Demand, supply, and learning in a very low-income context

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June 2022

Abstract

In very low-income settings, how much does family demand matter for child learning? In rural Gambia, caregivers with high aspirations for their children's future education and career, measured before children start school, invest substantially more than other families in their children's education. Despite this, essentially no children are literate or numerate three years later. In contrast, in villages receiving a highly impactful, teacher-focused supply-side intervention, children of high-aspirations caregivers are 25 percent more likely to achieve literacy and numeracy than other children. In such settings, greater demand can map onto developmentally meaningful learning differences, but only with adequate complementary inputs.

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1 Introduction

Families commonly wish to provide better lives for their children than experienced by previous generations. A key lever many families use to achieve this goal is education. Intergenerational educational mobility is an important source of economic mobility, both in Europe and North America (Black et al., 2011; Chetty et al., 2014, 2017), and, as shown more recently, in many low- and middle-income countries (Azam and Bhatt, 2015; Asher et al., 2018; Alesina et al., 2021).

In these low- and middle-income countries, both supply of and demand for education can shape educational and learning outcomes. Several hundred empirical studies and impact evaluations, summarized in a series of large meta-analyses, show that improved quality of educational supply can lead to greater learning, even in very low-income contexts (Kremer and Holla, 2009; McEwan, 2014; Ganimian and Murnane, 2016; Glewwe and Muralidharan, 2016; Evans and Yuan, Forthcoming). There is also an established empirical link between demand for education and learning levels in such settings (c.f. Foster and Rosenzweig 1996; Behrman 2010; Jensen 2010; Beaman et al. 2012). It is not clear, however, whether family demand for a child's education can map onto meaningfully greater learning in very low-income contexts where complementary inputs are often absent, or of extremely low quality.

In this paper, we study two core questions: first, if caregivers in these very low-income contexts want to raise their children's learning levels, how much learning can they bring about on their own? Second, how does this relationship change when the constraint of very low-quality educational supply is relaxed? To do so, we collect data from children and their caregivers in rural Gambia. We focus on a crucial period of child development in terms of skill acquisition, starting from the time immediately prior to the child starting primary school and following them for the next three years. We use these data to estimate the mapping from baseline demand onto subsequent educational investment and learning. We then show how a supply-side intervention, which dramatically raises learning levels for all children, also changes the relationship between baseline demand and endline learning.

We use data from a census of families in 169 villages in the two central regions of The Gambia. The data track families who, at the time of a baseline survey, intended to enroll at least one of their children in the first grade, for the first time, in the fall of 2015. Families and children were then followed over three years, during which time data were collected on the child's school enrollment, school-related time use, and on the family's educational expenditure for the child. At endline, these children were administered one-on-one tests of basic reading and math skills.[1]

We measure family demand by capturing the caregiver's aspirations at baseline for their child's future education and career. This draws from a series of theoretical and empirical studies showing a strong linkage from aspirations, a specific type of desire for the future, to both greater investment in education and higher educational outcomes (cf. Beaman et al. 2012; Bernard et al. 2014; Genicot and Ray 2017; Lybbert and Wydick 2018; La Ferrara 2019).[2] In our study, these serve as coarse measures of latent family demand for helping the child towards a better life than experienced by previous generations of the family.

We find that higher baseline aspirations map onto greater subsequent investment in the child's education. Caregivers with greater baseline educational and career aspirations for their children are three to six percentage points more likely to enroll their children in school in the first two years of the study than children of other caregivers. In the final year of the study, when essentially all children are enrolled in school, high-aspirations caregivers spend significantly more money on the child's education, and their children spend more time each day on school-related tasks.

Higher baseline aspirations also map onto higher endline test scores. Children whose caregivers report higher aspirations at baseline score 0.28-0.30 standard deviations (SD) better on a composite score measuring performance on endline tests of basic reading and math ability, administered three years after the baseline. The SD metric is a popular way to measure learning gains in studies of education, particularly in the many hundreds of impact evaluations of educational interventions that have been conducted in low-income contexts (McEwan, 2014; Glewwe and Muralidharan, 2016;

[1] These were Early Grade Reading and Math Assessments, also known as "EGRA" and "EGMA" tests, respectively. See Platas et al. (2014) and Dubeck and Gove (2015) for details on their development, implementation, and limitations.

[2] Fruttero et al. (2021) summarizes recent empirical research on this topic.

Ganimian and Murnane, 2016; Evans and Yuan, Forthcoming). In the context of these studies, our estimate appears to suggest substantially higher learning levels among children of high-aspirations caregivers.

We next show that the SD dramatically overstates the mapping from demand to learning when baseline levels of learning are extremely low. To do so, we estimate this same relationship using a set of measures that are developmentally meaningful for a child's subsequent learning and educational trajectory. Using standard measures of literacy and numeracy derived from our tests, we estimate a precise zero relationship between baseline aspirations and endline levels of either skill. We also find very small gains in other measures of developmentally meaningful reading and math skill acquisition, such as familiar word reading and single-digit addition. Because learning levels in this context are close to zero, even a very small absolute gain in test scores translates into a large relative change, which is picked up only by the SD. Despite the large relative gains measured by the SD, our results show that essentially all children in these areas possess none of the other skills necessary for literacy and numeracy – and expected of grade 2 students in The Gambia – such as reading simple words or calculating basic sums.[3]

We argue further that our estimates provide a likely upper bound on the status-quo relationship in this context between demand for education, as measured by aspirations, and learning outcomes. This is because potential unobservable confounders – for example, unobserved wealth or family preferences – are most likely to be positively correlated with both the aspirations we study and educational outcomes (Bernard et al., 2014; Ross, 2019). Should such unobserved traits influence our estimates, the true relationship would be even smaller than what we measure.

We then estimate how a dramatic increase in the quality of educational supply changes the mapping from demand to learning. We exploit the random assignment of a highly-resourced, teacher-focused supply-side educational intervention offered to half of the villages in our study. Eble et al. (2021) show that the intervention yielded transformative learning gains for all students in these villages. In our study, we exploit this shock to educational supply to estimate how demand

[3]This inverse relationship between the learning contained in a given effect size estimate and the baseline learning level of the population being studied has also been found in US schools (Hill et al., 2008).

and supply interact to generate learning in rural Gambia.

We find that, in the presence of high-quality educational supply, there is a positive and significant relationship between baseline educational demand and endline learning. This pattern holds both in terms of the child's likelihood of achieving literacy and numeracy, and in their acquisition of other related skills. In villages randomly assigned to receive the intervention, children of caregivers with high educational aspirations at baseline are 25 percent more likely to reach literacy and numeracy at endline than other children in these same villages. We estimate similar gains in the number of words these children can correctly read per minute. We find a much smaller, statistically insignificant mapping from baseline career aspirations onto literacy or numeracy.

We then study patterns of complementarity and substitutability between demand and supply in the acquisition of individual skills at varying levels of difficulty. For the lowest-level reading and math skills, our estimates suggest substitutability between both educational and career aspirations, respectively, and educational supply. For higher level skills, we find evidence of complementarity between educational aspirations and educational supply, but no evidence of complementarity for career aspirations. This underscores the difference between the latent factors captured by our measures of baseline educational and career aspirations.

Finally, we discuss two potential alternative explanations for this latter set of results: that aspirations merely capture unobserved child ability or household wealth, respectively, which also lead to greater learning when the quality of educational supply increases. Unlike in our analysis of these relationships in the rural Gambian status quo (i.e., among children in villages not receiving the intervention), we cannot use a bounding argument to capture how unobserved factors may contribute to this second set of results, as the intervention could either substitute for or reinforce the role of these factors. Instead, we explore the likely magnitude of these contributions. For child ability, several facts – the extremely low proportion of caregivers who have ever gone to school or are able to read, the fact that aspirations are measured prior to the child starting school, and the fact that even after children go to school, caregivers in such contexts often have highly inaccurate beliefs about child ability (Dizon-Ross, 2019) – make it exceedingly unlikely that caregiver aspirations are

merely a proxy for child ability. For wealth, we show that our main results are robust to including interactions between aspirations and measures of wealth and caregiver education, evidence that our results are not driven by this alternative explanation.

Our paper documents an important interaction between the inputs of families (through aspirations and investments of caregivers) and school systems (through the availability of quality educational inputs), during a crucial juncture in children's lives. We show that highly resource-poor families expend substantial resources, both money and time, towards helping their children learn these skills. We then show that nearly all of the students in the status quo areas are highly unlikely to master key skills for their developmental trajectory – specifically literacy, numeracy, and related skills – in this crucial three year period.

Sadly, failure to master these skills in this period has grave implications for these children's futures. From a developmental perspective, we study this relationship in a period of childhood (ages 6-11) which is critical for child learning and development (Knudsen, 2004; Nelson III and Gabard-Durnam, 2020). This age range is one in a series of sensitive periods for many domains of cognitive development, including processes essential for acquiring basic literacy and numeracy skills (Werker and Tees, 2005; Nelson III and Gabard-Durnam, 2020). The absence of critical inputs during this period can function as what the developmental literature refers to as "a violation of the expectable environment," or the "absence of an expected experience" (Nelson III and Gabard-Durnam, 2020, p. 134), rendering it more difficult for children to acquire these skills later in life. This is important for the child's subsequent learning trajectory because the development of key academic skills such as literacy and numeracy are inter-related and complementary over time (Masten et al., 2005), and have been found to be predictive of later academic achievement (Duncan et al., 2007; Wolf and McCoy, 2019). Relatedly, a large body of prior work on learning in developing country contexts has studied curricular progression. This work documents that many teachers, particularly those in government schools, are incentivized to stick to the grade-specific curriculum even if students do not understand it. As a result, children who reach higher grades without mastering foundational skills – in our case, essentially all children in the status quo – are likely to be

left behind in school and highly unlikely to ever acquire these skills (Cunha and Heckman, 2007; Pritchett and Beatty, 2015; Muralidharan et al., 2019; Niaz Asadullah et al., 2019).

Our results show that this does not have to be the case. The dramatic change in the quality of supply generated by the intervention provides many necessary inputs absent in the status quo. These inputs shift the impact of high-aspirations families' investments in their children, moving these children from a status quo state of having somewhat greater likelihood of mastering rudimentary skills than other children to, instead, having a substantially greater likelihood of mastering higher-level reading and math skills, including literacy and numeracy.

Our study also advances general understanding of how the demand-side and supply-side interact to generate learning in low-income contexts (cf. Jensen 2010; Glewwe and Muralidharan 2016; Muralidharan et al. 2019; Romero et al. 2020). We uncover patterns of substitutability and complementarity between demand and supply in children's acquisition of reading and math skills, building on recent studies of complementarities between educational inputs on the supply side in similar settings (Mbiti et al., 2019; Kerwin and Thornton, 2021). Finally, we also contribute to the growing body of work on the role of aspirations in education and development (cf. Dalton et al. 2016; Genicot and Ray 2017; Lybbert and Wydick 2018; Serneels and Dercon 2021). Prior work on aspirations frustration has shown that the hypothesized links between aspirations, investment, and outcomes can fail when the outcome to which an individual or family aspires is so far away as to seem futile, which in turn depresses related investment (Genicot and Ray, 2017; Ross, 2019; McKenzie et al., 2022). We show that in rural parts of The Gambia, an analog failure can also appear when, despite a robust mapping from aspirations to investment, the mapping from investment to key developmental outcomes collapses in the absence of other necessary inputs.

2 Setting and data

In this section, we describe the setting of our study, the data we analyze, and our measures of learning and aspirations.

2.1 Setting

Our study takes place in small, rural settlements in the Lower River and North Bank regions of The Gambia. The Gambia is located in West Africa, with Senegal on its border to the north, east, and south, and the Atlantic Ocean to its west.[4] Its population is roughly two million people, and its geographic area covers roughly 11,300 square kilometers (CIA, 2019). It is a former British colony and served as a major hub for the trans-Atlantic slave trade (Wright, 2015). The devastation and historical impacts of this legacy are important contributors to the fact that The Gambia is very income poor, with per-capita GDP estimated to be $716 in 2018. The country's main sources of economic activity are currently agriculture, tourism, remittances, and foreign aid.

In addition to income poverty, the country's education levels are also very low. In 2013, the Demographic and Health Surveys estimated that only 26.7 percent of adults living in rural areas were literate, and roughly half of adults in these areas had never been to school (The Gambia Bureau of Statistics and ICF International, 2014). Other national assessments of children's reading and math abilities have shown that learning levels among children in The Gambia are dramatically lower than in other countries in the region (Sprenger-Charolles, 2008).

The population of our study comes from a census of all villages in these two regions meeting a series of pre-specified eligibility criteria. We began with the universe of villages in these two regions which had between 10 and 300 households according to the 2013 national census.[5] Of these villages, we enrolled those which had at least 10 eligible children resident in the village at the time of enumeration in early 2015.[6] Children were eligible if, at time of enumeration, they were between the ages of 6 and 8, they had not yet entered the first grade, and their primary caregiver intended to enroll them in the first grade in the coming academic year. Ultimately, 169 villages across the two regions were enrolled in the trial. The participants in our study were all children in

[4] In Figure A.1, Panel A, we show a map of The Gambia's location on the African continent.

[5] In Figure A.1, Panel B, we show a map of The Gambia indicating the regions in which these villages are located. These data were collected as part of the randomized controlled trial registered in Boone et al. (2015).

[6] There were 323 total villages to begin with. Of these, 113 had too few children to be eligible. The study excluded a further 41 of the remaining villages to create buffer zones between villages in order to ensure no potential for spillover between villages, i.e., caregivers of children in control villages instructing their children to walk into an intervention village and avail themselves of the intervention there.

the village meeting these eligibility criteria, and each child's primary caregiver.

Because presence in this sample is conditional on the caregiver intending to enroll the child in school in the coming year, aspirations measured among participants may differ from the population in these areas. When abstracting from our sample to the population of all children in our study areas in this age range, we make the following assumption: the trajectory of literacy and numeracy skills among excluded children is unlikely to be dramatically better than of study participants, though it could be either similar, or worse. This stems from the fact that excluded children will enter school later than study children, and later school entry corresponds to worse academic outcomes in similar settings (Glewwe and Jacoby, 1995; Bommier and Lambert, 2000).

There were 4,518 children enumerated at baseline, 3,825 for whom we have endline test scores. For the sake of brevity, we focus on these 3,825 students in our analysis.[7] In the next section, we describe the characteristics of these children and their families.

2.2 Data

Data were collected from participants (children and their caregivers) over the period from January 2015 to June 2018. Participants were enumerated in early 2015 and randomization occurred in late 2015. Villages randomly assigned to the intervention arm received a highly-resourced, "bundled" intervention providing after-school remedial education delivered by para teachers. This program began in early 2016 and continued until the beginning of May 2018.

The program bundled together multiple teacher-focused prongs known to work in isolation. It began by hiring para teachers, either from within the village or nearby (Kingdon and Sipahimalani-Rao, 2010; Muralidharan and Sundararaman, 2013). It trained them to use scripted lessons (Piper et al., 2014; Banerjee et al., 2017) to deliver after-school, supplementary education for 12 hours per week over the course of the study, following the official Gambian curriculum as children progressed through school. These para teachers were regularly monitored with a focus on "coaching," that is, improving their instructional capacity and ensuring student learning (Kraft et al., 2018; Piper et al., 2018). Eble et al. (2021) show that this intervention was highly effective at raising

[7] Baseline aspirations do not predict attrition at the endline test.

Table 1: Demographic characteristics

	(1) All	(2) Status quo	(3) Intervention
Child is female	0.50	0.51	0.48
Caregiver can read simple sentence	0.08	0.08	0.08
Caregiver is not child's mother	0.23	0.22	0.23
Books found in house	0.67	0.65	0.69
Caregiver education			
Never been to formal schooling	0.76	0.77	0.76
At least some primary education	0.16	0.15	0.16
At least some junior secondary education	0.06	0.06	0.06
At least some senior education, or more	0.02	0.02	0.02
Household wealth			
House is made of all natural materials	0.06	0.05	0.08
House is made of partially synthetic materials	0.68	0.68	0.68
House is made of all synthetic materials	0.26	0.28	0.24
Observations	3,825	2,045	1,780
Joint F-statistic		0.652	
(p-value)		(p= 0.688)	

Table 1 note: this table presents select demographic characteristics for children in our sample, both overall (column 1) and then separately by the treatment status to which they were randomized (columns 2 and 3, respectively). The joint F-statistic is a test of the null that these variables together are not jointly predictive of the child's randomization status to the intervention (treatment) or status quo (control) group, clustering by trial-assigned clusters of contiguous villages. All variables in this table, except for the number of observations, are binary, with 0 = No and 1 = Yes.

learning levels for all children in villages randomly assigned to receive it.

In Table 1, we present a few key demographic characteristics of the children in our sample first overall, and then separately by the arm of the trial into which they were randomized. We refer to children enumerated in villages that were subsequently randomized to not receive the intervention (i.e., the control group) as the "status quo" group. We refer to children enumerated in villages subsequently randomized to receive the intervention as the "intervention" group. At baseline, fewer than 25 percent of primary caregivers in either group had ever been to school.[8] This is lower than average levels in The Gambia (The Gambia Bureau of Statistics and ICF International, 2014), consistent with the fact that the areas in which the study took place are lower-income, more remote,

[8]We focus on caregivers, as opposed to parents, because early fieldwork suggested that the most important person for the child's development is the primary person from whom the child receives their day-to-day care. This is often, but not always, the parent. In our data, roughly 75% of caregivers are mothers, 11% are grandmothers, and the rest are various other members of the household in which the child lives.

and less well-served by the government than many others in the country. We observe a simple proxy for wealth: whether the floor, walls, and roof of the home are made of synthetic materials (also used in Eble et al., 2021 and Fazzio et al., 2021), with roughly one quarter of households living in homes constructed entirely out of synthetic materials. There is balance between randomization groups in these and other observable characteristics, as shown in the p-value of the joint F-test for a test that these characteristics predict group membership reported at the bottom of the table (Bruhn and McKenzie, 2009).

We also collect three types of data on family investment in the the child's schooling. The first captures child enrollment in school, collected at the end of each academic year. The second and third were collected at the end of the third year: the caregiver's annual financial expenditure on the child's education (comprising teacher "top-up" fees, school materials such as stationery, and other related costs), and the proportion of the child's waking hours on an average weekday spent on school-related tasks, which we refer to as "time use."

2.3 Measuring learning

We measure child learning at endline with tests conducted in May and June of 2018. These tests were EGRA- and EGMA-style tests (short for Early Grade Reading and Math assessments, respectively; Platas et al. 2014; Dubeck and Gove 2015), administered to each study child one-on-one as per test guidelines. These tests are highly sensitive to capturing learning at the earliest stages, cases where most children cannot yet read instructions on a written test. They measure the acquisition of a series of early grade reading and math skills which are precursors to, or components of, achieving literacy and numeracy.

The reading and math tests are both comprised of questions that belong to different "subtasks," and each subtask captures one such skill. In Table 2 we describe the subtasks/skills evaluated by each test. Each test has six subtasks; as the number of the subtask rises, so does the level of difficulty. For example, reading subtask 1 focuses on letter sound identification, a precursor to (and easier than) the skill evaluated in reading subtask 4, familiar word recognition. We provide the full

Table 2: Test subtasks

Reading		*Math*	
Subtask	**Example**	**Subtask**	**Example**
1	Read a letter's sound (e.g., "eh" for e)	1	Read a number (e.g., 1, 5, 22)
2	Differentiate sounds (e.g., which word starts with a different sound: book, dog, or boy)	2	Choose the larger number (e.g., 7 or 5)
3	Read a made-up word (e.g., tob)	3	Complete a sequence (e.g., 2 4 6 __)
4	Read a familiar word (e.g., but)	4a	Simple addition (e.g., 3+2)
		4b	Two- and three-digit addition (e.g., 38+26)
5a	Read a short passage	5a	Simple subtraction (e.g., 5-3)
5b	Answer questions on the passage's content	5b	Two- and three-digit subtraction (e.g., 59-37)
6	Listen to a different short passage, answer questions on the passage's content	6	Solve a simple word problem read aloud

Table 2 notes: this table describes the individual "subtasks" within the reading (EGRA) and math (EGMA) tests administered at endline. The full test papers are given in Appendix A; the relevant subtask number for each block of questions is indicated in the test papers.

test papers in Appendix A.

The skills these tests evaluate align closely with the Gambian national curriculum for grades 1-3. Versions of them have also been used as part of the government's efforts to assess its own teachers since 2007. This ensures that our measures of learning hew closely to the education goals of the Gambian national education system.

We generate four key measures of learning using these tests. First, following Eble et al. (2021), we generate a composite score of overall child performance at endline. This is calculated as the proportion of total questions answered correctly on each of the two tests.[9] We estimate both the difference in raw scores between groups, as well as the transformation of this difference into standard deviation units using Cohen's d. From here onward, we refer to this as our SD measure.

We also study children's acquisition of specific skills via their performance on the individual subtasks within each test. First, we use binary variables capturing whether the child meets estab-

[9]Each test is given equal weight in generating this measure, and within each test, performance on each subtask is given equal weight.

lished thresholds for achieving literacy and numeracy, derived from the child's performance on certain subtasks within each test (Dubeck and Gove, 2015; Fazzio et al., 2021). A child is assessed to be literate if they can read "with good fluency" (45 words per minute; subtask 5a) and correctly answer at least 80% of reading comprehension questions (subtask 5b). A child is assessed to be numerate if they can successfully identify missing numbers in a sequence (e.g., 2, 4, _, 8) in at least 70% of the questions on the test (subtask 3), and correctly answer at least 80% of word problems (subtask 6). Finally, we study differences in child performance on each of the individual subtasks, as measured by the proportion of questions in that subtask answered correctly. Measuring performance across these subtasks allows us to show detailed learning trajectories across a spectrum of skills, from the very earliest stages of learning to more advanced skills on the path to these two benchmark abilities.

In consultation with the Gambian Ministry of Basic and Secondary Education and other experts in the area, at the end of pre-trial fieldwork we decided not to conduct baseline tests of learning. Our fieldwork suggested that, because our focus was on children who had not yet been to school at the time of baseline enumeration (and prior to randomization), baseline tests would have generated only a trivially small number of non-zero scores, and therefore the cost – both financial and in terms of the time and energy of participants – greatly exceeded the likely benefit of these tests. We assume every child starts from a zero baseline learning level in terms of the skills we measure at endline; the very low levels of these skills that we measure in the status quo group, after the vast majority of students have completed three years of primary schooling, support this assumption.

2.4 Measuring demand via aspirations

At baseline, prior to randomization and before the child would enter school for the first time, we asked the child's main caregiver about their aspirations for the child's future. These questions were designed to capture a coarse measure of the family's latent desire to provide a better future for their child than that experienced by previous generations. They were piloted prior to use, and are similar to those asked in other studies of aspirations in Ethiopia, India, and Somalia (Bernard et al., 2014;

Attanasio et al., 2020; Kipchumba et al., 2021).

Following La Ferrara (2019), we target two types of aspiration. The first is the caregiver's aspirations for their child's highest level of educational attainment. To capture educational aspirations, we asked the child's main caregiver: "ideally, what is the highest level of education you would like [child name] to attain?"[10] The second is the caregiver's aspirations for their child's career in adulthood. To capture career aspirations, we asked the caregiver: "when [child name] is 20 years old, what job do you hope [she/he] will be doing?" We transform these into binary variables. For education, we generate an indicator variable for whether the caregiver would like the child will go to university. For career, we generate an indicator for whether the caregiver hopes the child will work in an urban area[11], capturing the fact that most jobs in urban areas require literacy and numeracy skills, and on average pay substantially more than jobs in the countryside.

In Table 3, we present conditional means of aspirations levels by treatment status and by a series of variables related to relative economic prosperity, household features, and caregiver education. These characteristics are all predetermined relative to our measurement of aspirations. Roughly 60 percent of caregivers would like their child to go to university, what we will call "high" educational aspirations. This is slightly lower than levels recently recorded in rural Ethiopia (Bernard et al., 2014) and Somalia (Kipchumba et al., 2021), and far lower than levels recently recorded in India (Attanasio et al., 2020). Roughly 65 percent of caregivers aspire that their child will work an urban area, what we will call high career aspirations. The correlation between educational and career aspirations is 0.181, indicating substantial independent variation between the two. Comparing across groups, we see no difference in baseline aspirations between the caregivers of children in the intervention and status quo group, respectively.

[10]Lybbert and Wydick's 2018 study of aspirations differentiates between "aspirational hope" and "wishful hope," arguing that the latter are characterized by a lack of a viable pathway to achieve them. Among our study participants, as in the Ethiopian, Indian, and Somalian contexts referenced above, few individuals are likely to go to university. Nonetheless, many caregivers hope that their children will do so, and we follow this body of prior research in referring to responses to the two questions as capturing aspirations. The aspirations we measure also differ importantly from expectations. In our pilot, we worked to choose language that differentiated between aspirations and expectations. In this work, however, we determined that we could not ask respondents about both expectations and aspirations without unacceptably large priming effects.

[11]This includes jobs such as doctor, nurse, judge, legal clerk, or politician, but not jobs like imam, farmer, or farm laborer.

While baseline aspirations correlate with other baseline characteristics that might predict educational investment and learning levels, these conditional means show that there is substantial variation in aspirations independent of these variables. Caregivers who have been to school and, separately, those who can read, are significantly more likely to hold high educational and career aspirations at baseline. Nonetheless, fewer than a quarter of caregivers have ever been to school, and less than 10 percent can read a simple sentence. These estimates show that even among caregivers with no formal schooling and who cannot read, the majority also express high educational and career aspirations for their children. We find no evidence of correlation between our wealth measure and either aspirations measure, nor between wealth and caregiver education. This is in line with the notion that, in rural parts of The Gambia, higher levels of wealth are not necessarily predictive of greater education, particularly given the importance of farming and animal husbandry. In our analysis of the relative importance of baseline aspirations on subsequent educational investment and learning gains, we control for these variables, isolating the relationship between our dependent variables and the part of our aspirations measures which are orthogonal to these variables.

We argue that these measures capture (part of) latent family demand for investment in their children's education. Two features of our data support this argument. First, as we show in Section 4, these measures are significant predictors of subsequent investment in the child's education. Second, as we show in Section 5, they appear to be family-specific rather than child-specific. Among the families with multiple children in our study, between 70 (career) and 90 (education) percent report the same aspiration for both children. This suggests we are likely capturing family demand, rather than traits of the child such as unobserved ability. We discuss these issues in greater depth in Section 5.2

Table 3: Levels of aspirations at baseline and conditional means by predetermined household variables

	(1) Aspires that child will go to university	(2) Aspires that child will find work in urban area
Overall	0.61	0.65
Randomization group		
Intervention	0.61	0.65
Status quo	0.61	0.65
P-value of difference	(0.72)	(0.87)
Child gender		
Male	0.63	0.64
Female	0.60	0.67
P-value of difference	(0.07)	(0.04)
Caregiver education		
Caregiver has been to school	0.71	0.74
Caregiver has never been to school	0.58	0.63
P-value of difference	(0.00)	(0.00)
Caregiver literacy		
Can read simple sentence	0.82	0.82
Cannot read simple sentence	0.59	0.64
P-value of difference	(0.00)	(0.00)
Materials of home		
Home made of synthetic materials	0.62	0.68
Home made of natural materials	0.61	0.64
P-value of difference	(0.47)	(0.04)
Books in house		
Books found in house	0.63	0.67
No books found in house	0.58	0.63
P-value of difference	(0.00)	(0.01)

Table 3 notes: this table shows the mean levels of the two aspirations we study, along with their conditional means by each of the binary baseline characteristics labeled in the left-most column. For conditional means, we also conduct a t-test of the null that the aspiration in question is equal for those with each value of the baseline characteristic, and present the p-value in parentheses below. Caregiver literacy is an indicator for whether the caregiver can read a simple sentence – in the spirit of the ASER literacy test (Pratham, 2012) – at the time of a baseline survey. The household wealth variable is described in the text. Books in house is indicator for whether there were any books found in the child's home during the baseline survey.

3 Research design

Our study aims to answer two core research questions.[12] The first core question is how caregiver aspirations and educational investment in low-income context map onto early learning outcomes during a critical developmental period for obtaining basic literacy and numeracy skills? To answer this question, we estimate the mapping from aspirations at baseline onto subsequent investment in education and endline learning levels, respectively, using the following equation:

$$y_{ic} = \alpha_0 + \alpha_1 A_{t=0,ic} + \alpha_2 X_{t=0,ic} + \eta_r + \varepsilon_{ic} \tag{1}$$

In this equation, y_{ic} is the outcome variable of child i in cluster c; α_0 is a constant; $A_{t=0,ic}$, is the aspirations of the caregiver for child i at baseline (i.e., when $t = 0$); $X_{t=0,ic}$, is a vector of predetermined variables for child i, measured at baseline, which include all the variables shown in Table 3; and η_r is a region-specific fixed effect. We cluster our standard errors at the level of contiguous clusters of villages, ε_{ic}.[13]

Our main parameter of interest is α_1, which captures the mapping from baseline aspirations to subsequent outcomes, conditional on the region of the child's village and the baseline characteristics contained in $X_{t=0,ic}$ (and listed in Table 3), such as gender, wealth, and caregiver education. In these analyses, we use only data from the status quo group. This is because, as shown in Eble et al. (2021), the intervention group's subsequent educational investment and endline learning levels are affected by receipt of the intervention, confounding our ability to measure the status quo mapping from baseline aspirations to subsequent outcomes among children in this group.[14]

Our second core research question is whether the mapping from baseline demand to endline learning changes when the quality of educational supply increases dramatically. To answer this question, we conduct analyses using children in both the status quo and intervention groups. We

[12] While the analysis for the broader RCT was pre-specified and pre-registered (Boone et al., 2015), this paper reports exploratory analysis of these data, for which we chose not to pre-register an analysis plan (Olken, 2015; Lin and Green, 2016).

[13] This is the same level as the randomization in Eble et al. (2021).

[14] For completeness, in Appendix Table A.1 we show these relationships for both the status quo and intervention groups, estimated using Equation 2.

exploit the random assignment of the bundled para teacher intervention as a source of identifying variation. These analyses also use ordinary least squares, regressing the outcome variable on a constant, baseline aspirations, the randomly assigned treatment status of the village in which the child was enumerated, and their interaction, following the same error clustering strategy as in Equation 1.

$$y_{ic} = \beta_0 + \beta_1 A_{t=0,ic} + \beta_2 T_c + \beta_3 T_c * A_{t=0,ic} + \beta_4 X_{t=0,ic} + \eta_r + \varepsilon_{ic} \tag{2}$$

Here T_c is child i's treatment status, and $A_{t=0,ic}$ is again the relevant measure of aspirations for the child reported by their caregiver at baseline.

Our main parameter of interest from this equation is β_3. The sign and significance of β_3 indicate whether the change in the quality of educational supply induced by the intervention changes the mapping from baseline aspirations to endline learning. A positive and significant estimate of β_3 would suggest that family inputs and educational supply are complementary, while a negative and significant estimate would suggest substitutability between the two, including possible substitution behavior on the part of the family. β_1 in this equation is analog to α_1 from the Equation 1; β_2 captures the main treatment effect in Eble et al. (2021). We also present a parameter which we call the "interaction mean." This captures the mean level of the outcome variable for high-aspirations children, conditional on being enumerated at baseline in a village that was later randomly assigned to receive the intervention. We calculate this by adding β_1 and β_3. We also present a p-value of a test of the null that the interaction mean is equal to zero. The magnitude and statistical significance of the interaction mean estimates whether children in the high-aspirations group in intervention villages demonstrate a higher level of the skill in question than do children of the low aspirations group in these same intervention villages.

4 Aspirations, investment, and learning in the status quo

In this section, we characterize the mapping from baseline aspirations onto subsequent educational investments and endline learning levels in the rural Gambian status quo. We estimate Equation 1 using the three measures of investment and four measures of learning described in Section 2. We

then bound our results by describing the likely sign of any potential influence from unobserved factors on our estimates.

4.1 Aspirations and educational investment in the status quo

We first characterize the mapping from baseline aspirations levels to subsequent educational investment in the status quo group. We present our estimates in Table 4; the outcome variables, named in the column headings, are educational expenditure in year three of the study, child time use in year three of the study, and enrollment in school in each of the three study years.

Baseline aspirations have a significant positive mapping onto subsequent educational investments. Caregivers of children who hold higher educational or career aspirations for the child spend between 10 and 15 percent more money per year on costs related to the child's education.[15] Children of these caregivers also spend a greater proportion of their time on a typical weekday on school-related tasks; this difference is statistically significant for baseline educational aspirations, but not for baseline career aspirations.

In addition, children whose caregivers have higher educational or career aspirations for the child at baseline are more likely to be enrolled in school in the first two years of the study. This pattern disappears in year three of the study, at which point almost all children are enrolled in school. Nonetheless, this early difference is important. Children of low-aspirations caregivers are much more likely to suffer from delayed enrollment in school than those of high-aspirations children, and delayed enrollment is a strong predictor of lower overall educational attainment (Nonoyama-Tarumi et al., 2010).

As a check for plausibility, we compare the sign and magnitude of our estimate of α_1 to similar relationships in this context, as well as to estimates from another, similar context. First, we observe that the estimated coefficients for the mappings from other control variables to educational investment have a similar order of magnitude as do those for baseline aspirations, and the signs of these estimated relationships are as expected. For example, there is a statistically significant positive

[15] Expenditures are reported in Gambian Dalasis. In mid-2018 when these data were collected, the exchange rate between Dalasis to US Dollars was 46.81 to one.

Table 4: Baseline aspirations and educational investment in the status quo

	(1) Educational expenditure	(2) School-related time use	(3) Enrolled in school, year 1	(4) Enrolled in school, year 2	(5) Enrolled in school, year 3
Panel A: Educational aspirations					
Aspiration: child will go to college (α_1)	76.70**	0.019***	0.031	0.055**	0.006
	(27.88)	(0.007)	(0.027)	(0.025)	(0.008)
Wealth index high	122.44***	0.003	-0.008	-0.027	-0.001
	(41.19)	(0.007)	(0.024)	(0.018)	(0.012)
Caregiver can read simple sentence	80.58	0.025**	0.063*	0.049*	0.016*
	(73.77)	(0.012)	(0.034)	(0.026)	(0.008)
Books found in house	62.97**	0.008	0.051**	0.040***	0.005
	(30.64)	(0.007)	(0.021)	(0.013)	(0.006)
Child is female	-13.58	0.006	0.018	-0.000	0.010
	(23.67)	(0.008)	(0.015)	(0.022)	(0.008)
Comparison group mean	611.36	0.545	0.825	0.802	0.971
Number of observations	1,923	1,970	2,002	1,970	1,970
Panel B: Career aspirations					
Aspiration: child will work in urban area (α_1)	69.25**	0.005	0.034	0.055***	0.000
	(27.44)	(0.006)	(0.023)	(0.020)	(0.005)
Wealth index high	119.58***	0.003	-0.009	-0.029	-0.001
	(40.44)	(0.007)	(0.024)	(0.018)	(0.012)
Caregiver can read simple sentence	83.81	0.027**	0.064*	0.051*	0.017**
	(71.22)	(0.012)	(0.035)	(0.028)	(0.008)
Books found in house	67.10**	0.009	0.053**	0.043***	0.005
	(30.20)	(0.007)	(0.020)	(0.013)	(0.006)
Child is female	-19.61	0.005	0.016	-0.005	0.010
	(23.58)	(0.008)	(0.015)	(0.023)	(0.008)
Comparison group mean	617.54	0.553	0.820	0.799	0.973
Number of observations	1,923	1,970	2,002	1,970	1,970

Table 4 notes: this table reports the results of estimating Equation 1 using the outcome variable given in the column heading and with the type of baseline aspirations (educational or career) indicated in the panel heading. Dependent variables are labeled in the column headings and defined in the text. These analyses include only children in the status quo group. We report clustered standard errors in parentheses below each estimated coefficient. Observations vary by column because outcome variables were collected at different times and some children were missed in some periods. Results are robust to including only the smallest estimation sample. The full set of controls is as indicated in Section 3. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. For completeness, in Appendix Table A.1 we show these relationships for both the status quo and intervention groups, estimated using Equation 2.

relationship between wealth and educational expenditure. Second, we note that the estimates in Bernard et al. (2014) of an intervention-driven aspirations gain on educational investment in rural Ethiopia are similar in sign and magnitude to our estimates of the mapping from aspirations to investment in rural Gambia.

4.2 Aspirations and learning in the status quo

We next estimate how baseline aspirations map onto endline learning levels in the status quo group. We present our first set of results in Table 5. In column 1 we show this relationship for raw test scores. We find that, after controlling for baseline characteristics, children whose caregivers have high baseline educational aspirations for the child perform 3.3 points better than children of caregivers with low baseline education aspirations. This is from a baseline of 15 points, i.e., the average child correctly answering 15 percent of questions correctly, which is shown in the "comparison group mean" row. For children of caregivers with high career aspirations, this difference is 3.8 points. Both differences are highly statistically significant.

We plot the distribution of these scores, by aspiration group, in Figure 1. This shows that the high-aspirations group's test score distribution first-order stochastically dominates that of the low aspirations group for both types of aspiration. Kolmogorov-Smirnov tests of equality of distributions reject equality with $p < 0.001$ in both cases.

Using the common practice of transforming raw score differences into standard deviation units, the mapping from baseline caregiver aspirations to endline learning appears very large. For educational aspirations, the raw difference translates into a difference of 0.28 SD, and for career aspirations, it would be 0.30 SD.[16] As a thought experiment, if we simply compared the magnitude of our estimates of α_1 to the effect estimates reported in the hundred of studies summarized in a series of recent meta-analyses of evaluations of educational interventions in such contexts (c.f. Kremer and Holla, 2009; McEwan, 2014; Glewwe and Muralidharan, 2016; Evans and Yuan, Forthcoming), they would be placed between the 75th and 90th percentile of all estimates included in these meta-analyses.

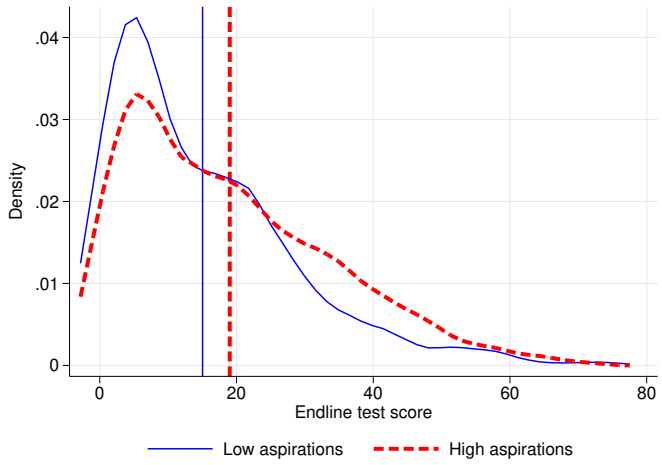
[16]Estimated using *Cohen's d*.

Table 5: Baseline aspirations and endline learning in the status quo

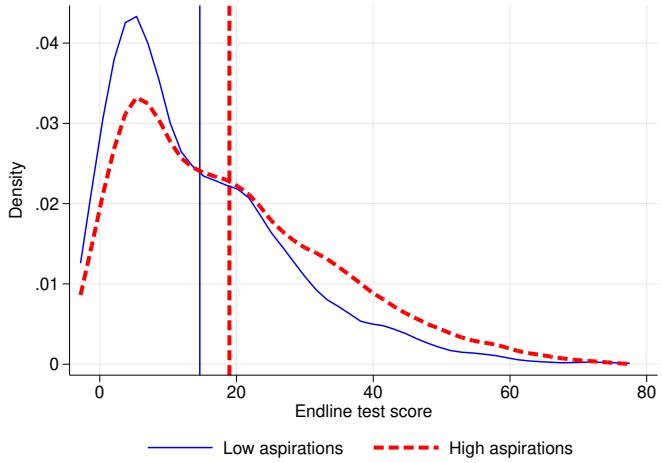
	(1) Endline test score	(2) Child is literate	(3) Child is numerate	(4) Words read per minute
Panel A: Educational aspirations				
Aspiration: child will go to college (α_1)	3.390***	-0.001	-0.002	1.147**
	(0.942)	(0.002)	(0.005)	(0.507)
Wealth index high	1.821*	0.001	-0.002	1.252*
	(1.027)	(0.002)	(0.004)	(0.645)
Caregiver can read	5.937***	-0.001	-0.005	1.380*
	(1.420)	(0.001)	(0.004)	(0.791)
Books found in house	2.678***	0.001	-0.001	0.449
	(0.705)	(0.001)	(0.002)	(0.347)
Child is female	1.746**	-0.002	0.000	0.256
	(0.866)	(0.001)	(0.003)	(0.354)
Comparison group mean	14.964	0.001	0.006	1.991
Number of observations	2,039	2,039	2,038	2,033
Panel B: Career aspirations				
Aspiration: child will work in urban area (α_1)	3.603***	0.002	0.001	1.268***
	(0.633)	(0.001)	(0.003)	(0.339)
Wealth index high	1.696	0.001	-0.002	1.207*
	(1.043)	(0.002)	(0.004)	(0.658)
Caregiver can read	6.018***	-0.001	-0.005	1.401*
	(1.420)	(0.001)	(0.005)	(0.768)
Books found in house	2.887***	0.001	-0.001	0.521
	(0.690)	(0.001)	(0.002)	(0.339)
Child is female	1.466	-0.002	0.000	0.158
	(0.893)	(0.001)	(0.003)	(0.354)
Comparison group mean	14.604	0.000	0.004	1.806
Number of observations	2,039	2,039	2,038	2,033

Table 5 notes: this table reports the results of estimating Equation 1 using the outcome variable given in the column heading and with the type of baseline aspirations (educational or career) indicated in the panel heading. Dependent variables are labeled in the column headings and defined in the text. These analyses include only children in the status quo group. We report clustered standard errors in parentheses below each estimated coefficient. The scale of the endline test score is 0-100. Literacy and numeracy are indicator variables. The full set of controls is as indicated in Section 3. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Figure 1: Distributions of endline test scores in the status quo group, by baseline aspirations



Panel A: Educational aspirations



Panel B: Career aspirations

Figure 1 notes: this figure shows kernel density plots of endline test scores for children whose caregivers did (red dashed line) and did not (solid blue line) express the aspiration listed in the panel title at baseline. In these plots, we focus on children in the status quo group (that is, in villages assigned to not receive the intervention) and for whom we have a test score, comprising 1,971 observations. The vertical lines show the mean test score of the group whose distribution is plotted using the same width, color, and pattern of line. Kolmogorov-Smirnov tests reject the equality of the two distributions with $p \leq 0.001$ in each panel.

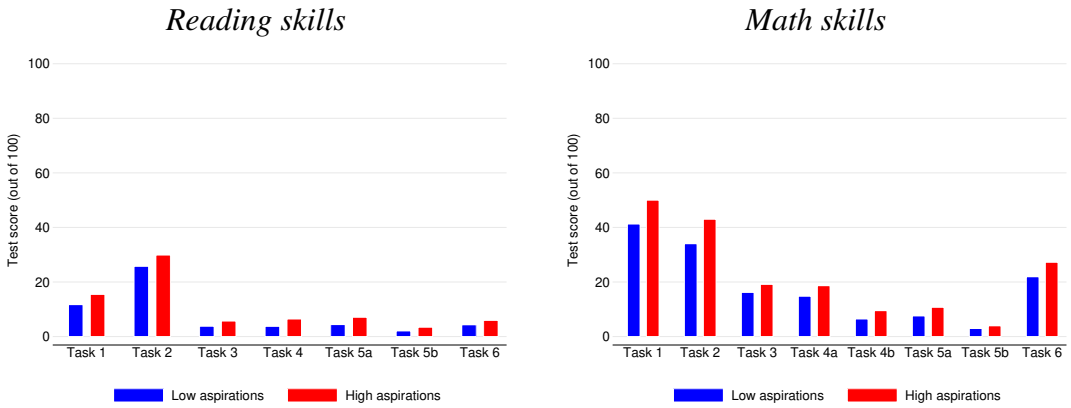
Unfortunately, children of high aspirations caregivers make little or no gains in terms of their acquisition of developmentally meaningful skills related to reading or math. First, we show that they are no more likely to master either of two crucial skills – literacy and numeracy – as measured by their performance on these same tests. In columns 2 and 3 of Table 5, we report results from estimating Equation 1 using literacy and numeracy, respectively, as our outcome variables. We estimate precise zeroes in all cases, indicating no relationship between baseline aspirations and endline likelihood of achieving literacy or numeracy; furthermore, the confidence intervals we generate can reject anything larger than a one percentage point difference. In column 4 we show results for a related skill, correct words read per minute. Here we see that children of high-aspirations caregivers can read roughly one additional word out of the 50 words given on the test, from a baseline of less than two total words read.[17] For reference, a common benchmark for reading proficiency is reading between 45 and 60 words per minute (Dubeck and Gove, 2015).

We next show how baseline aspirations map onto the acquisition of a range of other early grade reading and math skills that lead up to literacy and numeracy. As described in Table 2, each test comprises a series of subtasks that evaluate different sets of skills, such as number and letter recognition, familiar word recognition, and single-digit addition. These skills either lead up to literacy and numeracy or, for certain higher-level skills, comprise part of how we measure them.[18] In Figure 2 we present, by aspirations group, the average proportion of questions in each subtask that children in status quo villages correctly answered. In Tables A.2 and A.3, we show regression results for this comparison, estimating Equation 1 using the relevant subtask score as the dependent

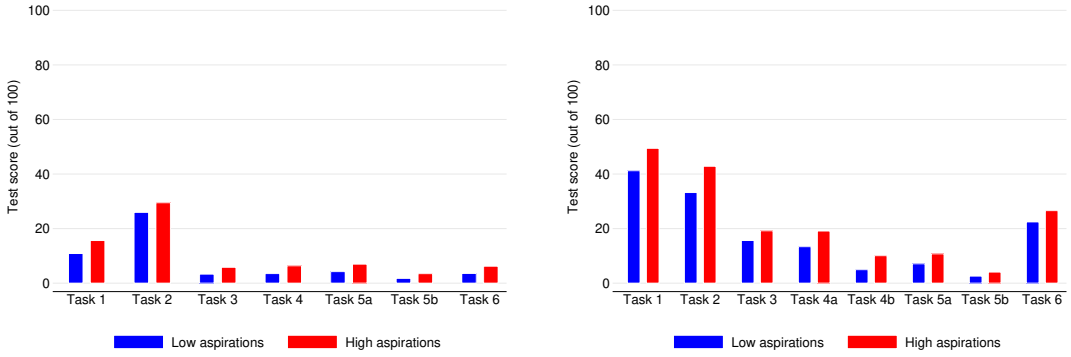
[17]Hundreds of studies and several meta-analyses use effect sizes stated in SD terms for rough comparison of the magnitudes of different relationships between educational inputs and learning outcomes in these contexts (Kremer and Holla, 2009; McEwan, 2014; Ganimian and Murnane, 2016; Glewwe and Muralidharan, 2016; Evans and Yuan, Forthcoming). Our findings here – in particular the comparison between our estimates when using the SD measure as our dependent variable, as opposed to estimates generated using skill-based measures of learning – show that in cases where learning levels are very low, using the test score SD metric to compare across contexts can lead to overly optimistic conclusions about the relative importance of different inputs. This is primarily because low levels of baseline variation (i.e., due to the compression of the distribution of scores near zero) make small absolute gains appear as large relative gains. This underscores the conclusions of prior work outlining the psychometric issues with the comparability of different tests, and particularly the problems with using the SD measure that these studies point out (Hill et al., 2008; Kraft, 2020; Furr, 2021; Evans and Yuan, Forthcoming). It also suggests that, in such contexts and for cross-context comparison, measures of absolute skill acquisition should be preferred.

[18]See Appendix A for the full test papers.

Figure 2: Endline skill levels in the status quo group, by baseline aspirations



Panel A: Educational aspirations



Panel B: Career aspirations

Figure 2 notes: this figure shows endline performance, by baseline aspirations level, on each of the individual subtasks of the EGRA and EGMA tests, respectively. Panel titles indicate the aspiration being studied. In these plots, we focus on children in the status quo group (that is, in villages assigned to not receive the intervention) and for whom we have a test score, comprising 1,971 observations. The subtasks listed on the x-axis are described in Table 2 and the full test papers are given in Appendix A.

variable.

Our analysis reveals two key facts about early grade child learning in the rural Gambian status quo. First, endline skill levels are extremely low regardless of baseline aspirations. For most higher-level math and reading skills – such as single-digit subtraction or the ability to read simple, familiar words such as "and" and "but" – children of both low- and high-aspirations caregivers correctly answer fewer than 10 percent of questions. Second, even though the relative differences in performance between children of low-aspirations and high-aspirations caregivers are very large, the absolute differences in skill levels between the groups are extremely small. For example, in reading subtask 4, familiar word recognition, children of caregivers with high educational aspirations perform roughly 100% better than those of other caregivers. In absolute terms, however, this is just a three percentage point difference, consistent with the results we show in column 4 of Table 5, with children of high-aspirations caregivers being able to correctly read roughly one more word of the 50 given on the test than children of low-aspirations caregivers, who can read slightly less than two total words.

As a rough rule of thumb, literacy and numeracy begin to manifest when a child correctly answers between 60 to 65 percent of all questions on these tests. Re-examining the distributions in Figure 1 through this lens, essentially no children in the status quo group are remotely close to achieving either literacy or numeracy at endline. Together, our results show that, in rural Gambia, higher family aspirations alone – even with the greater levels of investment that correspond to them – are unlikely to map onto greater likelihood of a child achieving crucial reading and math skills necessary for participating in most spheres of society and economic activity as an adult.

This is particularly troubling for the age group of children we study. At the end of this study, these children are between nine and 12 years old, and three quarters of them are in the second or third grade. As they progress to higher grades, the school curriculum will advance from teaching the encoding and decoding skills that comprise literacy and numeracy to more abstract skills which themselves rely upon mastery of literacy and numeracy. Given how far these students are from mastering these skills, they are extremely likely to be left behind as school progresses, and thus

unlikely to ever attain the skills comprising either basic literacy or numeracy in their schooling (Cunha and Heckman, 2007; Pritchett, 2013; Pritchett and Beatty, 2015; Muralidharan et al., 2019).

4.3 Interpreting our estimates for the status quo group

We argue that our estimates are likely to provide an upper bound for the true relationship between caregiver educational and career aspirations, educational investment, and child learning for these areas of rural Gambia. Aspirations for education and employment are often positively correlated with other hard-to-measure or unobservable traits – such as caregiver wealth, education, or other tastes and preferences – that are also positively correlated with child educational investment and outcomes (Bernard et al., 2014; Ross, 2019). As a result, any confounding from such sources would cause our estimates to be exaggerated, relative to the true relationship (Wooldridge, 2016). Therefore, unless there exists some other important, unobserved trait which is negatively correlated with these specific aspirations and positively correlated with educational investment and learning outcomes (or vice versa), our estimates are likely to be larger in magnitude than the true relationship. This further suggests that demand alone is likely insufficient to reach meaningfully higher learning levels in this, and perhaps similar contexts.

As described in Section 2.2, presence in our sample is conditional on the caregiver intending to enroll the child in school in the coming year[19], and aspirations may differ between this sample and the overall population of children in rural Gambia. Extrapolating to this latter group, we believe our estimates show a slightly different parameter. We argue that our estimates of α_1 in Table 5 form an upper bound on what a child in this broader population might expect to enjoy were their caregivers to possess high educational or career aspirations for the child. Our argument rests upon an assumption about the children excluded from our study by the eligibility criterion of the caregiver's expressed intent for the child's enrollment intent at baseline. Specifically, we assume that these children are likely to have either a similar or worse learning trajectory than those we included in the study. This premise is supported by multiple studies showing negative

[19]In our sample, this eligibility criterion excluded roughly 13 percent of children at baseline who would otherwise be eligible according to our two remaining eligibility criteria: one, the child's age; and two, their not having previously attended school at grade 1 or higher.

consequences, in terms of both learning and educational attainment, stemming from delayed school enrollment in similar contexts (cf. Glewwe and Jacoby 1995; Bommier and Lambert 2000).

5 Demand, supply, and learning

In this section, we estimate how a dramatic increase in the quality of educational supply changes the mapping from demand – as measured by aspirations – to learning. We also provide evidence on the substitutability and complementarity of these two inputs in generating learning at different levels of skill. We estimate Equation 2 using data from the entire sample, i.e., both the status quo and intervention groups. We focus on β_3, which captures the interaction between baseline aspirations and the large change in the quality of educational supply caused by the randomly assigned intervention. We also interpret the sign and significance of the interaction mean as a test for whether, conditional on the presence of high-quality educational supply, educational demand at baseline maps onto greater learning at endline.

We show results in Table 6 using the four summary learning outcomes – standardized test scores, literacy, numeracy, and correct words read per minute – studied in Section 4. In Panel A, we show these results for educational aspirations; in Panel B, we show them for career aspirations. In Figure 3, we plot the distribution of test scores among the four relevant groups – children with low- and high-aspirations caregivers, who did and did not receive the intervention, respectively. As in Figure 1, we show separate panels for educational and career aspirations.

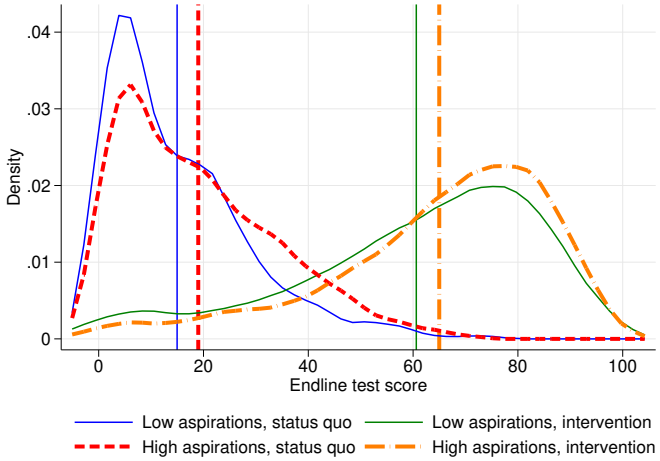
Our core finding is that, in the presence of high-quality educational supply, the mapping from baseline educational aspirations to endline learning is large and statistically significant. Both Figure 3 and Table 6 show that, conditional on receiving the dramatic improvement in the quality of educational supply provided by the intervention, baseline educational aspirations map significantly greater acquisition of high-level reading and math skills. For literacy, children of caregivers with high educational aspirations are six percentage points more likely to achieve literacy (from a baseline of 23 percent) and they are four percentage points more likely to achieve numeracy (from a baseline of 17 percent). These are equivalent to a roughly 25 percent gain in the child's likelihood

Table 6: How the mapping from baseline aspirations to endline learning changes in the presence of a large supply-side intervention

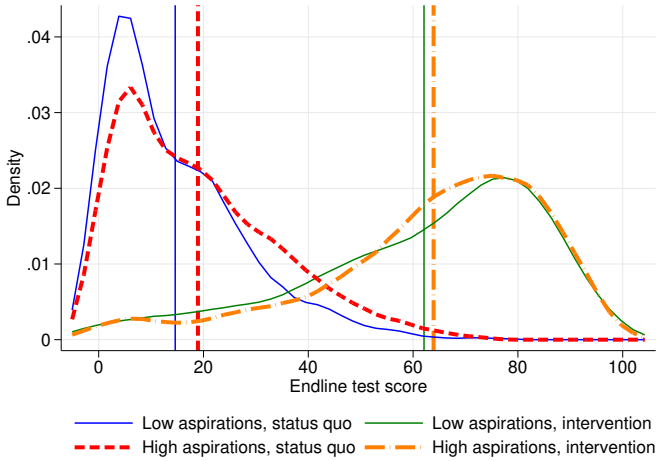
	(1) Endline test score	(2) Child is literate	(3) Child is numerate	(4) Words read per minute
Panel A: Educational aspirations				
Aspirations x intervention (β_3)	0.39	0.06***	0.04*	3.15**
	(1.58)	(0.02)	(0.02)	(1.59)
Intervention (β_2)	45.52***	0.23***	0.17***	35.22***
	(1.74)	(0.02)	(0.02)	(1.77)
Aspirations (β_1)	3.65***	-0.00	-0.00	1.17***
	(0.92)	(0.00)	(0.01)	(0.49)
Interaction mean ($\beta_1 + \beta_3$)	4.04	0.06	0.04	4.32
P-value [$\beta_1 + \beta_3 = 0$]	[0.002]	[0.019]	[0.081]	[0.005]
Comparison group mean	14.96	0.00	0.01	1.99
Number of observations	3,814	3,814	3,813	3,805
Panel B: Career aspirations				
Aspirations x intervention (β_3)	-2.44*	0.03	0.01	0.87
	(1.32)	(0.02)	(0.02)	(1.27)
Intervention (β_2)	47.33***	0.25***	0.18***	36.56***
	(1.68)	(0.03)	(0.02)	(1.75)
Aspirations (β_1)	3.86***	0.00	0.00	1.20***
	(0.64)	(0.00)	(0.00)	(0.35)
Interaction mean ($\beta_1 + \beta_3$)	1.42	0.03	0.01	2.07
P-value [$\beta_1 + \beta_3 = 0$]	[0.216]	[0.162]	[0.595]	[0.093]
Comparison group mean	14.60	0.00	0.00	1.81
Number of observations	3,814	3,814	3,813	3,805

Table 6 notes: this table reports our estimates of the parameters in Equation 2 for the outcomes listed in the column headings. The panel titles indicate which baseline aspiration was used to generate the estimates shown. Coefficient estimates are reported according to the row title. We report clustered standard errors in parentheses below each estimated coefficient. Each panel x column "cell" corresponds to a separate regression. Comparison group means are calculated for those in the status quo group whose caregiver did not express the aspiration given in the column title at baseline. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Figure 3: Distributions of endline test scores, by baseline aspirations and receipt of intervention



Panel A: Educational aspirations



Panel B: Career aspirations

Figure 3 notes: this figure shows kernel density plots of endline test scores for children whose caregivers did and did not express the aspiration listed in the panel title at baseline, and within these groups. We plot these two distributions separately for children who were and were not resident at baseline in a village which was randomly assigned to receive the intervention (that is, both the status quo and intervention), as indicated in the figure legends. The vertical lines show the mean test score of the group whose distribution is plotted with the same width, color, and pattern of line. A total of All 3,813 observations in our estimation sample from Table 6 were used to generate these figures.

of achieving each of these levels of reading and math ability at endline. Children of these caregivers also read more than three extra words per minute (from a baseline of 35), or a roughly 10 percent increase. For children in intervention villages whose caregivers express high career aspirations at baseline, we see a smaller and statistically insignificant relationship between baseline aspirations and literacy, numeracy, and words read per minute. Similarly, Kolmogorov-Smirnov tests strongly reject equality of the low aspirations and the high aspirations distributions for all aspirations type-intervention group cell ($p < 0.001$), except for the low vs. high career aspirations comparison in intervention villages ($p > .10$).

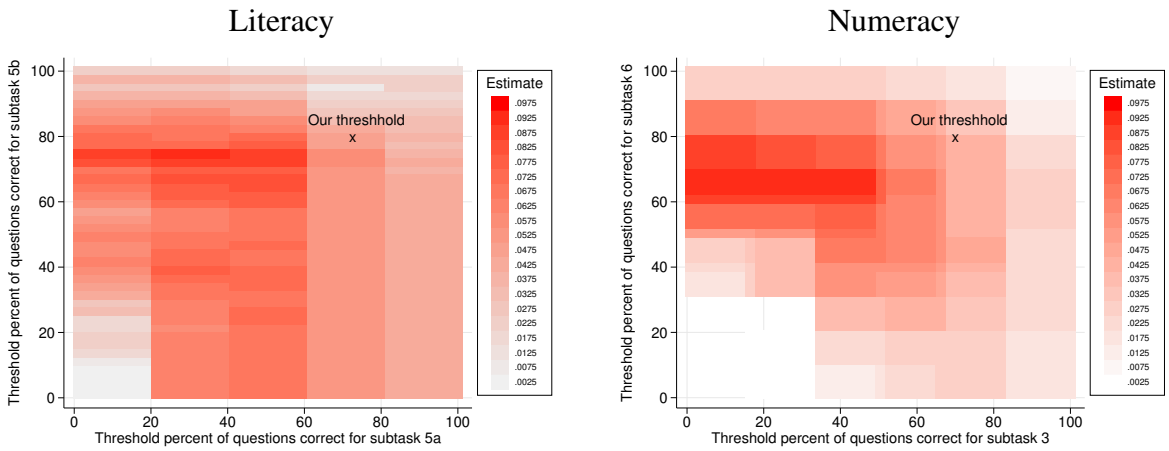
We next report sensitivity analyses for these results. The literacy and numeracy variables, while coded based on accepted levels of skill mastery for these two tests, are binary. In Figure 4, we show how sensitive our results are to alternative specifications of literacy and numeracy based on other, arbitrary thresholds for performance on the component skills comprising each measure. This figure reports a heat map of estimates of β_3 from Equation 2, using 10,000 such alternative, arbitrary measures of literacy and numeracy. These 10,000 variables consist of each location on the 100-by-100 unit grid of all possible integer thresholds for the percent of questions answered correctly on each of the two subtasks comprising each skill (literacy and numeracy, respectively). For clarity of exposition, we display all estimates with values zero or lower as white space.

This analysis shows that our main results are robust across a wide range of potential thresholds. Furthermore, in many cases our estimates would be larger in magnitude were we to choose any of a large set of other, more lenient thresholds. In addition, a key pattern we see in Table 6 appears here as well – strong evidence of a positive interaction between baseline educational aspirations and educational supply in generating learning at endline, and far weaker evidence of an interaction between baseline career aspirations and educational supply.

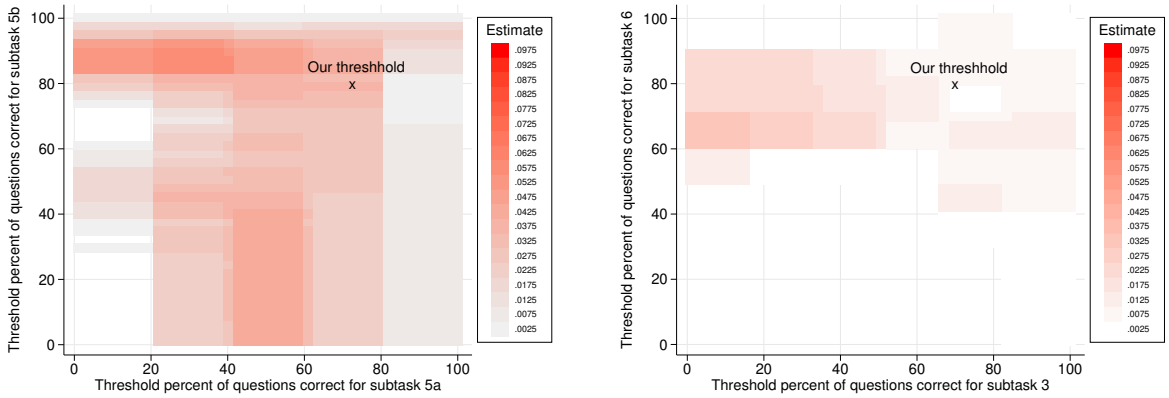
5.1 Results for specific skill acquisition

In this section, we study these relationships as they pertain to the acquisition of the various individual reading and math skills captured by these tests. We estimate Equation 2 using child performance on the different subtasks in reading and math on each test as the outcome. We present

Figure 4: Sensitivity analysis of β_3 across alternative definitions of literacy and numeracy



Panel A: Educational aspirations



Panel B: Career aspirations

Note: This figure shows heat maps of estimates of β_3 from Equation 2 for each skill (literacy or numeracy) by aspiration (education or career) cell. Each map plots the magnitude of estimates from each of 10,000 alternative definitions of literacy and numeracy. These 10,000 variables consist of each location on the 100-by-100 unit grid of all possible integer thresholds for the percent of questions answered correctly on each of the two subtasks comprising each skill (literacy and numeracy, respectively). For clarity of exposition, we display all esitmates with values zero or lower as white space. For reference, we plot the relevant threshold used (for either literacy or numeracy) in Table 6 with an x and overlay it on each graph. In Figure A.2, we show an analog to this table censoring all estimates not significant at the 10 percent level.

our results in Tables 7 and 8.

Recall that the sign and significance of our estimates for β_3 capture the interaction between demand and supply in the acquisition of different levels of skill, with negative estimates indicating substitutability between them, and positive estimates indicating complementarity. In our results, we see that the sign, magnitude, and significance of β_3 vary systematically by skill difficulty. In Panel A of both of these tables, we see a clear positive gradient between β_3 and the difficulty of the skill being tested. For the earliest reading and math skills, such as letter and number recognition (reading and math subtask 1, respectively), we estimate a statistically significant negative interaction term. For higher-level skills, such as familiar word reading and two-digit addition and subtraction, the estimates become positive and increase in magnitude for educational aspirations, though they stay largely negative for career aspirations.

For educational aspirations, the confidence intervals around the lower-level subtasks (1 and 2 in both reading and math) exclude the point estimates for the higher-level subtasks (4 and 5), and vice versa, even when the estimates themselves are not statistically significant. For the two most difficult subtasks – reading and math subtasks 5b, capturing reading comprehension and the ability to perform two digit subtraction with borrowing, respectively – we estimate a large and statistically significant positive interaction term for educational aspirations. For career aspirations, we find no evidence of this trend towards positive effects as skill difficulty increases.[20]

Our results in this section show nuanced patterns of how demand and supply interact to generate learning in this context. For the lowest-level subtasks – those which capture the acquisition of the earliest reading and math skills – our estimates suggest substitutability between supply and both educational and career aspirations. For higher-level subtasks, which measure acquisition of more difficult skills including those which feed into the measures of literacy and numeracy we use, our estimates show clear patterns of complementarity between supply and educational aspirations, but none between supply and career aspirations.

These results suggest that the dramatic increase in the quality of educational supply shifted

[20]Subtask 6 on both tests has no written component, making it somewhat different than all other subtasks, and less difficult in practice than other higher-level subtasks.

Table 7: Demand, supply, and reading skill acquisition

	Subtask 1	Subtask 2	Subtask 3	Subtask 4	Subtask 5a	Subtask 5b	Subtask 6
Panel A: Educational aspirations							
Aspirations x intervention (β_3)	-1.955	-0.882	1.989	3.215	2.938	4.464**	-1.039
	(1.953)	(2.022)	(1.870)	(2.168)	(2.092)	(2.050)	(2.183)
Intervention (β_2)	55.870***	24.492***	45.678***	57.489***	54.465***	41.945***	57.149***
	(2.161)	(2.111)	(1.907)	(2.243)	(2.283)	(2.097)	(2.373)
Aspirations (β_1)	3.559***	4.136***	1.767**	2.425***	2.462***	1.193**	1.083
	(1.302)	(1.294)	(0.883)	(0.868)	(0.893)	(0.507)	(0.861)
Interaction mean ($\beta_1 + \beta_3$)	1.604	3.254	3.756	5.640	5.400	5.657	0.044
P-value [$\beta_1 + \beta_3 = 0$]	[0.275]	[0.042]	[0.026]	[0.005]	[0.005]	[0.006]	[0.983]
Comparison group mean	37.820	37.261	25.238	30.705	29.915	21.682	31.135
Number of observations	3,814	3,814	3,814	3,814	3,814	3,814	3,814
Panel B: Career aspirations							
Aspirations x intervention (β_3)	-3.853**	-0.278	-0.927	-0.721	-0.672	0.699	-1.601
	(1.512)	(1.851)	(1.588)	(1.695)	(1.545)	(1.765)	(2.280)
Intervention (β_2)	57.172***	24.108***	47.479***	59.892***	56.667***	44.191***	57.560***
	(2.018)	(2.094)	(1.956)	(2.065)	(2.053)	(2.067)	(2.395)
Aspirations (β_1)	4.160***	3.125**	2.203***	2.320***	2.253***	1.586***	2.389***
	(0.873)	(1.211)	(0.527)	(0.605)	(0.573)	(0.349)	(0.666)
Interaction mean ($\beta_1 + \beta_3$)	0.307	2.847	1.276	1.599	1.581	2.285	0.788
P-value [$\beta_1 + \beta_3 = 0$]	[0.802]	[0.034]	[0.390]	[0.310]	[0.269]	[0.187]	[0.713]
Comparison group mean	37.656	37.404	25.632	31.591	30.752	22.279	30.365
Number of observations	3,814	3,814	3,814	3,814	3,814	3,814	3,814

Table 7 notes: this table shows results for estimating Equation 2 for children's scores on the individual reading subtasks; panel titles indicate which aspiration is being studied. The dependent variable in each column is the subtask listed in the column heading; subtasks are described in Table 2. We report clustered standard errors in parentheses below each estimated coefficient. The tests are shown in their entirety in Appendix A, divided by subtasks and with subtask indicated at the top of each relevant block of questions. The possible values of each subtask score range from zero to 100 percent of questions answered correctly. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 8: Demand, supply, and math skill acquisition

	Subtask 1	Subtask 2	Subtask 3	Subtask 4a	Subtask 4b	Subtask 5a	Subtask 5b	Subtask 6
Panel A: Educational aspirations								
Aspirations x intervention (β_3)	-5.805**	-4.490**	3.125*	0.574	2.868	1.678	7.296***	0.141
	(2.330)	(2.256)	(1.730)	(1.917)	(2.154)	(1.824)	(2.349)	(1.956)
Intervention (β_2)	50.171***	50.003***	41.133***	46.512***	56.478***	38.885***	46.813***	26.500***
	(2.940)	(2.796)	(1.853)	(2.170)	(2.207)	(1.635)	(2.259)	(1.966)
Aspirations (β_1)	7.940***	8.351***	2.399**	3.523***	2.952***	3.013***	0.906	5.078***
	(2.047)	(1.841)	(0.957)	(1.102)	(0.816)	(0.842)	(0.681)	(1.119)
Interaction mean ($\beta_1 + \beta_3$)	2.135	3.861	5.524	4.097	5.820	4.691	8.202	5.219
P-value [$\beta_1 + \beta_3 = 0$]	[0.053]	[0.003]	[0.000]	[0.012]	[0.004]	[0.005]	[0.000]	[0.001]
Comparison group mean	64.822	57.450	35.478	36.491	32.851	25.710	24.955	34.343
Number of observations	3,813	3,813	3,813	3,813	3,813	3,813	3,813	3,813
Panel B: Career aspirations								
Aspirations x intervention (β_3)	-6.645***	-7.916***	-1.671	-3.450*	-2.844	-2.382	2.324	-2.295
	(1.970)	(1.800)	(1.489)	(1.924)	(2.181)	(1.637)	(2.415)	(1.930)
Intervention (β_2)	50.925***	52.385***	44.103***	49.091***	60.058***	41.435***	49.719***	28.041***
	(2.729)	(2.566)	(1.903)	(2.145)	(2.450)	(1.731)	(2.590)	(2.031)
Aspirations (β_1)	7.318***	9.010***	2.972***	5.282***	4.717***	3.330***	1.272**	3.662***
	(1.668)	(1.472)	(0.735)	(0.991)	(0.830)	(0.639)	(0.581)	(0.943)
Interaction mean ($\beta_1 + \beta_3$)	0.673	1.094	1.301	1.832	1.873	0.948	3.596	1.367
P-value [$\beta_1 + \beta_3 = 0$]	[0.520]	[0.299]	[0.312]	[0.264]	[0.349]	[0.527]	[0.127]	[0.416]
Comparison group mean	65.094	57.615	36.279	36.287	33.057	26.468	25.887	35.698
Number of observations	3,813	3,813	3,813	3,813	3,813	3,813	3,813	3,813

Table 8 notes: this table shows results for estimating Equation 2 for children's scores on the individual math subtasks; panel titles indicate which aspiration is being studied. The dependent variable in each column is the subtask listed in the column heading; subtasks are described in Table 2. We report clustered standard errors in parentheses below each estimated coefficient. The tests are shown in their entirety in Appendix A, divided by subtasks and with subtask indicated at the top of each relevant block of questions. The possible values of each subtask score range from zero to 100 percent of questions answered correctly. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

the impact of the marginal unit of investment that high-aspirations families make. This shift, we argue, raised the platform from which these families were reaching to help their children. In the status quo group, we saw the largest differences between the children of low- and high-aspirations caregivers in their performance on the lowest level subtasks (see Figure 2 and Tables A.2 and A.3). Among children in the intervention group, our results in this section show that these differences at lower levels disappear while, for educational aspirations, differences at higher levels become far larger. The fact that we do not see this pattern for higher-level subtasks among children of caregivers with high career aspirations could suggest that families with high career aspirations take a more satisficing approach to their child's learning. It is also consistent with the notion that career aspirations differ from educational aspirations in terms of how they are acted upon, as we saw previously for our analysis of educational investment (see column 2 of Table 4).

5.2 Interpreting our results

In this section we address two potential alternative explanations for our key results: the first is correlation between unobserved child ability and aspirations. The second is correlation between unobserved family wealth and aspirations. We then interpret the main results of Section 5 through the lens of the bounding argument in Section 4.3.

There are several reasons why the correlation between unobserved child ability and aspirations is highly unlikely to be the main explanation for our results. First, in this context and, particularly, at the time that we measure aspirations, caregivers are highly unlikely to know whether the child is of high academic ability. These baseline aspirations data were collected when the child had not yet been to school. As Dizon-Ross (2019) documents, even after children enroll in school, caregivers in low-income contexts often have highly inaccurate beliefs about child ability.[21] Furthermore, more than three quarters of the caregivers in our sample have never been to school themselves, and over 90 percent of them could not read a short, simple sentence at baseline. As a result, it is highly unlikely that they would be able to identify academic skill related to literacy and numeracy among

[21] Gallegos and Celhayb (Forthcoming) show that in a much higher-income context, Chile, parent beliefs respond to signals from the school about child ability, and that this process occurs over several years after the child first enters school.

their children at the time when baseline aspirations were measured, prior to the child's first ever enrollment in school.

Second, the mapping from aspirations to educational investment we measure is similar to that found in another context. In rural Ethiopia, Bernard et al. (2014) report a statistically significant increase in educational investment in response to an experimentally-generated increase in aspirations. Their estimate of this relationship is very similar in magnitude to ours. Third, while career and education aspirations both predict subsequent investment behavior, they are only mildly correlated (pairwise correlation: 0.18).

Finally, we examine how much aspirations vary across children within a family. We study this relationship as a proxy for measuring within-family differences in child ability, which are unobservable to the econometrician, that may manifest as differences in aspirations. There are 151 caregivers in our sample with more than one child who is enrolled in our study. In 92 percent of these cases, the caregiver expresses the same educational aspirations for each child under their care. In 70 percent of these cases, the caregiver expresses the same career aspirations for each child under their care. This suggests that our measures of aspirations capture family desires for the future of (all of) their children, rather than family beliefs about an individual child's skill or ability.

Similarly, there are several reasons why it is highly unlikely that some broader, latent socioeconomic variable is what drives the interaction between baseline aspirations and the supply-side intervention. First, we see evidence of baseline educational aspirations leading to greater likelihood of literacy and numeracy in the presence of the intervention, but no such relationship for career aspirations. Second, we conduct a robustness test which estimates an alternative version of Table 6, adding interactions between the intervention and household wealth, caregiver education, caregiver literacy, and the presence of books in the home. In Tables A.4 and A.5 we present these results for baseline educational and career aspirations, respectively. These show that the main patterns we observe in Table 6 are robust to the inclusion of these other predictors of a potential non-aspirations response to the intervention. In other words, for a reasonable set of observable controls, we show that there is a residual in the learning outcomes that we study. This residual is

not explained by the interaction of the intervention and these other traits of the children and their families which also predict learning, but it can (partly) be explained by differentials in baseline educational aspirations. Finally, in these tables – as in Tables 7 and 8 – our estimates for career aspirations show no evidence of positive interaction effects, underscoring the difference between educational and career aspirations.

It is harder to bound our estimates in this section using the methods used in Section 4.3, inferring the likely sign of effects from other contributing sources. This is because the intervention could be either a substitute or complement for inputs from other sources that might be correlated with our measure of demand, such as household wealth or unobserved child ability. If these inputs were complements, our estimates would be an upper bound, as the true mapping from aspirations and the intervention would be smaller. If they were substitutes, our estimates would likely be a lower bound.

Instead, we argue that the significance and order of magnitude of our estimates of α_1, β_3, and the interaction mean reveal how demand and supply contribute to the production of learning in this context. Our estimates for α_1 from Sections 4.1 and 4.2 show that our measures of demand are correlated with investment behavior but very little acquisition of key basic skills. Our estimates of β_3 and the interaction mean in this section show that, in the presence of adequate supply, demand is correlated with a substantially greater likelihood of children achieving literacy and numeracy, and of their acquiring other, higher-level skills.

In short, a large improvement in the quality of educational supply moves out the frontier from which high-aspirations families invest in their children and amplifies the relationship between demand and learning. The intervention generates a gain in test scores that is more than an order of magnitude larger than the low aspirations–high aspirations differential. It also creates increases in the likelihood of a child demonstrating numeracy and literacy of between 17 and 25 percentage points, from a counterfactual case of essentially zero likelihood of the child demonstrating either skill. From this new, higher starting point, we show that family aspirations do map onto very large additional gains in the likelihood of possessing these crucial skills at the end of three years of

school.

5.3 Aspirations failure and systems failure

Our findings highlight a phenomenon related to the active literature on what is called aspirations frustration or failure. In that research, as here, researchers study two links. The first is from aspirations to actions, usually investment in education, business, or some other endeavor with potentially high future returns. The second link is from these actions to outcomes, usually educational attainment, learning, or enterprise profits. Dalton et al. (2016) uses a model to show that people can hold suboptimally high aspirations, such that if there exists an insurmountably large gap between the aspiration and the person's current state, the person may choose to invest very little. They refer to this state as "aspirations frustration" or "aspirations failure." Ross (2019) shows empirical evidence of this phenomenon in educational investment in rural India, and McKenzie et al. (2022) show evidence of it among entrepreneurs in the Philippines. Leight et al. (2021) show that an intervention to raise aspirations evaluated in Ethiopia, similar to that studied in Bernard et al. (2014), has no measurable effect on either aspirations or investment.

We have shown that even when there is no aspirations failure, there can be systems failure. In Section 4.1, we show that in our context, rural Gambia, the first link is intact: our estimates uncover that higher baseline aspirations do map onto to significantly greater subsequent investment. In Section 4.2, however, we show that these investments yield very little gain in terms of skill acquisition on margins – literacy and numeracy – relevant for a person's ability to participate in many spheres of society. Finally, in Section 5, we show that this does not have to be the case. With the benefit of high-quality educational supply, children of high-aspirations families are much more likely to master a range of key higher-level skills than those of low-aspirations families. Seen through the lens of prior work on aspirations failure, our findings show a different failure of this link from aspirations to action, and action to outcomes. We show that even in the absence of aspirations failure, high aspirations – and demand more broadly – may not map onto meaningfully different learning trajectories in the status quo. We conceive of this breakdown in the second linkage as a

failure of the educational system, or "systems failure," in juxtaposition to the aspirations failure or aspirations frustration studied elsewhere.

6 Conclusion

Many families across the world wish for their children to live better lives than those lived by previous generations, and a common path for realizing this desire is through education. Our paper studies this process in a very low-income context. We focus on how family inputs and school system inputs interact to generate learning, via the educational system, in a crucial stage of early childhood.

Our research highlights an important feature of the educational experience of children and their families in extremely resource-poor contexts such as the one we study. As is the case in many contexts, the majority of caregivers in our sample wish to improve the life chances of their children and help them to reach a prosperous adulthood, partly through investing in their education. We show that these caregivers expend dear financial resources to do so, both in terms of money and their children's time. These investments yield a statistically significant return in terms of the child's performance on literacy and numeracy tests, relative to that of their peers. Sadly, because counterfactual learning levels are extremely low in the rural Gambian status quo, these relative gains still leave children nowhere near achieving developmentally meaningful levels of learning, particularly literacy or numeracy. These are among the most crucial skills for reaching later economic productivity and participating in many spheres of society, and our findings therefore belie the notion that families in such contexts merely need to wish and try harder to "pull themselves up by their bootstraps" to realize their desires for their children's futures.

With the presence of complementary inputs on the supply side, however, we show that these same aspirations map onto far greater likelihood of the child mastering developmentally meaningful skills, including the ability to read with understanding and conduct basic arithmetic. For research, this suggests the need for greater study of how demand and supply interact to create learning at different levels of economic prosperity. For policy, this suggests that while the demand

side can yield important learning gains in some low- and middle-income contexts, substantial increases in the quality of educational supply will also be necessary to address the very low levels of learning in the many pockets of extreme poverty in the developing world.

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Appendix

Table A.1: Estimating the mapping of aspirations at baseline to subsequent educational investment, including both status quo and intervention groups

	(1) Educational expenditure	(2) School-related time use	(3) Enrolled in school, year 1	(4) Enrolled in school, year 2	(5) Enrolled in school, year 3
Panel A: Educational aspirations					
Aspirations x intervention (β_3)	4.88	-0.017*	0.071*	-0.003	0.005
	(40.26)	(0.009)	(0.042)	(0.035)	(0.011)
Intervention (β_2)	-79.23*	0.139***	-0.069	0.040	0.002
	(39.10)	(0.011)	(0.043)	(0.033)	(0.012)
Aspirations (β_1)	79.46**	0.021***	0.034	0.059**	0.008
	(28.69)	(0.007)	(0.026)	(0.026)	(0.007)
Comparison group mean	572.54	0.611	0.794	0.822	0.972
Number of observations	3,654	3,732	3,754	3,702	3,732
Panel B: Career aspirations					
Aspirations x intervention (β_3)	4.33	-0.001	0.035	-0.010	-0.000
	(40.71)	(0.010)	(0.034)	(0.029)	(0.008)
Intervention (β_2)	-79.20**	0.129***	-0.048	0.045	0.006
	(38.14)	(0.012)	(0.042)	(0.033)	(0.010)
Aspirations (β_1)	66.38**	0.008	0.035	0.058***	0.002
	(27.72)	(0.006)	(0.023)	(0.020)	(0.005)
Comparison group mean	576.20	0.614	0.802	0.823	0.977
Number of observations	3,654	3,732	3,754	3,702	3,732

Table A.1 notes: this presents an analog to Table 4, but including children from both the status quo and intervention groups. Here we report the results of estimating Equation 2 using the outcome variable given in the column heading and with the type of baseline aspirations (educational or career) indicated in the panel heading, including both the status quo and intervention groups. Dependent variables are labeled in the column headings and defined in the text. We report clustered standard errors in parentheses below each estimated coefficient. Observations vary by column because outcome variables were collected at different times and some children were missed in some periods. Results are robust to including only the smallest estimation sample. The full set of controls is as indicated in Section 3. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.2: Mapping of aspirations at baseline to endline performance on reading subtasks in the status quo group

	Subtask 1	Subtask 2	Subtask 3	Subtask 4	Subtask 5a	Subtask 5b	Subtask 6
Panel A: Educational aspirations							
High baseline educational aspirations (α_1)	3.364**	3.740***	1.635*	2.395**	2.291**	1.212**	1.126
	(1.327)	(1.294)	(0.898)	(0.904)	(0.925)	(0.534)	(0.889)
Comparison group mean	11.592	25.741	3.744	3.729	4.371	2.028	4.309
Number of observations	2,039	2,039	2,039	2,039	2,039	2,039	2,039
Panel B: Career aspirations							
High baseline career aspirations (α_1)	3.955***	2.769**	2.129***	2.400***	2.202***	1.635***	2.256***
	(0.855)	(1.210)	(0.511)	(0.603)	(0.557)	(0.308)	(0.641)
Comparison group mean	10.884	25.949	3.295	3.499	4.183	1.671	3.494
Number of observations	2,039	2,039	2,039	2,039	2,039	2,039	2,039

Table A.2 notes: this table shows results for estimating Equation 1 for children's scores on the individual reading subtasks. We restrict our attention in this table to children in the status quo group. We report clustered standard errors in parentheses below each estimated coefficient. The dependent variable in each column is the subtask number listed in the column heading. Subtasks are described in Table 2. The tests are shown in their entirety in Appendix A, divided by subtasks and with subtask indicated at the top of each relevant block of questions. The possible values of each subtask score range from zero to 100 percent of questions answered correctly. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.3: Mapping of aspirations at baseline to endline performance on math subtasks in the status quo group

	Subtask 1	Subtask 2	Subtask 3	Subtask 4a	Subtask 4b	Subtask 5a	Subtask 5b	Subtask 6
Panel A: Educational aspirations								
High baseline educational aspirations (α_1)	7.286***	7.716***	2.229**	3.138***	2.740***	2.695***	0.734	4.766***
	(2.053)	(1.840)	(0.982)	(1.127)	(0.798)	(0.876)	(0.657)	(1.135)
Comparison group mean	41.153	33.866	16.109	14.594	6.337	7.414	2.978	21.779
Number of observations	2,038	2,038	2,038	2,038	2,038	2,038	2,038	2,038
Panel B: Career aspirations								
High baseline career aspirations (α_1)	6.642***	8.287***	2.820***	4.879***	4.474***	2.989***	1.166**	3.412***
	(1.662)	(1.459)	(0.744)	(0.978)	(0.782)	(0.622)	(0.572)	(0.941)
Comparison group mean	41.183	33.074	15.623	13.371	4.958	7.132	2.597	22.450
Number of observations	2,038	2,038	2,038	2,038	2,038	2,038	2,038	2,038

Table A.3 notes: this table shows results for estimating Equation 1 for children's scores on the individual math subtasks. We restrict our attention in this table to children in the status quo group. We report clustered standard errors in parentheses below each estimated coefficient. The dependent variable in each column is the subtask number listed in the column heading. Subtasks are described in Table 2. The tests are shown in their entirety in Appendix A, divided by subtasks and with subtask indicated at the top of each relevant block of questions. The possible values of each subtask score range from zero to 100 percent of questions answered correctly. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.4: How the mapping from baseline educational aspirations to endline learning changes in the presence of a large supply-side intervention, adding interactions with various other predictors of learning

	(1) Endline test score	(2) Child is literate	(3) Child is numerate	(4) Words read per minute
Educational aspirations x intervention (β_3)	0.32	0.06***	0.04*	3.07*
	(1.53)	(0.02)	(0.02)	(1.58)
Educational aspirations x household wealth	2.30	0.01	0.02	0.99
	(1.71)	(0.03)	(0.03)	(1.45)
Educational aspirations x caregiver has never been to school	-0.00	-0.05*	-0.04**	-0.53
	(1.43)	(0.03)	(0.02)	(1.51)
Educational aspirations x caregiver can read simple sentence	-1.85	0.01	-0.05	-5.09
	(2.89)	(0.05)	(0.05)	(3.52)
Educational aspirations x books in house	3.71***	0.02	0.05***	3.17***
	(1.26)	(0.02)	(0.02)	(1.34)
Educational aspirations (β_2)	0.75	0.02	-0.00	-0.44
	(1.66)	(0.03)	(0.02)	(1.59)
Household wealth	-0.36	0.01	-0.02	0.38
	(1.31)	(0.01)	(0.02)	(0.98)
Caregiver has never been to school	-0.27	0.05**	0.02	0.95
	(1.19)	(0.02)	(0.01)	(1.41)
Caregiver can read simple sentence	5.16**	0.02	0.02	7.03**
	(2.42)	(0.04)	(0.04)	(3.25)
Books in house	-0.50	-0.02	-0.02	-1.70
	(1.23)	(0.02)	(0.02)	(1.33)
Intervention (β_1)	45.58***	0.23***	0.17***	35.29***
	(1.71)	(0.02)	(0.02)	(1.76)
Comparison group mean	14.96	0.00	0.01	1.99
Number of observations	3,814	3,814	3,813	3,805

Table A.4 notes: this table shows results for estimating Equation 2 after adding the interaction terms shown here. This is an analog to Panel A of Table 6, adding the interaction terms shown here to test whether, for a reasonable set of observable controls, there is still a residual in the learning outcomes we study to be explained by aspirations which is not explained by the interaction of the intervention and other traits of the children and their families which also predict learning. We report clustered standard errors in parentheses below each estimated coefficient. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

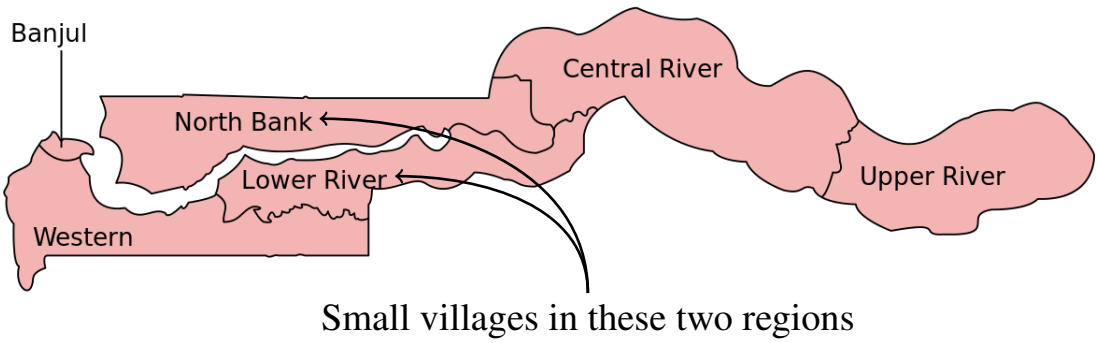
Table A.5: How the mapping from baseline career aspirations to endline learning changes in the presence of a large supply-side intervention, adding interactions with various other predictors of learning

	(1) Endline test score	(2) Child is literate	(3) Child is numerate	(4) Words read per minute
Career aspirations x intervention (β_3)	-2.39*	0.03	0.01	0.87
	(1.32)	(0.02)	(0.02)	(1.27)
Career aspirations x household wealth	1.65	0.00	-0.02	-0.11
	(1.48)	(0.02)	(0.02)	(1.53)
Career aspirations x caregiver has never been to school	1.77	-0.03	-0.04	1.69
	(1.95)	(0.02)	(0.03)	(1.74)
Career aspirations x caregiver can read simple sentence	3.93	0.06	0.01	5.04*
	(3.13)	(0.04)	(0.05)	(2.98)
Career aspirations x books in house	1.58	0.00	0.00	-0.27
	(1.40)	(0.02)	(0.02)	(1.51)
Career aspirations (β_1)	0.77	0.02	0.04	-0.22
	(2.04)	(0.02)	(0.03)	(1.78)
Household wealth	-0.13	0.01	0.00	1.01
	(1.29)	(0.02)	(0.02)	(1.28)
Caregiver has never been to school	-1.61	0.03	0.02	-0.73
	(1.67)	(0.02)	(0.03)	(1.48)
Caregiver can read simple sentence	1.02	-0.02	-0.02	-0.63
	(2.52)	(0.04)	(0.05)	(2.63)
Books in house	0.79	-0.01	0.00	0.32
	(1.19)	(0.02)	(0.02)	(1.41)
Intervention (β_2)	47.26***	0.25***	0.18***	36.56***
Comparison group mean	14.60	0.00	0.00	1.81
Number of observations	3,814	3,814	3,813	3,805

Table A.5 notes: this table shows results for estimating Equation 2 after adding the interaction terms shown here. This is an analog to Panel B of Table 6, adding the interaction terms shown here to test whether, for a reasonable set of observable controls, there is still a residual in the learning outcomes we study to be explained by aspirations which is not explained by the interaction of the intervention and other traits of the children and their families which also predict learning. We report clustered standard errors in parentheses below each estimated coefficient. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Figure A.1: Regions of The Gambia and study area

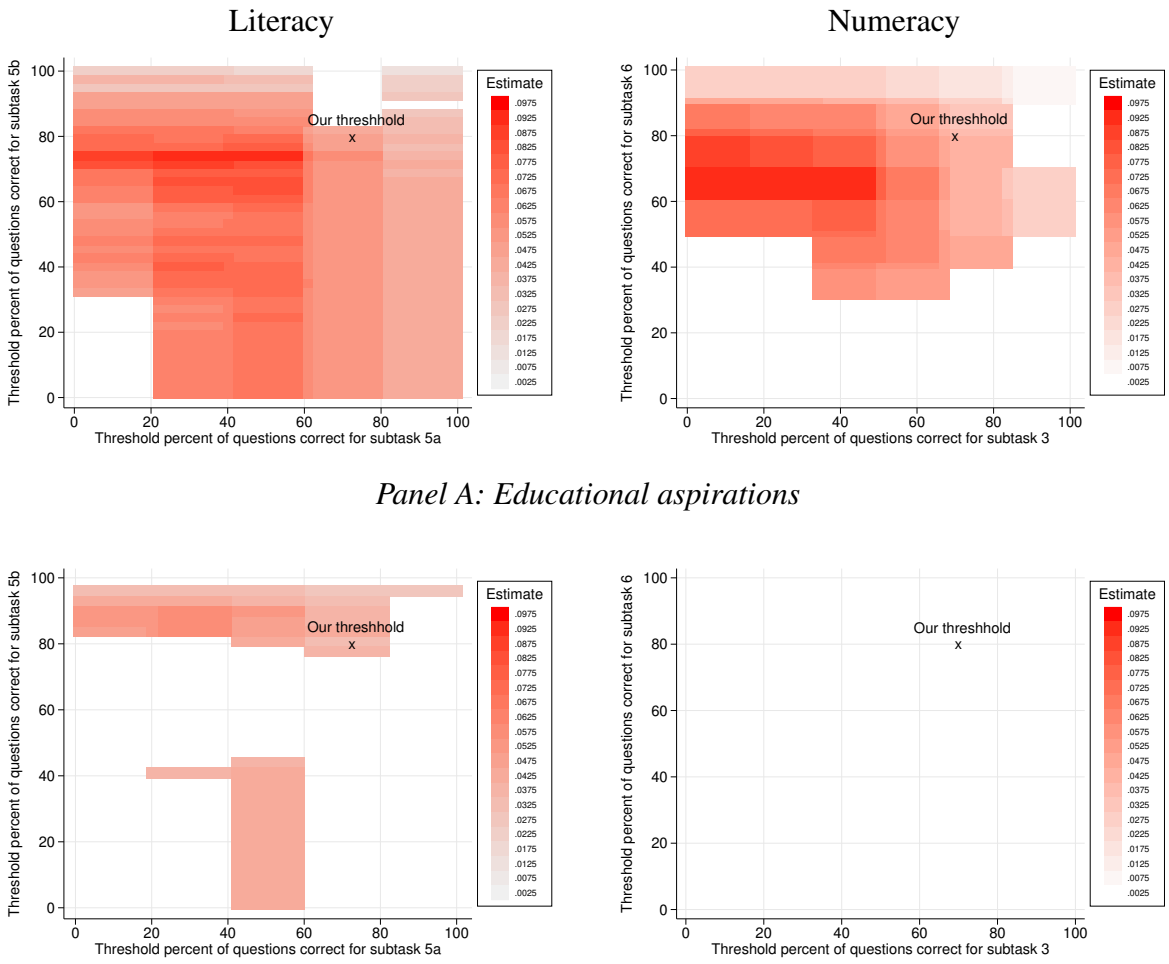
Panel A: The Gambia's location in West Africa



Panel B: Study area with The Gambia

Figure A.1 notes: this figure shows the location of our study area. In Panel A, we show a map of the continent of Africa with The Gambia shown within the red circle. In Panel B, we show a map of the Gambia, indicating the two regions where the study took place.

Figure A.2: Sensitivity analysis of β_3 across alternative definitions of literacy and numeracy, excluding estimates not significant at the 10 percent level



Panel A: Educational aspirations

Panel B: Career aspirations

Note: This figure shows an analog to Figure 4, displaying heat maps of estimates of β_3 from Equation 2 for each skill (literacy or numeracy) by aspiration (education or career) cell. Each map plots the magnitude of estimates from each of 10,000 alternative definitions of literacy and numeracy. These 10,000 variables consist of each location on the 100-by-100 unit grid of all possible integer thresholds for the percent of questions answered correctly on each of the two subtasks comprising each skill (literacy and numeracy, respectively). In this figure we additionally censor all results for which the estimate is not statistically significant at the 10 percent level. For clarity of exposition, we display all esitmates with values zero or lower as white space. For reference, we plot the relevant threshold used (for either literacy or numeracy) in Table 6 with an x and overlay it on each graph.

For Online Publication: Appendix A: Test papers

Test papers begin on next page

Early Grade Math Assessment in The Gambia: Instructions for Enumerators and Children Response Form

General Instructions

It is important to establish a playful and relaxed relationship with the child through an initial talk on topics of interest to the child (follow the text in bold below). The child should perceive the assessment more as a game rather than an evaluation. It is important that you ONLY read aloud the text in **bold**, slowly and clearly, so that the child can understand the exercises.

Good morning. My name is _____. And you, what's your name? I like to _____. And you, what do you like to do? Now that you have done some reading games with my colleague, let's do some Maths game. Throughout this exercise, you can answer in the language that you prefer. Is that ok? [wait until the child responds] **Are you ready? [**wait until the child responds] **Let's start.**

Assessment start time:	_____ hh: _____ mm

Subtask 1. Number identification	Page 1	60 seconds
In this sheet there are some numbers. When I say "start", start here [point to the first number]**, and read through the page** [sweep finger across first line]. **Point to each number and read out loud. I will use this timer and will tell you when to stop. Read as fast and the best you can. If there is one number you can't read, move to the next one. Put your finger in the first one [**make sure the child does so and prepare to time]**. Are you ready?** [wait until the child replies] **You can start.**		Start the timer when the child reads the first letter. When the timer reaches 0, say "stop." If the child hesitates for 5 seconds, say the number and then point to the next item and say "Go on". Mark the number that you provided as incorrect.
(/) = Mark any incorrect number or no response with a slash (/). (Ø) Mark with a circle the self-corrections if you already marked as incorrect. (⌋) = Mark the final number read with a bracket (⌋).		

2	**9**	**0**	**12**	**30**
22	**45**	**39**	**23**	**48**
91	**33**	**74**	**87**	**65**
108	**245**	**587**	**731**	**989**

Time remaining on timer at completion (SECONDS):

NA1:	NE1:

Which languages did the child use in this task? (circle all answers that apply)

English Pulaar Mandinka Olof Others (please specify) _____

Thank you, let's move to the next task.

Subtask 2. Number discrimination (PRACTICE)	Page 2	
Look at these numbers. Say which number is bigger [the child can only be considered correct if he/she "says" the bigger number, pointing is not enough]. **8 4** ✓ [If the child answered 8, say] **Well done, 8 is bigger. Let's try another example.** ✗ [If the child did not answer 8, say] **The bigger number is 8.** [Point to 8] **This is 8.** [Point to 4] **This is 4. 8 is bigger than 4. Let's try another example.**		
Look at these numbers. Say which number is bigger. **10 12** ✓ [If the child answered 12, say] **Well done, 12 is bigger. Let's continue.** ✗ [If the child did not answer 12, say] **The bigger number is 12.** [Point to 10] **This is 10.** [Point to 12] **This is 12. 12 is bigger than 10. Let's continue**.		

Subtask 2. Number discrimination (TEST)	Page 3	
Look at these numbers. Say which number is bigger. [repeat for each item]		If the child makes 4 successive errors at any point, say "thank you", discontinue this subtask, mark below and move to the next subtask.
(✓) 1 = Correct (✓) 0 = Incorrect or without answer (Ø) Mark with a circle the self-corrections if you already marked as incorrect. (⌋) = Mark the final answer provided with a bracket (⌋).		If the child hesitates for 5 seconds, provide the answer and then point to the next item and say "Go on". Mark the item that you provided answer as incorrect.

1	7	5	7		1	0
2	11	24	24		1	0
3	47	34	47		1	0
4	58	49	58		1	0
5	65	67	67		1	0
6	94	78	94		1	0
7	146	153	153		1	0
8	287	534	534		1	0
9	623	632	632		1	0
10	867	965	965		1	0

Exercise discontinued because the child made 4 successive mistakes. ☐

NA2:	NE2:

Which languages did the child use in this task? (circle all answers that apply)

English Pulaar Mandinka Olof Others (please specify) _____

Thank you, let's move to the next task

Subtask 3. Missing Number (PRACTICE)	Page 4	✘
P1 **Here are some numbers. 1, 2 and 4, what number goes here** [point to the empty box]**?** 1 2 (3) 4 ✓ [If the child answered 3, say] **Well done, it's 3. Let's do another one.** ✘ [If the child did not answer 3, say] **The number 3 goes here. Say the numbers with me** [point to each number]. **1, 2, 3 and 4. 3 goes here. Let's try another one.** **P2** **Here are some numbers. 5, 10 and 15, what number goes here?** 5 10 15 (20) ✓ [If the child answered 20, say] **Well done, it's 20. Let's continue** ✘ [If the child did not answer 20, say] **The number 20 goes here. Say the numbers with me** [point to each number]. **5, 10, 15 and 20. 20 goes here. Let's continue.**		

Subtask 3. Missing Number (TEST)	Page 5 and 6	✘

Here are some numbers [point to the box]**. What number goes here?**
[repeat for each item]

(✓) 1 = Correct
(✓) 0 = Incorrect or without answer
(ø) Mark with a circle the self-corrections if you already marked as incorrect.
(⌋) = Mark the final answer provided with a bracket (⌋).

If the child makes 4 successive errors at any point, say "thank you", discontinue this subtask, mark below and move to the next subtask.

If the child hesitates for 5 seconds, provide the answer and then point to the next item and say "Go on". Mark the item that you provided answer as incorrect

1.	5	6	7	(8)	1	0
2.	14	15	(16)	17	1	0
3.	20	(30)	40	50	1	0
4.	(200)	300	400	500	1	0
5.	2	4	6	(8)	1	0
6.	348	349	(350)	351	1	0
7.	28	(26)	24	22	1	0
8.	30	35	(40)	45	1	0
9.	550	540	530	(520)	1	0
10.	3	8	(13)	18	1	0

Exercise discontinued because the child made 4 successive mistakes. ☐

NA3:	NE3:

Which languages did the child use in this task? (circle all answers that apply)

English Pulaar Mandinka Olof Others (please specify) _____

Thank you, let's move to the next task.

Subtask 4a. Addition (level 1)	Page 7 and 8	60 seconds

Paper and pencil

In these two pages there are some addition questions [glide hand from top to bottom on the two pages]. **You should start here** [point to the first problem]. **I will use the timer and will tell you when to start and when to stop. Say the answer for each question. If you don't know an answer, move to the next problem. If you want, you can use this paper and pencil. Are you ready?** [wait until the child responds and prepare to time] **Start.**

Start the timer when you say "start".

When the timer reaches 0, say "stop."

If the child makes 4 successive errors at any point, say "thank you", discontinue this subtask, mark below and move to the next subtask.

If the child hesitates for 5 seconds, provide the answer and then point to the next item and say "Go on". Mark the item that you provided answer as incorrect.

(✓) 1 = Correct
(✓) 0 = Incorrect or without answer
(ø) Mark with a circle the self-corrections if you already marked as incorrect.
(❑) = Mark the final answer provided with a bracket (❑).

1	3 + 2 = (5)	1	0	11	7 + 8 = (15)	1	0
2	1 + 3 = (4)	1	0	12	4 + 7 = (11)	1	0
3	4 + 5 = (9)	1	0	13	7 + 5 = (12)	1	0
4	6 + 2 = (8)	1	0	14	8 + 6 = (14)	1	0
5	8 + 1 = (9)	1	0	15	9 + 8 = (17)	1	0
6	3 + 3 = (6)	1	0	16	6 + 7 = (13)	1	0
7	7 + 3 = (10)	1	0	17	8 + 8 = (16)	1	0
8	3 + 9 = (12)	1	0	18	8 + 5 = (13)	1	0
9	2 + 8 = (10)	1	0	19	10 + 2 = (12)	1	0
10	9 + 3 = (12)	1	0	20	8 + 10 = (18)	1	0

The child used:

	Fingers to count.
	Paper and pencil.
	Solved the question in his/her head.

Tick✓ all answers that apply.

Time remaining on timer at completion (SECONDS):

Exercise discontinued because the child made 4 successive mistakes. ☐

NA4a:	NE4a:

Which languages did the child use in this task? (circle all answers that apply)

English Pulaar Mandinka Olof Others (please specify) _____

Thank you, let's move to the next task.

Subtask 4b. Addition (level 2)	Page 9	

Paper and pencil

Here are some addition questions [glide hand from top to bottom]**. Tell me the answer for each question. If you do not know the answer, move to the next one. If you want, you may use this paper and pencil. Are you ready?** [wait until the child responds] **Start here** [point to the first problem]

(✓) 1 = Correct
(✓) 0 = Incorrect or without answer

1	13 + 6 = (19)	1	0
2	18 + 7 = (25)	1	0
3	14 + 25 = (39)	1	0
4	22 + 37 = (59)	1	0
5	38 + 26 = (64)	1	0
6	234+512= (746)	1	0

The child used:

	Fingers to count.
	Paper and pencil.
	Solved the question in his/her head.

Tick ✓ all answers that apply.

Skip this subtask if the child scores zero in level 1 Addition questions.

If the child makes 4 successive errors, say "thank you", discontinue this subtask, mark below and move to the next subtask.

I If the child uses an inefficient strategy (e.g. tick marks), ask the child **"Do you know another way to solve the problem?** If "no", move to the next item after 5 seconds.

If the child does not provide answer in 30, point to the next item and say "Go on". You may give additional 30 second if the child is still processing the question.

Exercise discontinued because the child made 4 successive errors. ☐

NA4b:	NE4b:

Which languages did the child use in this task? (circle all answers that apply)

English Pulaar Mandinka Olof Others (please specify) _____

Thank you, let's move to the next task.

Subtask 5a. Subtraction (level 1)	Page 10 and 11	60 seconds

Paper and pencil

In these two pages there are some subtraction questions [glide hand from top to bottom, showing the two pages]**. You should start here** [point to the first problem].**I will use timer and will tell you when to start and when to stop. Say the answer for each question. If you don't know an answer, move to the next question. If you want, you may use this paper and pencil. Are you ready?** [wait until the child responds and prepare to time] **Start.**

Start the timer when you say "start".

When the timer reaches 0, say "stop."

(✓) 1 = Correct (✓) 0 = Incorrect or without answer

(Ø) Mark with a circle the self-corrections if you already marked as incorrect.

(❑) = Mark the final answer provided with a bracket (❑).

If the child makes 4 successive errors, say "thank you", discontinue this subtask, mark below and move to the next subtask.

If the child hesitates for 5 seconds, provide the answer and then point to the next item and say "Go on". Mark the item that you provided answer as incorrect

1	5 - 3 = (2)	1	0	11	15 - 7 = (8)	1	0
2	4 - 1 = (3)	1	0	12	11 - 4 = (7)	1	0
3	9 - 5 = (4)	1	0	13	12 - 7 = (5)	1	0
4	8 - 2 = (6)	1	0	14	14 - 8 = (6)	1	0
5	9 - 8 = (1)	1	0	15	17 - 9 = (8)	1	0
6	6 - 3 = (3)	1	0	16	13 - 6 = (7)	1	0
7	10 - 7 = (3)	1	0	17	16 - 8 = (8)	1	0
8	12 - 3= (9)	1	0	18	13 - 8 = (5)	1	0
9	10 - 2 = (8)	1	0	19	12 - 10 = (2)	1	0
10	12 - 9 = (3)	1	0	20	18 - 8 = (10)	1	0

The child used:

	Fingers to count.
	Paper and pencil.
	Solved the questions in his/her head.

Tick ✓ all answers that apply.

Time remaining on timer at completion (SECONDS)

Exercise discontinued because the child made 4 successive mistakes. ☐

NA5a:	NE5a:

Which languages did the child use in this task? (circle all answers that apply)

English Pulaar Mandinka Olof Others (please specify) _____

Thank you, let's move to the next task.

Subtask 5b. Subtraction (level 2)	Page 12	
Paper and pencil		Skip this subtask if the child scores zero in Level 1 subtraction questions.
Here are some subtraction questions [glide hand from top to bottom]**. Tell me the answer for each subtraction question. If you do not know an answer, move to the next one. If you want to, you may use this paper and pencil. Are you ready?** [wait until the child replies] **Start here** (point to the first problem]		If the child makes 4 successive errors, say "thank you", discontinue this subtask, mark below and move to next task.
(✓) 1 = Correct (✓) 0 = Incorrect or without answer		If the child uses an inefficient strategy (e.g. tick marks), ask the child **"Do you know another way to solve the problem?** If "no", move to the next item after 5 seconds.

1	19 - 6 = (13)	1	0
2	25 - 7 = (18)	1	0
3	26 - 14 = (12)	1	0
4	59 - 37 = (22)	1	0
5	64 - 26 = (38)	1	0
6	746 - 512= (234)	1	0

The child used:

	Fingers to count.
	Paper and pencil.
	Solved the questions in his/her head.

Tick ✓all answers that apply.

If the child does not provide answer in 30, point to the next item and say "Go on". You may give additional 30 second if the child is still processing the question.

Exercise discontinued because the child made 4 successive mistakes. ☐

NA5b:	NE5b:

Which languages did the child use in this task? (circle all answers that apply)

English Pulaar Mandinka Olof Others (please specify) _____

Thank you, let's move to the next task.

Subtask 6. Word problems (PRACTICE)	
Counters, paper and pencil.	
I am going to read some problems for you to solve them. If you want you can use these counters, paper and pencil. Listen carefully to each problem. If you need, I can repeat once. Are you ready? [wait until the child replies] **Let's start.**	
There are 3 children in the classroom [pause and check] **1 child gets out of the classroom.** [pause and check] **How many children stay in the classroom**?	

✓ [If the child answers 2, say] **Well done, 2 children stayed in the classroom. Let's continue.** ✗ [If the child does not answer 2, Put 3 counters on top of the table and say] **Imagine that these counters are children. One of the children gets out of the classroom. Show me the child getting out of the classroom. How many children stayed in the classroom?** **Well done, two children stayed in the classroom. Let's continue.**	

Subtask 6. Word Problems (TEST)	✗	✗
Counters, paper and pencil.		
Now I will read some more problems for you.		
(✓) 1 = Correct (✓) 0 = Incorrect or no response		
1. There is 1 child in the classroom. Another 3 children get inside the classroom. How many children are now in the classroom?	(4) 1 0	[pause and check] at the end of each sentence to make sure that the child understands what you have said before continuing. You can ask "Do you understand?" when in doubt. If the child requests, you may repeat the question ONCE only.
2. There are 8 balls in the bag. 2 are white and the rest are red. How many red balls are inside the bag?	(6) 1 0	
3. Demba has 3 oranges. Awa has 6 oranges. How many oranges do I have to give to Demba so that they have the same number of oranges?	(3) 1 0	
4. There were 8 children in the classroom. Some more children got inside the classroom. Now there are 14 children in the classroom. How many children got inside the classroom?	(6) 1 0	If the child makes 4 successive errors, say "thank you", discontinue this subtask and mark below.
5. I have 15 bananas to share between 3 children. How many bananas should I give to each child so that all of them get the same number of bananas?	(5) 1 0	If the child has worked on the problem for more than 60 seconds and not provided an answer, say "let us try another one" and move on to the next item and mark the item as incorrect.
6. There are 6 tables in the classroom. At each table there are 2 children seated. How many children are in the classroom altogether?	(12) 1 0	

The child used (Tick all answers that apply):

	Fingers to count.
	Counter
	Paper and pencil.
	Solved the problems in his/her head.

Exercise discontinued because the child made 4 successive errors. ☐

NA6:	NE6:

✍ Which languages did the child use in this task? (circle all answers that apply)

English Pulaar Mandinka Olof Others (please specify) _____

Thank you, you did a good job. Now please return to your own classroom/you can go home.

✍ Which language(s) did you use to apply this test? (circle all answers that apply)

English Pulaar Mandinka Olof Others (please specify) _____

Assessment end time:	_____ hh: _____ mm

Does the child have any visible/noticeable disability? (circle as appropriate)

No Yes (please specify)_____

Early Grade Reading Assessment in The Gambia: Instructions for Enumerators and Children Response Form

General Instructions

It is important to establish a playful and relaxed relationship with the child that will be assessed through an initial talk on topics of interest to the child (see example below). Use this time to identify whether the child is comfortable with the national language you use. The child should perceive the assessment more as a game rather than an evaluation. It is important that you do not deviate from the guidelines and ONLY read aloud the text in **bold**, slowly and clearly, so that the child can understand the exercises.

Good morning/afternoon. My name is _____ and I work at Effective Intervention. And you, what's your name? [wait until the child responds] **How is your family?** [wait until the child responds] **When I am not at work, I like to _____. And you? What do you most enjoy doing when you are not at school?** [wait until the child responds]

Verbal Consent

- **Let me tell you why I am here today. I am working with a project of Effective Intervention. We came today to your school to do an exercise to help us better understand how children learn how to read and do mathematics, and you were chosen to help us.**
- **We would like to ask for your help. But you do not have to take part if you do not want to.**
- **We are going to play reading and mathematics games. I am going to ask you to read letters, words and a short story out loud. Then you will go to my friend/colleague sitting at the other side** (point to the direction of the EGMA enumerator**), and he/she will ask you to identify numbers, do some calculations and solve a few problems.**
- **Sometimes I will use this timer to time how long it takes you to complete some of the tasks. If you hear it beeps, please do not pay attention to it.**
- **This is NOT a test and it will not affect your grade at school.**
- **Once we begin, if you would rather not answer a question, that's all right.**
- **Can we start?** [wait until the child responds]

If the oral consent is obtained, please tick: ☐
If the oral consent is not obtained, please make a note on the student list.

Assessment start time:	_____ hh: _____ mm

Subtask 1. Letter Sound Identification	Page 1	60 seconds

Here is a page with many English letter sounds. Please tell me the SOUNDS of as many letters as you can- not the NAMES of the letters, but the SOUNDS.

For example, [Point to "A"] **this letter sound is /a/.**

Let's practice. [Point to "T"] **Tell me what letter sound this is.**
✓ [If the child read /t/, say] **Very good, this letter sound is /t/**.
× [If the child did not read /t/, say] **This letter sound is /t/.**

[Point to "b"]. **Now let's try another one. Tell me what letter sound this is.**
✓ **[**If the child read /b/, say] **Very good, this letter sound is /b/.**
× [If the child did not read /b/, say] **This letter sound is /b/.**

Have you understood? [wait until the child replies]

When I say "start", start here [point to the first letter]**, and read through the page** [sweep finger across first line]. **I will use this timer and will tell you when to stop. Point to each letter and read out loud the letter sound. Read as fast and the best you can. If there is a letter sound you can't read, move to the next one.**

Put your finger on the first letter [make sure the child does so]. **Are you ready?** [wait until the child responds and prepare to time] **You can start.**

Start the timer when the child reads the first letter. Stop the timer when the child reads the last letter.

If the child hesitates for 3 seconds, read that letter and then point to the next letter and say "Continue". Mark the letter you read as incorrect.

When the timer reaches 0, say "stop."

If the child does not provide a single correct response on the first line, say "Thank you!", discontinue this subtask, check the box at the bottom, and go on to the next subtask.

(/) Mark any incorrect words with a slash (/).
(ø) Mark with a circle the self-corrections if you already marked as incorrect.
(⌋) Mark the final letter read with a bracket (⌋).

Examples: A T b

1	2	3	4	5	6	7	8	9	10	
L	i	h	R	S	y	E	O	w	T	(10)
i	e	T	m	G	t	a	d	n	B	(20)
h	O	A	E	U	r	L	e	R	u	(30)
g	R	e	N	i	r	m	t	s	r	(40)
S	T	E	C	p	A	F	c	a	E	(50)
y	s	K	A	O	C	O	h	t	P	(60)
e	A	e	s	M	F	n	u	R	t	(70)
A	y	H	N	S	i	g	m	i	L	(80)
b	i	L	O	i	o	E	p	r	x	(90)
N	v	c	D	e	d	J	z	O	n	(100)

Time remaining on timer at completion (SECONDS): _____

Exercise discontinued because the child had no correct answers in the first line. ☐

NA1:	NE1:

Thank you, let's move to the next task.

Subtask 2: Letter Sound Discrimination

In this exercise, you will listen to the English words that I read. I will read three words and one of them starts with a different sound. I will read twice. Tell me which one starts with a different sound.

For example:

"cat", "car", "hot"; "cat", "car", "hot" which one starts with a different sound?

✓ [If the child answered "hot", say] **Very good, "hot" starts with a different sound.**

✗ [If the child did not answer "hot", say] **"cat", "car", "hot". "hot" starts with a different sound than "cat" and "car".**

Now let's try again:
"light", "count", "learn"; "light", "count", "learn", which one starts with a different sound?

✓ [If the child answered "count", say] **Very good, "count" starts with a different sound.**

✗ [If the child did not answer "count", say] **"light", "count", "learn". "count" starts with a different sound than "light" and "learn".**

Did you understand? [wait until the child responds] **Are you ready?** [wait until the child responds] **Let's start.**

If the child does not provide a correct answer in the first 5 items, say "Thank you!", discontinue this subtask, check the box at the bottom, and go on to the next subtask.

If the child hesitates for 5 seconds, provide the answer. Mark the item that you provided answer as "no response".

(✓) 1 = Correct
(✓) 0 = Incorrect
(✓) . = No answer

	…… which one starts with a different sound?			Correct answer	Correct	Incorrect	No response
1.	**book**	**dog**	**boy**	[dog]	1	0	.
2.	**like**	**eat**	**egg**	[like]	1	0	.
3.	**do**	**get**	**go**	[do]	1	0	.
4.	**say**	**pay**	**sad**	[pay]	1	0	.
5.	**apple**	**candle**	**ant**	[candle]	1	0	.
6.	**sun**	**red**	**run**	[sun]	1	0	.
7.	**bag**	**ball**	**kick**	[kick]	1	0	.
8.	**is**	**if**	**of**	[of]	1	0	.
9.	**from**	**drum**	**drive**	[from]	1	0	.
10.	**fly**	**good**	**food**	[good]	1	0	.

Exercise discontinued because the child had no correct answers in the first 5 items. ☐

NA2:

NE2:

Thank you, let's move to the next task.

Subtask 3. Nonword Reading	Page 2	60 seconds

In this sheet there are some made-up words. Read as many words as you can. Do not spell the words, but read them.

For example [Point to the word "ut"], **this made up word is "ut"**.

Let's practice. [Point to the word "dif"] **Read this word.**

✓ [If the child answered "dif", say] **Very good, this made up word is "dif"**.
× [If the child did not answer "dif", say] **This made up word is "dif".**

[Point to the word "mab"] **Now let's try another one. Read this word.**

✓ [If the child answered "mab", say] **Very good, this made up word is "mab"**.
× [If the child did not answer "mab", say] **This made up word is "mab".**

When I say "start", start here [point to the first word]**, and read through the page** [sweep finger across first line]. **I will use this timer and will tell you when to stop. Point to each word and read out loud. Read as fast and the best you can. If there is one word you can't read, move to the next one. Put your finger on the first word** [make sure the child does so]**. Are you ready?** [wait until the child responds and prepare to time] **Start.**

✍ (/) Mark any incorrect words with a slash (/).
(⌀) Mark with a circle the self-corrections if you already marked as incorrect.
(⌋) Mark the final word read with a bracket (⌋).

Start the timer when the child reads the first word. Stop the timer when the child reads the last word.

➲ If the child hesitates for 3 seconds, say the word and then point to the next word and say "Continue". Mark the word that you provided as incorrect.

✋ When the timer reaches 0, say "stop."

✋ If the child does not provide a single correct response in the first line (5 words), say "Thank you!", discontinue this subtask, check the box at the bottom, and go on to the next subtask.

Examples: ut dif mab

1	2	3	4	5	
ri	loz	yat	zam	tob	(5)
zom	hon	mon	jaf	git	(10)
bas	af	ked	ig	el	(15)
tig	om	dop	pif	ip	(20)
fe	ral	mip	kag	vif	(25)
lut	sig	zop	zir	naf	(30)
riz	yot	wab	lat	jep	(35)
wub	dod	ik	vit	nux	(40)
pek	zel	bef	wab	hix	(45)
wof	ib	mig	zek	vok	(50)

✍ Time remaining on timer at completion (SECONDS): _____

✍ Exercise discontinued because the child had no correct answers in the first line. ☐

NA3:	NE3:

Thank you, let's move to the next task.

Subtask 4. Familiar Word Reading	Page 3	60 seconds

In this sheet, there are some English words. Read as many words as you can. Do not spell the words, but read them.

For example, [Point to the word "cat"] **this word is "cat".**

Let's practice. [Point to the word "mat"]**. Read this word.**
✓ [If the child answered "mat", say] **Very good, the word is "mat".**
✗ [If the child did not answer "mat", say] **This word is "mat".**

Now let's try another one. [Point to the word "top"]
✓ [If the child answered "top", say] **Very good, the word is "top".**
✗ [If the child did not answer "top", say] **This word is "top".**

When I say "start", start here [point to the first word]**, and read through the page** [sweep finger across first line]. **I will use this timer and will tell you when to stop. Point to each word and read out loud. Read as fast and the best you can. If there is one word you can't read, move to the next one. Put your finger on the first word** [make sure the child does so]**. Are you ready?** [wait until the child responds and prepare to time] **Start.**

Start the timer when the child reads the first word. Stop the timer when the child reads the last word.

If the child hesitates for 3 seconds, provide the word and then point to the next word and say "Continue". Mark the word that you provided as incorrect.

When the timer reaches 0, say "stop."

f the child does not provide a single correct response on the first line (5 words), say "Thank you!", discontinue this subtask, check the box at the bottom, and go on to the next subtask.

(/) Mark any incorrect words with a slash (/).
(Ø) Mark with a circle the self-corrections if you already marked as incorrect.
(⌋) Mark the final word read with a bracket (⌋).

Example: cat mat top

1	2	3	4	5	
but	time	in	the	also	(5)
make	no	its	said	where	(10)
came	very	do	after	long	(15)
water	run	all	for	paper	(20)
her	was	three	been	more	(25)
that	must	can	ear	it	(30)
jump	words	back	called	work	(35)
could	an	him	on	see	(40)
that	get	not	zip	what	(45)
you	if	their	teacher	when	(50)

Time remaining on timer at completion (SECONDS): _____

Exercise discontinued because the child had no correct answers in the first line. ☐

NA4:	NE4:

Thank you, let's move to the next task.

Subtask 5a: Passage Reading

60 seconds

Page 5.

Show to the children the page of the stimulus booklet while you read the instructions.

Here is a short story. I would like that you read this story aloud, quickly but carefully. I will use this timer and will tell you when to begin and when to stop. If there is a word that you cannot read, go to the next one. When you finish, I will ask you some questions about the story. Ready? [wait until the child responds and prepare to time] **You can start.**

(/) Mark any incorrect words with a slash (/).
(ø) Mark with a circle the self-corrections .
(]) Mark the final word read with a bracket (]).

Ali told his friend Ida to go to uncle Musa's farm.	11
Ali was hungry and wanted to steal bananas in the farm.	22
Ida was angry and said: "We cannot do that, to steal is very wrong.	36
Let's just ask." They found uncle Musa and asked him nicely. He gave them one banana each.	53
They were glad that they did the right thing.	62

Start the timer when the child reads the first word.

If the child hesitates or stops more than 3 seconds on a word, move to the next word and say "Continue".

When the timer reaches 0, say "stop."

If the child does not read any word correctly before the boxed word farm mark below and move to the next task.

If the child says "I don't know", mark incorrect.

Ask the last question even if the child only reads up to word 53.

Time remaining on timer at completion (SECONDS): _____

Exercise discontinued because the child did not read any word correct before the boxed word. ☐

Subtask 5b: Reading Comprehension

When the child finishes reading, REMOVE the passage from the child's view and ask the first question.

Ask the child only the questions related to the text read. The child should have read the part of the text that corresponds to the question. If a child does not give an answer after 10 seconds, mark "no response" and move to the next question. Do not repeat the questions. Consider all sensible answers the child provides as correct.

Now I am going to ask you about the story you just read. Answer the questions the best you can.

Questions [Answers]	Correct	Incorrect	No response
1. **Who went with Ali to the farm?** [Ida]	1	0	.
2. **What did Ali want to do in uncle Musa's farm?** [To steal bananas]	1	0	.
3. **Why was Ida angry?** [Because to steal is very bad; because Ali wanted to steal]	1	0	.
4. **How did Ali and Ida get the bananas?** [They asked nicely, they asked uncle Musa, uncle Musa gave to them]	1	0	.
5. **How would uncle Musa feel if he found out what Ali wanted to do?** [Sad; angry; disappoint]	1	0	.

NA 5a:	NE 5a:	NA 5b:	NE 5b:

Which languages did the child use in this task? (circle all answers that apply)

English Pulaar Mandinka Wolof Others (please specify) _____

Thank you, let's move to the next task.

Subtask 6. Listening comprehension				
I am going to read you a short story aloud ONCE and then ask you some questions. Please listen carefully and answer the questions as best as you can. You can answer the questions in whichever language you prefer. Ready? [wait until the child responds]				Remove the passage from the child's view. Do not allow the child to look at the passage or the questions. If a child says "I don't know", mark as incorrect.
Demba was very sad when he lost one of his goats. He could not go to look for the goat, because he had to watch the other goats. Demba's grandfather helped and found the goat. Demba was very happy.				
Now I am going to ask you some questions related to the story:	Correct	Incorrect	No response	
Why was Demba sad? [He lost his goat; he could not go to look for it; he cannot see his goat]	1	0	.	
Who helped to look for the goat? [Demba's grandfather, his grandfather, grandfather]	1	0	.	
Why was Demba happy? [Grandfather returned with his goat; his goat is back; Grandfather found the goat, he sees/saw the goat etc]	1	0	.	

Which languages did the child use in this task? (circle all answers that apply)

English Pulaar Mandinka Wolof Others (please specify) _____

Thank you for doing this exercise with me. [Follow the instruction on the enumeration manual]

Which language(s) did you use to apply this test? (circle all answers that apply)

English Pulaar Mandinka Wolof Others (please specify) _____

Assessment end time:	_____ hh: _____ mm

Does the child have any visible/noticeable disability? (circle as appropriate)
No Yes (please specify) _____