  |  |  |  |
| Standardized N of possessions | 0.000 | 0.014 | -0.017 | 0.003 | -0.012 | 0.012 | -0.002 | 0.006 | -0.012 | -0.020 |
|  | (0.000) | (0.028) | (0.020) | (0.013) | (0.016) | (0.014) | (0.022) | (0.017) | (0.026) | (0.012) |
|  |  |  |  |  |  |  |  |  |  |  |
| Standardized N of reading materials | 0.000 | 0.006 | 0.006 | 0.003 | 0.011 | 0.018 | 0.035 | -0.013 | 0.058 | -0.021 |
|  | (0.000) | (0.028) | (0.024) | (0.018) | (0.031) | (0.022) | (0.034) | (0.019) | (0.030) | (0.020) |
|  |  |  |  |  |  |  |  |  |  |  |
| N of HLE interactions | 0.000 | 0.001 | -0.005 | -0.001 | -0.004 | -0.005 | -0.008 | 0.000 | -0.016\*\*\* | -0.003 |
|  | (0.000) | (0.003) | (0.005) | (0.002) | (0.003) | (0.004) | (0.005) | (0.002) | (0.004) | (0.003) |
|  |  |  |  |  |  |  |  |  |  |  |
| Constant | 0.994\*\*\* | 0.617\*\*\* | 0.283 | 0.244\* | 0.333 | 0.311 | 0.276 | 0.360\*\* | 0.323 | 0.933\*\*\* |
|  | (0.003) | (0.149) | (0.186) | (0.112) | (0.198) | (0.198) | (0.230) | (0.133) | (0.180) | (0.120) |
|  |  |  |  |  |  |  |  |  |  |  |
| N | 216 | 216 | 216 | 216 | 216 | 216 | 216 | 216 | 216 | 216 |

Standard errors in parentheses

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

Table B4.3 Malawi 1 endline numeracy skills multivariate regressions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
| Variable | Number identification | Addition | Subtraction | Shapes | Measurement |
|  |  |  |  |  |  |
| NB dosage | -0.026 | 0.008 | 0.066 | 0.011 | 0.052 |
|  | (0.047) | (0.044) | (0.040) | (0.035) | (0.043) |
|  |  |  |  |  |  |
| Child’s age | -0.002 | 0.005 | 0.015 | -0.007 | -0.011 |
|  | (0.010) | (0.010) | (0.010) | (0.005) | (0.006) |
|  |  |  |  |  |  |
| Female | 0.004 | -0.017 | -0.005 | -0.030 | -0.013 |
|  | (0.052) | (0.042) | (0.041) | (0.028) | (0.031) |
|  |  |  |  |  |  |
| ECD attendance | -0.005 | 0.058 | 0.009 | -0.006 | -0.020 |
|  | (0.042) | (0.039) | (0.039) | (0.026) | (0.026) |
|  |  |  |  |  |  |
| Speaks language of instruction | 0.329 | 0.236 | 0.422 | -0.118\*\*\* | 0.178 |
|  | (0.348) | (0.309) | (0.324) | (0.033) | (0.103) |
|  |  |  |  |  |  |
| Standardized N of possessions | 0.014 | 0.009 | 0.004 | 0.000 | -0.000 |
|  | (0.013) | (0.018) | (0.017) | (0.009) | (0.013) |
|  |  |  |  |  |  |
| Standardized N of reading materials | -0.028 | -0.027 | -0.009 | -0.011 | 0.002 |
|  | (0.020) | (0.020) | (0.014) | (0.009) | (0.011) |
|  |  |  |  |  |  |
| Constant | 0.460 | 0.422 | 0.204 | 1.130\*\*\* | 0.838\*\*\* |
|  | (0.322) | (0.308) | (0.314) | (0.056) | (0.105) |
|  |  |  |  |  |  |
| N | 485 | 485 | 485 | 485 | 485 |

Standard errors in parentheses

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

## B5. Home Numeracy Environment and numeracy skills at baseline

Table B5.1 Reading materials coefficients from multivariate regressions by country and numeracy skill

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Numeracy skill | Bangladesh | Egypt | Ethiopia 1 | Ethiopia 2 | Malawi 1 | Malawi 2 | Pakistan 2 |
| One to one correspondence |  |  | -0.008 | 0.003 | 0.00\* |  | 0.036 |
|  |  | (0.004) | (0.00424) | (0.00191) |  | (0.0218) |
| Number Identification | 0.026\* | 0.034\* | 0.017 | 0.035\*\* | 0.005 | 0.002 | 0.036 |
| (0.0146) | (0.0167) | (0.010) | (0.0108) | (0.0122) | (0.0138) | (0.0421) |
| Place value | 0.016 | 0.022 | 0.012 | 0.017 |  |  | 0.045 |
| (0.0149) | (0.0196) | (0.017) | (0.0187) |  |  | (0.0612) |
| Skip 2s |  |  | 0.034\* | 0.022 |  |  |  |
|  |  | (0.017) | (0.0166) |  |  |  |
| Skip 5s | 0.045\*\* |  | 0.022\* | 0.010 | 0.008 |  | 0.015 |
| (0.0255) |  | (0.010) | (0.0142) | (0.0120) |  | (0.0596) |
| Pattern recognition |  | -0.026 | 0.034\* | 0.033 |  |  |  |
|  | (0.0257) | (0.014) | (0.0207) |  |  |  |
| Missing value | 0.030\* | 0.000 | 0.019 | 0.026 | 0.000 |  | 0.035 |
| (0.0204) | (0.0224) | (0.012) | (0.0159) | (0.0109) |  | (0.0469) |
| Addition | 0.020 | 0.046 | 0.008 | 0.009 | 0.011 | -0.032 | 0.015 |
| (0.0141) | (0.0314) | (0.005) | (0.00974) | (0.0210) | (0.0189) | (0.0179) |
| Subtraction | 0.028 | 0.000 | 0.01\* | 0.005 | -0.007 | -0.047 | 0.010 |
| (0.0200) | (0.0110) | (0.004) | (0.00680) | (0.0174) | (0.0175) | (0.00900) |
| Word problems | 0.026\* | 0.005 | 0.025 | 0.011 | -0.010 |  | 0.022 |
| (0.0152) | (0.0114) | (0.013) | (0.0185) | (0.0181) |  | (0.0476) |
| Shapes | 0.035\*\*\* | -0.023 | 0.027\*\* | -0.005 | 0.009 | -0.018 | 0.083\* |
| (0.0142) | (0.0153) | (0.010) | (0.0118) | (0.0117) | (0.00965) | (0.0405) |
| Measurement | 0.010 | 0.053\* | 0.012 | 0.000 | 0.019 | -0.010 | 0.034 |
| (0.0116) | (0.0231) | (0.015) | (0.0157) | (0.0191) | (0.0136) | (0.0353) |
| Time | -0.010 | 0.014 | 0.003 | 0.025 | 0.004 |  | 0.009 |
| (0.0132) | (0.0116) | (0.005) | (0.0146) | (0.0113) |  | (0.0405) |

Standard errors in parentheses. Coefficients from multivariate regressions that control for child’s age, sex, household size, educational background, home numeracy environment, SES.

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

Table B5.2 Home reading interactions coefficients from multivariate regressions by country and numeracy skill

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Numeracy skill | Bangladesh | Egypt | Ethiopia 1 | Ethiopia 2 | Malawi 1 | Pakistan 2 |
| One to one correspondence |  |  | -0.000 | -0.001 | 0.000 | 0.000 |
|  |  | (0.000) | (0.00118) | (0.000607) | (0.00445) |
| Number Identification | -0.001 | 0.000 | 0.004 | -0.006 | 0.004 | -0.02\* |
| (0.00220) | (0.00585) | (0.002) | (0.00348) | (0.00236) | (0.0207) |
| Place value | 0.000 | -0.006 | 0.001 | -0.003 |  | -0.015 |
| (0.00196) | (0.00614) | (0.003) | (0.00818) |  | (0.0134) |
| Skip 2s |  |  | 0.006 | -0.011 |  |  |
|  |  | (0.003) | (0.00728) |  |  |
| Skip 5s | -0.002 |  | 0.003 | -0.010 | -0.001 | -0.001 |
| (0.00361) |  | (0.002) | (0.00705) | (0.00214) | (0.0135) |
| Pattern recognition |  | 0.004 | 0.006\* | -0.006 |  |  |
|  | (0.00708) | (0.002) | (0.00560) |  |  |
| Missing value | -0.002 | 0.000 | 0.007\* | -0.003 | 0.000 | -0.015 |
| (0.00284) | (0.00464) | (0.003) | (0.00579) | (0.00181) | (0.00953) |
| Addition | -0.002 | -0.001 | 0.003\*\* | -0.001 | 0.001 | -0.001 |
| (0.00193) | (0.00545) | (0.001) | (0.00312) | (0.00301) | (0.00285) |
| Subtraction | -0.002 | 0.005 | 0.001 | -0.002 | 0.003 | -0.001 |
| (0.00271) | (0.00365) | (0.001) | (0.00249) | (0.00276) | (0.00187) |
| Word problems | -0.002 | 0.002 | 0.005\* | -0.010 | 0.005 | -0.015 |
| (0.00289) | (0.00394) | (0.002) | (0.00702) | (0.00302) | (0.00861) |
| Shapes | -0.002 | 0.004 | 0.006\*\* | -0.002 | 0.001 | -0.015 |
| (0.00227) | (0.00397) | (0.002) | (0.00533) | (0.00219) | (0.0104) |
| Measurement | -0.001 | 0.005 | 0.007\* | 0.006 | 0.000 | 0.002 |
| (0.00215) | (0.00646) | (0.003) | (0.00455) | (0.00304) | (0.00994) |
| Time | 0.003 | 0.010\* | 0.003\* | -0.026\*\*\* | 0.001 | -0.001 |
| (0.00165) | (0.00449) | (0.001) | (0.00456) | (0.00202) | (0.00516) |

Standard errors in parentheses. Coefficients from multivariate regressions that control for child’s age, sex, household size, educational background, home numeracy environment, SES.

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

Table B6.1 Reading materials coefficients from multivariate regressions by country and numeracy skill

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Numeracy skill | Bangladesh | Ethiopia 1 | Ethiopia 2 | Pakistan 2 |
| One to one correspondence |  | 0.000 | -0.009 | 0.001 |
|  | (0.000) | (0.005) | (0.001) |
| Number Identification | 0.014\* | 0.003 | -0.010 | -0.017 |
| (0.007) | (0.006) | (0.007) | (0.030) |
| Place value | 0.009 | -0.005 | -0.023 | -0.002 |
| (0.007) | (0.016) | (0.014) | (0.065) |
| Skip 2s |  | -0.004 | -0.005 |  |
|  | (0.007) | (0.007) |  |
| Skip 5s | 0.008 | 0.008 | -0.009 | 0.019 |
| (0.014) | (0.008) | (0.008) | (0.045) |
| Pattern recognition |  | 0.038\* | -0.004 |  |
|  | (0.018) | (0.014) |  |
| Missing value | 0.016 | 0.004 | -0.003 | -0.024 |
| (0.011) | (0.008) | (0.014) | (0.055) |
| Addition | 0.007 | -0.009 | -0.026 | 0.066 |
| (0.005) | (0.012) | (0.017) | (0.063) |
| Subtraction | 0.014 | 0.007 | -0.016 | 0.111 |
| (0.010) | (0.013) | (0.014) | (0.063) |
| Word problems | 0.004 | 0.003 | -0.013 | 0.114\* |
| (0.008) | (0.012) | (0.020) | (0.055) |
| Shapes | 0.018\*\* | 0.016\* | 0.007 | 0.110\* |
| (0.006) | (0.006) | (0.007) | (0.047) |
| Measurement | 0.011 | 0.015\* | -0.012 | 0.081 |
| (0.007) | (0.007) | (0.007) | (0.051) |
| Time | 0.005 | -0.006 | -0.024 | 0.092 |
| (0.005) | (0.022) | (0.019) | (0.085) |

Standard errors in parentheses. Coefficients from multivariate regressions that control for child’s age, sex, household size, educational background, home numeracy environment, SES.

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

Table B6.2 Home reading interactions coefficients from multivariate regressions by country and numeracy skill

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Numeracy skill | Bangladesh | Ethiopia 1 | Ethiopia 2 | Malawi 1 | Pakistan 2 |
| One to one correspondence |  | 0.000 | -0.000 | 0.000 | -0.000 |
|  | (0.000) | (0.001) | (0.000) | (0.000) |
| Number Identification | 0.004 | 0.000 | 0.002 | 0.004 | -0.010 |
| (0.006) | (0.001) | (0.002) | (0.005) | (0.009) |
| Place value | 0.008 | 0.001 | 0.005 |  | -0.031 |
| (0.006) | (0.002) | (0.004) |  | (0.018) |
| Skip 2s |  | -0.000 | 0.007\* |  |  |
|  | (0.002) | (0.003) |  |  |
| Skip 5s | -0.003 | 0.000 | 0.001 | 0.000 |  |
| (0.009) | (0.001) | (0.004) | (0.007) |  |
| Pattern recognition |  | 0.003 | 0.005 |  | -0.009 |
|  | (0.002) | (0.004) |  | (0.013) |
| Missing value | 0.006 | 0.002 | 0.007 | -0.002 | -0.019 |
| (0.009) | (0.002) | (0.005) | (0.004) | (0.015) |
| Addition | 0.016\*\* | 0.002 | 0.008 | -0.003 | -0.037\* |
| (0.006) | (0.002) | (0.005) | (0.006) | (0.015) |
| Subtraction | 0.020\* | 0.000 | 0.006 | -0.009 | -0.029 |
| (0.009) | (0.001) | (0.004) | (0.006) | (0.017) |
| Word problems | 0.023\* | 0.002 | 0.007 | -0.010 | -0.009 |
| (0.009) | (0.002) | (0.005) | (0.008) | (0.014) |
| Shapes | -0.007 | 0.000 | 0.002 | 0.001 | -0.020 |
| (0.007) | (0.001) | (0.002) | (0.004) | (0.013) |
| Measurement | 0.006 | 0.002 | 0.002 | -0.016\* | -0.024 |
| (0.006) | (0.002) | (0.002) | (0.008) | (0.014) |
| Time | -0.000 | 0.004 | 0.015\*\* | -0.002 | -0.004 |
| (0.004) | (0.003) | (0.006) | (0.005) | (0.022) |

Standard errors in parentheses. Coefficients from multivariate regressions that control for child’s age, sex, household size, educational background, home numeracy environment, SES.

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

Table B7.1 Change in reading materials coefficients from multivariate regressions by country and numeracy skill

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Numeracy skill | Bangladesh | Ethiopia 1 | Ethiopia 2 | Pakistan 2 |
| One to one correspondence |  | -0.004 | -0.008 | -0.001 |
|  | (0.005) | (0.006) | (0.008) |
| Number Identification | -0.001 | 0.006 | 0.010 | 0.033 |
| (0.006) | (0.009) | (0.006) | (0.039) |
| Place value | -0.003 | -0.006 | -0.028 | -0.041 |
| (0.006) | (0.019) | (0.020) | (0.069) |
| Skip 2s |  | 0.002 | 0.002 |  |
|  | (0.014) | (0.015) |  |
| Skip 5s | -0.002 | 0.009 | -0.006 | 0.071 |
| (0.013) | (0.009) | (0.012) | (0.065) |
| Pattern recognition |  | 0.041 | -0.019 |  |
|  | (0.023) | (0.018) |  |
| Missing value | -0.009 | -0.002 | -0.009 | 0.010 |
| (0.011) | (0.011) | (0.011) | (0.081) |
| Addition | -0.001 | 0.002 | -0.009 | 0.060 |
| (0.007) | (0.010) | (0.009) | (0.049) |
| Subtraction | 0.006 | -0.005 | -0.010 | 0.052 |
| (0.014) | (0.009) | (0.009) | (0.046) |
| Word problems | -0.009 | 0.014 | -0.009 | 0.035 |
| (0.010) | (0.016) | (0.013) | (0.053) |
| Shapes | 0.008 | 0.026\*\* | -0.014 | 0.024 |
| (0.008) | (0.010) | (0.011) | (0.054) |
| Measurement | 0.007 | -0.007 | 0.001 | 0.019 |
| (0.008) | (0.014) | (0.013) | (0.060) |
| Time | -0.011 | -0.029 | -0.003 | 0.033 |
| (0.011) | (0.016) | (0.017) | (0.081) |

Standard errors in parentheses. Coefficients from multivariate regressions that control for child’s age, sex, household size, educational background, home numeracy environment, SES.

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

Table B7.2 Changes in home reading interactions coefficients from multivariate regressions by country and numeracy skill

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Numeracy skill | Bangladesh | Ethiopia 1 | Ethiopia 2 | Malawi 1 | Pakistan 2 |
| One to one correspondence |  | -0.001\* | 0.002 | 0.000 | 0.000 |
|  | (0.001) | (0.001) | (0.001) | (0.002) |
| Number Identification | 0.001 | 0.001 | 0.001 | -0.001 | 0.019\* |
| (0.002) | (0.002) | (0.002) | (0.005) | (0.009) |
| Place value | 0.001 | -0.008\*\* | 0.006 |  | -0.003 |
| (0.002) | (0.003) | (0.006) |  | (0.023) |
| Skip 2s |  | -0.000 | 0.002 |  |  |
|  | (0.003) | (0.003) |  |  |
| Skip 5s | 0.007\* | -0.000 | -0.006 | -0.012 | -0.005 |
| (0.003) | (0.002) | (0.004) | (0.006) | (0.019) |
| Pattern recognition |  | -0.003 | 0.005 |  |  |
|  | (0.003) | (0.005) |  |  |
| Missing value | -0.001 | -0.003 | 0.004 | -0.003 | 0.014 |
| (0.002) | (0.002) | (0.005) | (0.003) | (0.021) |
| Addition | -0.002 | -0.002 | 0.005 | -0.005 | -0.020 |
| (0.002) | (0.002) | (0.004) | (0.005) | (0.011) |
| Subtraction | 0.000 | -0.004\*\* | 0.003 | -0.006 | -0.009 |
| (0.003) | (0.001) | (0.003) | (0.005) | (0.010) |
| Word problems | 0.001 | -0.001 | 0.007 | -0.012\* | 0.005 |
| (0.002) | (0.004) | (0.005) | (0.006) | (0.011) |
| Shapes | 0.005\* | -0.000 | 0.002 | -0.001 | 0.012 |
| (0.003) | (0.002) | (0.003) | (0.005) | (0.015) |
| Measurement | -0.004 | 0.002 | 0.004 | -0.022\*\* | -0.021 |
| (0.002) | (0.003) | (0.004) | (0.008) | (0.013) |
| Time | 0.004 | 0.000 | 0.008 | -0.002 | 0.006 |
| (0.002) | (0.002) | (0.007) | (0.006) | (0.018) |

Standard errors in parentheses. Coefficients from multivariate regressions that control for child’s age, sex, household size, educational background, home numeracy environment, SES.

\* p<0.05 \*\* p<0.01 \*\*\* p<0.001

1. A Common Approach is Save the Children International’s best understanding of how to address a particular problem facing children based on evidence and adapted to the multiple contexts in which the organization works. [↑](#footnote-ref-1)
2. Anecdotal evidence from the field revealed that girls might be more accurate but slower in responding to timed questions than boys, so we decided to test this hypothesis in a more formal way [↑](#footnote-ref-2)
3. Most of the inks to reports in these tables are internal to Save the Children. If you would like to gain access to a particular report you can email one of the authors [↑](#footnote-ref-3)
4. See Appendix A3. [↑](#footnote-ref-4)
5. Reading materials refer to the total number of materials present at home such as bools, comics, storybooks, religious books, etc. Math practices include activities that family members engage in with children such as telling them to study, helping them with math activities and operations, and playing math games with them. [↑](#footnote-ref-5)