Everyday Literacy and Numeracy Survey

Technical Report

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Contents

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List of abbreviations

ACSF	Australian Core Skills Framework
ANSA	Associação de Nutrição e Segurança Alimentar
DFID	UK Department for International Development
INAF	Functional Literacy Indicator (Indicador de Alfabetismo Funcional)
IRT	Item response theory
ISCO	International Standard Classification of Occupations
OECD	Organisation for Economic Cooperation and Development
OPM	Oxford Policy Management
PIAAC	Programme of the International Assessment of Adult Competencies
TVET	Technical and Vocational Education and Training

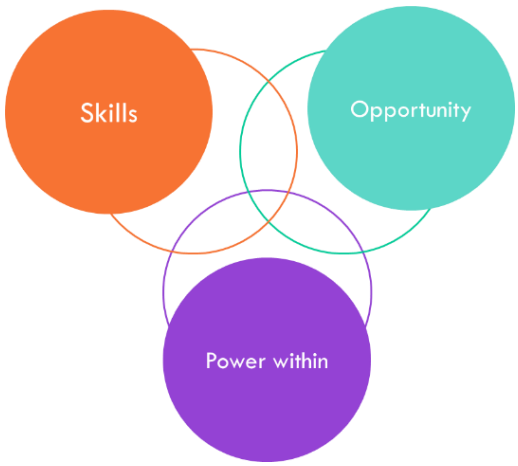
1 Introduction

1.1 About *MUVA*

***MUVA* is the UK Department for International Development (DFID) Mozambique's female economic empowerment programme, working with young women in urban areas.** The programme identifies, tests, and supports the uptake of approaches to working on female economic empowerment. The programme aims to find ways to increase urban Mozambican girls' and women's opportunities to find and retain decent work, by identifying and addressing the constraints that currently keep them out of work.

The majority of *MUVA*'s interventions are based on a bundled approach that tackles three main constraints:

- **Skills** – many young women lack the technical, foundational, and/or transferable skills needed to succeed in the labour market.
- **Opportunities** – young women, particularly from poor households, struggle to find the often critical first work experience or internship.
- **Power within** – in the context of adverse social norms, many young women struggle with inner constraints and lack of confidence, which prevents them from making use of their skills and opportunities.



MUVA is an evidence-based adaptive programme. Each project under the innovative fund, as well as the programme as a whole, has six-monthly reflection sessions, during which data and insights from the monitoring, evaluation, and learning system are reviewed. The learnings are used to help implementers make decisions about adapting their activities to respond to findings and improve their intervention.

MUVA is also an influencing programme. As such, the learnings are not only used to for adaptation of its own projects but also in order to scale up the approaches that have been proven to be successful. In addition, the programme aims to widely disseminate its evaluation and research results to stakeholders working on female economic empowerment and youth employment in Mozambique, as well as globally.

1.2 Everyday literacy and numeracy skills

Skills are a central component that enable young people to access decent remunerated work. Skills can be distinguished into the following categories (World Bank 2018):

- **foundational skills** refers to the basic skills that young people need for work, learning, and life. They are often a pre-requisite to learn technical skills. These skills include everyday literacy and numeracy skills;
- **technical skills** refers to the acquired knowledge and expertise needed to perform a particular job; and

- **soft skills** (often also called socio-emotional or non-cognitive skills) refers to the ability to navigate intra- and interpersonal situations that one might encounter in life and the workplace. Such skills may include teamwork, communication skills, motivation, grit, and flexibility.

We define everyday literacy and numeracy skills as:

The level of reading, writing, and calculation skills that are used to function in the particular community in which an individual lives and works.

This means that the literacy and numeracy skills of interest are linked to real life situations that a young person may experience in their daily life and at work. In particular, these skills are about comprehending information in written and/or printed form, producing and recording information in written and/or printed form, and being able to use numbers and calculations required in their daily lives and at work.

Following from this definition, everyday literacy and numeracy skills are not necessarily the same skills that one needs to get good results in a Portuguese or mathematics exam in school. Rather, everyday literacy and numeracy skills are about the capacity to use what one has learnt in school or elsewhere in everyday life, and in particular at work. From this it follows that level of schooling may or may not be a proxy for young people's everyday literacy and numeracy skills.

1.3 Survey motivation and objectives

Many of *MUVA*'s interventions have a skills training component. Depending on the context of the intervention, the type of skill that is taught varies widely and ranges from soft skills to information and communication technology skills, to technical skills and business skills.[1] Most of these interventions assume a minimum level of everyday literacy and numeracy skills, instead of teaching these. In a number of instances this assumption has proven incorrect, which has led to complications in achieving the interventions' objectives.

In the absence of a standardised and ready-to-use assessment tool, level of schooling is often used as a proxy for ability in order to select candidates for training programs or jobs. However, anecdotal evidence from a range of *MUVA* interventions, their local partner organisations, Technical and vocational education and training (TVET) centres, and finally employers shows that the level of schooling is not seen as a reliable indicator for what a young person can or cannot do.

In addition, consultations with private sector companies also tell us that recruiters and human resources teams struggle to find candidates with the right abilities, and there is often a mismatch of skills and job responsibilities. Many employers are also keen to invest in training but without knowing what the levels and gaps are, this is difficult.

Based on the challenges that *MUVA* interventions, training institutions, and employers face as a result of the uncertainty about young people's everyday literacy and numeracy skills, the objectives of the survey were the following:

[1] For an overview of *MUVA*'s portfolio of projects, please visit www.muvamoz.co.mz

- to provide a statistically representative overview of the situation of everyday literacy and numeracy skills among young people in urban Mozambique;
- to put data into a currently data-free area – knowing where the skills gaps are the largest can help improve targeting actions to increase the pool of skilled potential employees;
- to analyse the relationship between formal schooling and everyday literacy and numeracy as required by the urban labour market in Mozambique. This will be important for both employers and institutions working in education in Mozambique; and
- to develop and pilot an assessment tool for everyday literacy and numeracy that moves away from exam-type testing and focuses on finding out what people know, rather than what they do not know, with the possibility of adapting such a tool for use by employers, training centres etc.

1.4 Purpose of this report

This report provides a comprehensive summary of the methodology and the main findings of this study. It also presents some conclusions and implications that can be derived from the findings. This report will be the first of a series of outputs that will be produced based on this study. Most notably, we will produce a series of short research briefs based on the main findings of this report, with the aim of reaching a wider audience. There will also be an accompanying training report which will describe in more detail how the assessment instrument that was designed for this study should be applied.

2 Methodology

2.1 Survey methodology

2.1.1 Sampling strategy

The survey reported on in this report is the second round of the *MUVA* Urban Youth Survey, which surveyed 3,300 young people (15–25 years) in Maputo and Beira at the end of 2017 in order to construct a statistical profile of youth living in Mozambique's cities.

For the Everyday Literacy and Numeracy survey we re-visited just under half of the same households and young people that were part of the first round. The sampling strategy builds on the original sample of the *MUVA* Urban Youth Survey. This means that the sample of the Everyday Literacy and Numeracy survey is representative of the same areas that the *MUVA* Urban Youth Survey is representative of, namely: densely populated, low-income, inner-city areas in Maputo and Beira. A detailed explanation of the sampling strategy of the *MUVA* Urban Youth Survey, the selection criteria for eligible enumeration areas, and maps of the final areas that are part of the sample can be found in Section 2.1 of the *MUVA* Urban Youth Survey technical report.[2] The young people that were surveyed in 2017 were mostly between 16 and 26 years old at the time of the Everyday Literacy and Numeracy survey.

The sample for the Everyday Literacy and Numeracy survey was drawn via systematic random selection from the original sample of the *MUVA* Urban Youth Survey. When drawing this sample we explicitly stratified by city (sampling an equal number of respondents in Maputo and in Beira) and implicitly stratified by gender, neighbourhood, highest grade completed, and enumeration area within the samples of each of the cities. Implicit stratification means that the sampling frame was sorted by these variables prior to random selection. This process ensured that the new sample maintains its representativeness across the implicit strata.

Given that the aim was to re-interview a representative sub-sample of the same respondents that we had interviewed the year before, we also needed to sample a list of replacements. For each city, we sampled an excess 50% of respondents to be interviewed for cases in which respondents from the main sample could not be located or were not available/able to participate in the survey.

Replacements were drawn together with the main sample, using the same stratification strategy. Replacements were sorted randomly and given a sequence number. This allowed us to control the allocation process. Following a prescribed sequence guaranteed that replacements were allocated at random rather than convenience.

Replacement households/respondents were used in any of the following cases:

- the dwelling could not be located, even after several attempts;
- the respondent moved to a place outside the city;
- the respondent moved to an unknown place;

[2] The report can be downloaded in English or Portuguese from the *MUVA* website (www.muvamoz.co.mz). It is also available upon request to the authors.

- the respondent moved to a place within the same city but the household was not able or willing to provide their new contact details;
- the respondent died;
- the respondent refused to participate in the study;
- the respondent did not have any time to be interviewed before the end of the field work.

Field teams were instructed to minimise the use of replacements. Practically, this meant:

- making several attempts at finding the sampled dwelling by asking neighbours and community leaders about their location;
- interviewing the respondent in their new residence if they had moved to a location within the same city and someone was able/willing to provide the enumerators with the respondent's new contact details and/or address; and
- revisiting respondents' households several times and making appointments for interviews in order to facilitate their availability.

A detailed description of the sample size, interview outcomes, and number of replacements needed can be found in Table 2 in Section 2.1.3 below.

All estimates presented in this report take this sampling structure into account and include weights based on the probability of selection of each unit of observation, to ensure that estimates are representative of the areas from which this sample was drawn. When constructing the sampling weights we also took the rate of replacements into account (more details are given in Section 2.1.2).

2.1.2 Sample size

We re-interviewed 1,600 young men and women for the Everyday Literacy and Numeracy survey, 800 in Maputo and 800 in Beira. This number is the result of sample size calculations performed by the research team under the premise that the objective is to compare everyday literacy and numeracy levels of young people across the two cities and genders.

The final distribution across cities and gender can be found in Table 1 below. Overall, our sample consisted of 42% men and 58% women. This is roughly the same distribution as in the *MUVA* Urban Youth Survey and was the result of a random draw.

Table 1. Distribution of the achieved sample by gender and city

	Maputo	Beira	Total
Male	333 *(21%)*	332 *(21%)*	665 *(42%)*
Female	468 *(29%)*	467 *(29%)*	935 *(58%)*
Total	800 *(50%)*	800 *(50%)*	1,600 *(100%)*

2.1.3 Data collection and quality assurance

Data collection for the Everyday Literacy and Numeracy survey started on 29 October 2018 in Maputo and on 10 November 2018 in Beira. The last interview was completed on 9 January 2019 in Maputo.

Prior to the start of data collection, enumerators took part in a two-week-long training. An excess number of enumerators were trained and at the end of the training only the most capable were hired for data collection. A more detailed account of the training and its content can be found in Section 2.2.3.

In each city, the data collection teams were supported by an experienced field work supervisor and a data manager. The supervisor and data manager led the teams in locating the households and monitored the use of replacements. A large proportion of the enumerators were the same enumerators that had participated in the data collection for the *MUVA* Urban Youth Survey.

The distribution of interview outcomes can be found in Table 2 below. As per our target, the teams completed 1,600 interviews, 800 in Maputo and 800 in Beira, which is 71% of all interviews attempted. In total, the teams attempted to interview 2,259 respondents. This means that we used 659 replacements, 261 in Maputo and 398 in Beira.

The most common reason for replacement was that the respondent had moved to another city or country, followed by respondents that had moved to an unknown location. Around 3% of all people that we visited refused to participate in the study.

Table 2. Count and frequency of outcomes of all attempted interviews

Outcome	Count	Frequency
Interview completed	1,600	71%
Interview started but not completed	6	0.2%
The respondent moved – new location unknown	141	6%
The respondent moved – to another city/country	206	9%
The respondent moved – no contact details	85	4%
The respondent moved – temporarily (did not return before the end of field work)	15	0.7%
The dwelling could not be located	25	1%
The respondent died	4	0.2%
The respondent refused to participate	70	3%
The respondent was not available	53	2%
The respondent has never been part of the household	54	2%
TOTAL	2,259	100%

For the respondents that could be located, and that were available and willing to participate, the interview process consisted of the following parts:

i. everyday literacy and numeracy assessment (described in detail in Section 2.2); and
ii. small number of questions relating to the respondent's background characteristics that may have changed since the last visit in the scope of the *MUVA* Urban Youth Survey in 2017. These questions were related to education, employment, and family outcomes.

Data quality assurance was guaranteed in a similar way as during the *MUVA* Urban Youth Survey. By using tablets to collect data, it was possible to run data checks and provide feedback to field teams in real time. The quality assurance system was based on a Power BI dashboard designed by Oxford Policy Management, and was run by the data managers in Maputo and Beira. The system allowed us to monitor the performance of each enumerator, as well as noting any inconsistencies. Every day, after running the system, the data manager would provide continuous training and corrections where necessary via personalised WhatsApp messages to the enumerators. The system was also very useful to keep track of re-visits and replacements, and their order.

2.2 The assessment instrument

The instrument to assess everyday literacy and numeracy was developed purposefully for this study. The instrument was designed to fulfil the following requirements:

- To be different from a written exam in school – we wanted to find out what people can do in their everyday life not how good (or bad) they are at taking an exam. In addition, many people associate exams with fear, stress, and nervousness, which often negatively impacts their performance and hides their true skill.
- To be based on problems people might come across in their everyday life or work, rather than on content of the school curriculum.
- To be calibrated to the respondent's level to make sure no one was exposed to tasks that were either significantly too easy or significantly too hard for them. This was to not only make the assessment more efficient but also to avoid respondents from becoming either bored, demotivated, or humiliated.
- Be engaging and interesting in order to decrease the burden on the respondents.
- Be under one hour in length.

2.2.1 Standards of everyday adult literacy and numeracy

The first step in the design of the assessment instrument was to determine standards for the levels of assessment. Standards set the criteria for the successful demonstration of a particular set of skills. Statements of standards for everyday adult literacy and numeracy in an urban employment context in Mozambique were developed, using the Australian core skills framework (Perkins 2012) as a starting point (see Table 3 and

Table 4 below).

When designing the assessment instrument we worked under the key assumption that Portuguese is the main language of literacy and numeracy in the urban workplace. While other languages are commonly used in Mozambique, Portuguese is the expected language in the

urban workplace, the expected language on government forms for reading and writing, the most widespread language for advertisements and other public notices, and the language of instruction in schools. We recognise that there are other forms of literacy and that numeracy skills can be demonstrated in other ways in other contexts. However, in this study we took advice that urban employers would not usually alter their processes to align with the numeracy skills of those who could not show these in the expected language of the workplace. Therefore, the whole assessment, both literacy and numeracy, was administered and to be completed in Portuguese.

Table 3. Literacy standards

Level name	Definition of standards [3]
Literacy Level 1	A young person recognises a small number of very familiar whole words in print; recognises the meaning of some common signs supported by visuals; locates an extremely familiar piece of information in a short simple text; and recognises names of local places in a text.
Literacy Level 2	A young person recognises high-frequency words, common phrases, common signs and symbols; locates one or two pieces of information from a simple text (including SMS), diagram, table, map, or plan; reads word by word; sounds out letters/syllables to decode unfamiliar words.
Literacy Level 3	A young person locates, selects, and interprets information; identifies main ideas and can compare and contrast information from short, unambiguous texts, including simple non-linear web-based texts, advertisements, tables, diagrams, and application forms; reads by words and phrases; uses common patterns in language to identify unknown words.
Literacy Level 4	A young person understands many types of familiar texts of moderate complexity requiring integration of ideas and pieces of information and some inference; reads familiar texts fluently; uses a range of strategies, including cross-checks on syntactic and semantic sense to identify meaning of unknown words.
Literacy Level 5	A young person understands many types and lengths of familiar and unfamiliar complex texts involving abstract ideas, using inference and interpretation to identify the relationship between concepts and information; reads texts fluently with a broad range of strategies to understand complex unknown words and phrases.

Table 4. Numeracy standards

Level name	Definitions of standards [4]
Numeracy Level 1	In **extremely familiar contexts**, a young person can: • recognise whole numbers up to 10, including 0, and *potentially* up to 100; • recognise common notes and coins;

[3] Note that the requirements of the lower levels are not repeated in the summaries of the higher levels.
[4] Note that the requirements of the lower levels are not repeated in the summaries of the higher levels.

	• recognise oral day markers (yesterday, today, tomorrow); • recognise oral ordinal numbers; • recognise digital time; • recognise descriptive features of common 2D shapes, such as big, small, round, straight.
Numeracy Level 2	In **highly familiar contexts** a young person can • use place value in whole numbers into 100s; • add/subtract whole numbers and familiar monetary amounts; • recognise and compare familiar basic metric measurements and quantities, such as length, mass, capacity/volume, time, temperature (e.g. personal height and weight, a litre of milk, or vehicle height clearances); • identify simple symbols and pictorial representations in highly familiar maps and diagrams; • use language of shape, size, colour, such as straight, curved, square, circle, triangle; • use simple and informal symbolism.
Numeracy Level 3	In **familiar contexts**, an adult identifies, interprets, and uses: • whole numbers, including numbers into the 1,000s, money, and very simple and familiar fractions, decimals, and percentages, e.g. 1/4, 1/10, 50%, 25% or 0.25; • dates and digital times; • common 2D shapes and some common 3D shapes, e.g. spheres or cubes; • familiar and simple measures of length, mass, volume/capacity, and temperature; • a limited range of familiar and predictable calculations with the four operations (+, –, x, ÷), with division and multiplication related to small whole number values; • mainly informal and some formal symbolism.
Numeracy Level 4	In a **range of familiar contexts**, a young person interprets, understands, and uses • whole numbers and familiar or routine fractions, decimals, and percentages; • rates in familiar or routine situations; • familiar and routine 2D and 3D shapes, including pyramids and cylinders; • familiar and routine length, mass, volume/capacity, temperature and simple area measures in metric units familiar and routine maps and plans; • familiar and routine data, tables, graphs and charts, and common chance events; • formal and informal symbolism relevant to the level.
Numeracy Level 5	In **unfamiliar and unpredictable contexts**, a young person interprets, understands, and uses: • fractions, decimals, and percentages, including their equivalent values ratio, rates, and proportions; • positive and negative numbers; • numbers expressed as powers (e.g. 2^3 or 3.6×10^2); routine formulae and algebraic representations and conventions; 2D and 3D shapes, including compound shapes; • detailed maps and plans; • statistical data in complex tables and spreadsheets, graphs, measures of central tendency, simple measures of spread and common chance; • mostly formal mathematical symbolism.

We avoided the use of interpretive labels such as 'pre-literate', 'proficient', 'competent', 'below competent', and so on. Such labels have two undesirable properties: first, they assess what is yet to be shown – the relationship between particular levels and the requirements of jobs or roles in society (and such relationships may vary significantly – what is an essential requirement for one job may be more than is needed for another); secondly, such labels carry with them implications for social approval (and disapproval).

Using labels that have no particular connotations means that readers will have to read the definitions of the standards rather than interpret the names of the standards. Users of the

standards may find some sort of more or less meaningful shorthand labels helpful. Once the results of this study are available, therefore, it may be useful to invite employers to contribute to matching particular levels with skills required in various occupations. It will then be possible to develop some useful shorthand labels or graphics that can be used to supplement the words used to define the standards.

2.2.2 Comparison to international standards

Australian Core Skills Framework (ACSF)

The definitions of the levels used in the survey were derived from the literacy and numeracy levels in the ACSF (Perkins *et al*. 2012). The derivation process took into account (i) the urban context in Maputo and Beira, and (ii) advice from those with local knowledge about the sorts of skills that might reasonably be expected in the workplace.

The levels we used are approximately aligned with the levels pre-level 1, level 1, level 2, level 3, and level 4 in the ACSF.

OECD Programme for Assessing Adult Competencies (PIAAC)

The Organisation for Economic Co-operation and Development's (OECD's) PIAAC has five levels, plus a 'below level 1' level. An Australian study (Cirelli, *et al*. 2012) has, using studies of the items used to assess PIAAC levels and tasks used to assess ACSF levels, developed alignment between the PIAAC levels and the ACSF levels. This study concluded that ACSF Level 4 (which is called Level 5 in this study) aligns approximately with PIAAC Level 3 – the match is summarised in Table 5, along with other comparisons between the levels of the *MUVA* study and other international assessments of everyday literacy and numeracy.

Brazil's Functional Literacy Indicator (INAF)

Alignment with the *Indicador de Alfabetismo Funcional* (INAF) scale (Lima and Catelli 2008) presents some challenges. First, this study uses traditional testing approaches (and so draws inferences about lower levels of attainment that may well be strongly coloured by participants' – possibly negative – experiences of school and tests). Secondly, we can only estimate alignment from reading descriptions of skills. Thirdly, the study includes a focus on aspects of literacy and numeracy that are valued more strongly in school contexts than in many modern employment contexts, such as naming punctuation marks and calculating without a calculator. The INAF scale combines elements of both literacy and numeracy – something that does not align with our experience, where fewer than 10% of interviewees with Level 4 literacy have Level 4 numeracy: over 90% have a lower level.

Our estimated alignment with INAF (taking into account the many uncertainties involved) is also shown in Table 5, noting that this focuses primarily on the literacy levels.

Table 5. Comparison between the levels of different international assessment frameworks

***MUVA* study levels (Mozambique)**	**ACSF levels (Australia)**	**PIAAC levels (OECD countries)**	**INAF levels (Brazil)**
Level 1	Pre-level 1	Below Level 1	Illiterate

Level 2	Level 1	Level 1	Illiterate/rudimentary
Level 3	Level 2	Levels 1–2	Rudimentary/basic
Level 4	Level 3	Level 2–3	Intermediate
Level 5	Level 4	Level 3	Proficient

2.2.3 The structured adaptive interview

The everyday literacy and numeracy levels of the young people in Maputo and Beira were assessed via a structured adaptive interview process.

The interview was structured in the sense that all interviewers had the same set of tasks and questions available to them. They also had the same set of answer options available to them, which ensured consistency across interviewers. The interview was mostly administered orally, with the exception of the tasks at the higher levels, in which respondents were asked to provide written answers.[5]

In general, interviewers classified respondents' answers according to three categories:

1) answer was mostly correct and given without significant difficulties or additional support;

2) answer was mostly correct but with some additional support;

3) answer was not correct/no answer given, or only after a lot of additional support.

Each set of task had between five and 10 questions. The interviewer made a judgement of the answer for each question. In the end an algorithm decided whether the respondent's performance on the set of questions was 'high', 'medium', or 'low', which in turn decided either the next set of tasks or the final level.

The assessment was adaptive in the sense that not every respondent completed the same set of tasks. Instead, the assessment flow was designed to respond to the respondent's performance on each task. It was a process of calibration that was intended to ensure that respondents did not get given tasks that were significantly too easy or significantly too hard for them.

In practice, this meant that all respondents started by filling in a personal information form, a task pitched at around Level 2 or 3 of literacy. If the respondent managed to do this without difficulties they passed to a higher-level task. If they managed to fill in the form but with some difficulties, they passed to a task pitched at a slightly lower level. Finally, if they had grave difficulties filling in the personal information form (i.e. they struggled to understand and write very common words and phrases) they passed on to tasks pitched at Levels 1 or 2. The remainder of the assessment continued in a similar fashion until the respondent had reached their final level.

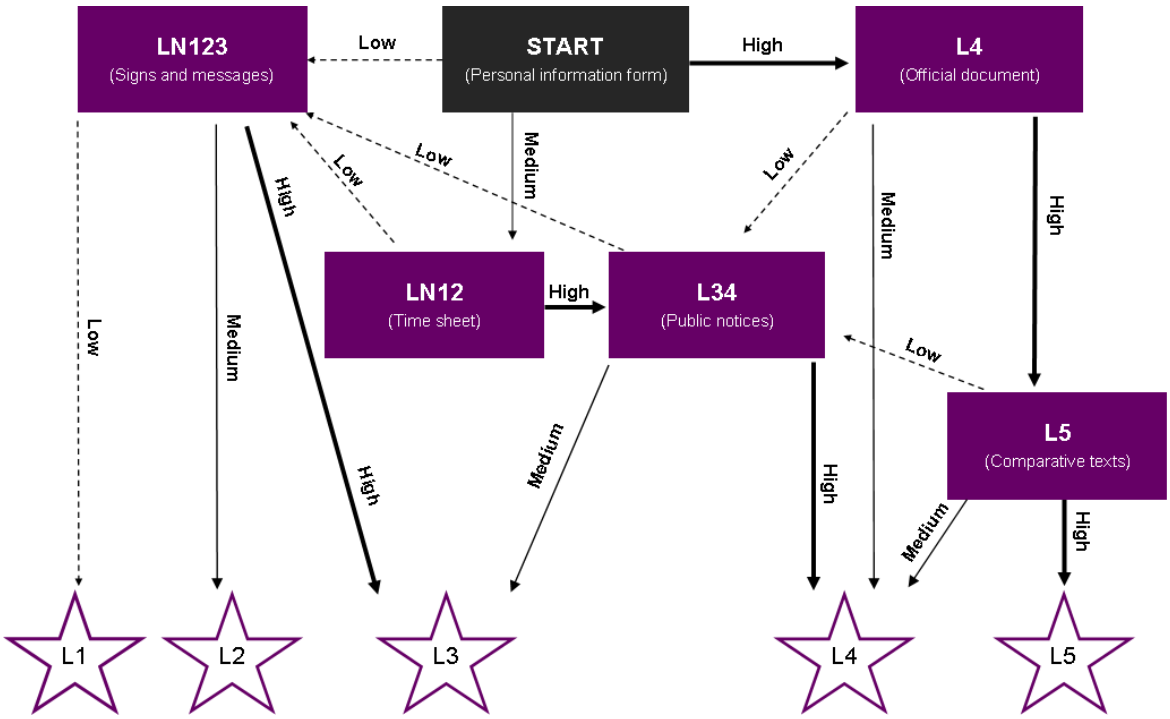
The adaptive assessment flow can be seen in Figure 1 and Figure 2 below. The boxes represent the task sets and the stars the final levels. It becomes clear that there are numerous different paths that could lead a respondent to their final level. For example, one

[5] All written answers were collected and checked by the data managers in order to make sure that the scores given by interviewers matched with the quality of the written answers provided by the respondents.

respondent with literacy Level 4 may perform 'high' at filling in the personal information form (START) and 'medium' at reading and writing about the official document (L4). A different respondent with literacy Level 4 may have been (mis)judged to have a 'medium' performance at filling in the personal information form but then have a 'high' performance at answering the questions about both the time sheet (LN12) and the public notices (L34).

The advantage of this process is that it gives both respondents and the interviewer several opportunities to find the right level. It also decreases task dependencies.

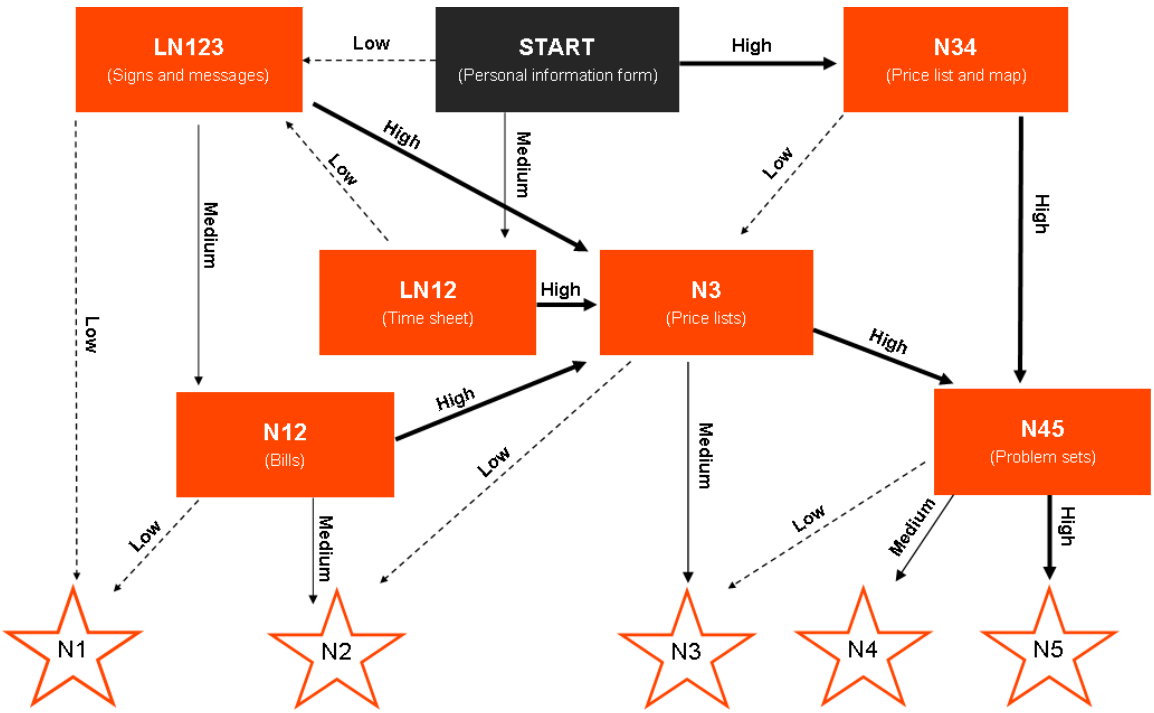
Figure 1. Assessment flow chart – literacy



Generally, each interview started by finding the respondent's level of everyday literacy and then turned to assessing the respondent's level of everyday numeracy. For the lower levels, literacy and numeracy were assessed with the same set of tasks (LN123 and LN12).

Respondents were provided with calculators for all numeracy tasks, even the ones at the lower levels. This is because we assume that in everyday life situations and the workplace, people can usually use a calculator to make calculations should they wish to do so.

Figure 2. Assessment flow chart – numeracy



Examples of tasks and questions

In total there were three tasks that assessed both literacy and numeracy, three tasks that exclusively assessed literacy, and four tasks that exclusively assessed numeracy.

All materials for the tasks were taken from everyday life situations that young people may expect to come across at work or in their communities. Examples of questions pitched at the different levels can be found in Annex A.[6]

2.2.4 Training of interviewers

Conducting the structured adaptive interview for assessment of everyday literacy and numeracy skills was not an easy task. Therefore, the training of interviewers lasted a total of 10 days per city. In each city, we trained an excess number of interviewers, which allowed us to make a selection at the end of the training and only keep the strongest interviewers.

We trained interviewers to be facilitators rather than enumerators. This means that they had to learn how to be supportive, yet objective, in their assessment, how to be encouraging and how to provide additional help where necessary, without giving away the answer, and how to quickly assess the profile and skill level of a given respondent.

A detailed training report that explains the profile of the interviewers, the content, and the methodology of the training is available upon request to the authors, or can be downloaded from the *MUVA* website.

[6] The assessment instrument is open source. For access, please get in touch with one of the authors.

2.3 Reliability of the assessment instrument

The reliability (or precision) of an assessment is related to the *consistency* of the results: we want to know whether assessing the same persons again using the same process would generate the same results.

The Everyday Literacy and Numeracy assessment was designed with the intention that it would produce results in terms of five levels and that its reliability at an individual level would be at least 70%: if we assessed the same person again they would get the same result at least 70% of the time (including those who were close to one level or another). This was considered sufficient for the level of aggregation expected of the data: no individual results, only inferences about groups.

In this assessment, a person's final level was determined algorithmically (by rules coded into a computer-assisted personal interviewing program). There was no opportunity to apply the same assessment (or an equivalent one) to the same persons on different occasions because they only took the assessment once.

Therefore, estimating the reliability of this assessment required developing an approach to assess its *classification consistency*. In other words, we asked the question: would using a different way to analyse the data change the assigned levels? Such an approach, one that would derive overall estimates of literacy and numeracy 'scores' rather than levels, would also provide estimates of the reliability of these scores.

To do this we applied a well-known and widely used approach for the analysis of assessment data: item response theory (IRT). An explanation of IRT and how it was used to fit a model for the data of this study can be found in Annex C.

2.3.1 Reliability results – levels

The following figures (Figure 3 and Figure 4) show boxplots of the IRT estimates for each level. A boxplot shows the distribution of a set of data points, in this case the distribution of IRT estimates (the y-axis, labelled 'theta') for each level of literacy (the x-axis). The box represents the middle 50% of the observed data points (the interquartile range), the line in the box is the median and the vertical lines are the expected maximum and minimum, based on the interquartile range. The dots are 'outliers' – data points outside this range.

The strong relationship is clear – only a small number of points in each category overlap with the points in adjacent categories. That is, each set of IRT estimates (literacy and numeracy) provides a measure that relates strongly to the levels (literacy and numeracy). The IRT estimates are derived from the individual items and the levels result from the application of rules to these items. We can cut up the IRT estimates into categories – levels of literacy and numeracy – by applying cut-scores to these distributions. This gives us a sense of the classification consistency (see above): would the results have been different if instead of applying rules to get a person's literacy or numeracy level we had applied IRT (test scores) to the results as a whole and then categorised these ability estimates into five levels?

Figure 3. Boxplot of IRT estimates by literacy level

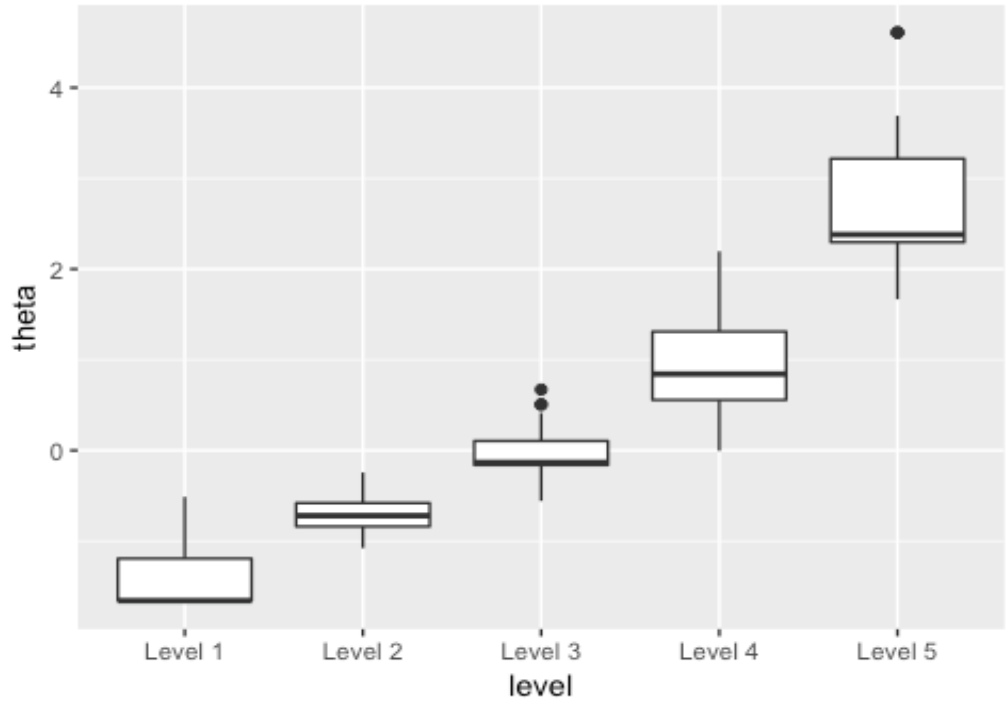
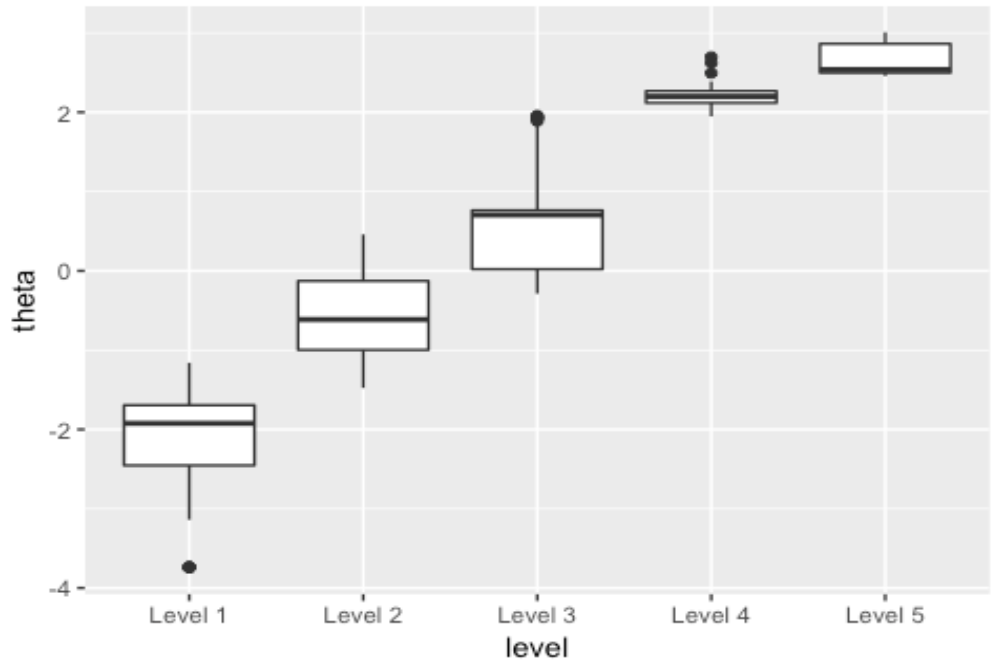


Figure 4. Boxplot of IRT estimates by numeracy level



To quantify these relationships we derived cut-scores: first, for each level we found the 0.05 and 0.95 quantiles of the IRT scores. Then, we estimated a cut-score as the average of these values at each boundary. This provided estimated levels. The relationship of these levels and the observed levels appears in Table 6 for literacy and Table 7 for numeracy.

Other than for Level 5 in numeracy (which was very rarely observed), the probability of the two classifications agreeing is very high (we intended to get 70%). For example, Table 6 shows that in our study 314 people were classified as Level 1. Out of the 314, the IRT model assigns 289 to Level 1 and 25 to Level 2. That suggests a probability of agreement between these two methods of 92%.

Table 6. Match of IRT-derived estimated levels and observed levels – literacy

		Observed literacy levels				
		Level 1	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Estimated literacy levels	**Level 1**	**289**	30	0	0	0
	Level 2	25	**178**	33	0	0
	Level 3	0	12	**559**	14	0
	Level 4	0	0	3	**373**	5
	Level 5	0	0	0	32	**23**
Probability of agreement		**92%**	**81%**	**94%**	**89%**	**82%**

Table 7. Match of IRT-derived estimated levels and observed levels – numeracy

		Observed numeracy levels				
		Level 1	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Estimated numeracy levels	**Level 1**	**215**	13	0	0	0
	Level 2	6	**433**	71	0	0
	Level 3	0	25	**752**	0	0
	Level 4	0	0	17	**28**	4
	Level 5	0	0	0	2	**10**
Probability of agreement		**97%**	**92%**	**90%**	**93%**	**71%**

2.3.2 Reliability results – interviewers

IRT estimates for the total set of data were also used to estimate any significant differences between interviewers. The purpose of this is to test whether some interviewers were especially harsh or especially lenient in their judgements and use of the assessment instrument.

Overall, we conclude that judgements by interviewers were mostly reliable and that no interviewer made judgements that were systematically different enough to require deletion.

To establish the reliability of interviewers, we use a linear regression model, modelling the IRT estimates from each interviewer and the respondents' background data (e.g. the respondent's gender, level of schooling, poverty etc.).[7] Such a model produces linear regression coefficients.

If no background information is used, then the interviewer coefficients would simply represent the average differences between the sets of people interviewed by each interviewer. Such differences would represent **both** *real* differences between interviewees (one interviewer happened to end up with a high-achieving group and one a low-achieving group) and *systematic* differences between interviewers (similar groups were being assessed differently).

The use of background information in this model gives some sense of the possible differences between interviewers. Large values for the coefficients can be taken as indicating systematic differences between interviewers.

If all interviewer coefficients were close to zero we could conclude that there were no differences between interviewers in their application of the rules (no interviewer was too harsh or too lenient).

The coefficients for interviewers were in the range -1 to 0.33, with an interquartile range of -0.44 to 0.09. These values are generally within half the range of the estimates for each level. Therefore, no interviewers were judged sufficiently discrepant to require deletion.

[7] Of course, this analysis can only use the *available* other factors. There may have been some significant (unobservable) differences between the different sets of persons interviewed by different interviewers.

3 Description and discussion of results

3.1 Distribution of the levels

We start by presenting the distribution of everyday literacy and numeracy levels among young people in Maputo and Beira (Figure 5 and Figure 6). This provides us with an indication of the supply of skills in these two cities.

The general patterns that emerge are the following:

- There are very few young people at the highest level for literacy and numeracy.
- The majority of young people can be found at medium-high levels for literacy (Levels 3 and 4) and at the medium level for numeracy (Level 3).
- A considerable number of young people can be found at the two lower levels for both literacy and numeracy.
- Overall, young people perform better in literacy than in numeracy.

In terms of everyday literacy, we find that 2% of all young people between 16 and 26 in Maputo and Beira were assessed to be at Level 5 of literacy or above. This means they can read and interpret even unfamiliar and lengthy texts of high complexity, using inference to identify relationships between contexts. They can use the information given to write longer texts. This group managed to read two unfamiliar texts and write a summary of the similarities and differences found in the texts.

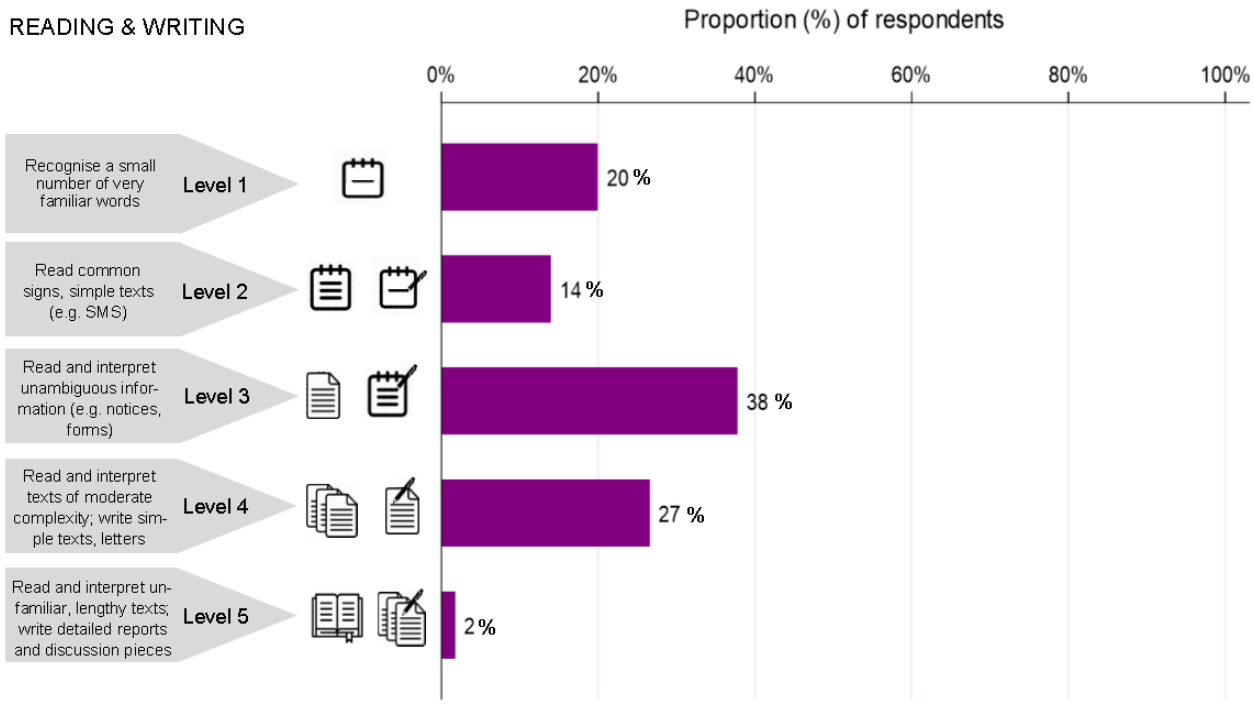
A little over a quarter (27%) are at Level 4 for literacy. They are able to read and interpret diverse types of text of moderate complexity, including official documents found in everyday life. They can fill in a personal information form with no difficulties and they can write short texts and letters, processing information and instructions they have been given.

Over a third (38%) of all young people were assessed to be at Level 3 of literacy. This group can read and interpret many common pieces of information found in everyday life, such as notices, advertisements, simple websites, and application forms. They also managed to fill in the whole personal information form (potentially with some difficulty).

14% of young people can be found at Level 2 for everyday literacy, which means they can read and understand common signs and simple texts, messages, tables, and diagrams. Many of them will have managed to understand the elements required in a time sheet and may have filled in part of the personal information form.

Finally, we find that 20% of all young people are at Level 1 for everyday literacy. This group of people may recognise a small number of very familiar words and identify the meaning of some common signs when supported by visuals. This group of people may be able to write a couple of words but most will not have been able to fill in the personal information form or correctly read and interpret a small piece of text, such as a text message.

Figure 5. Distribution of everyday literacy levels



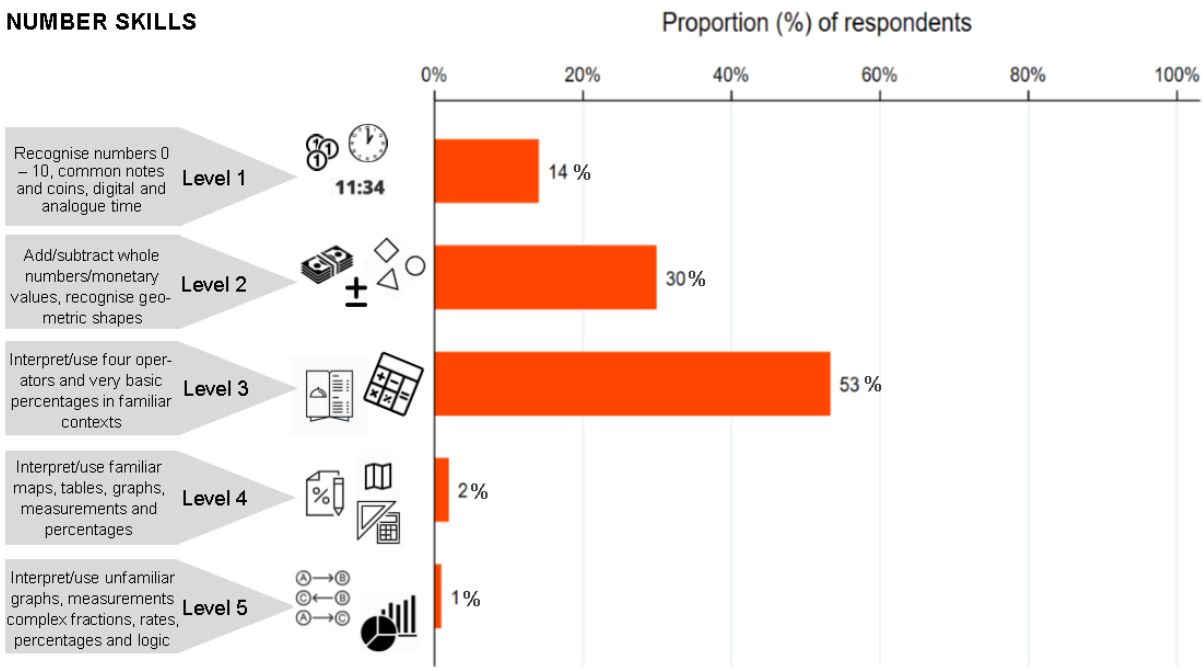
In terms of numeracy, we find that 2% and 1% of young people in Maputo and Beira reach Levels 4 and 5, respectively. People who reach these levels manage to do calculations that may be less routine but can still be found in everyday life. People at Levels 4 and 5 can interpret and use simple and complex maps, interpret and produce statistical data (frequencies, percentages, averages), calculate proportions and rates, and use and manipulate measurements (e.g. perform unit conversions). The young people at these levels also manage to apply more advanced logic to solve problems.

Over half of all young people (52%) have everyday numeracy skills at Level 3. This means they manage to perform most familiar everyday calculations using the four operators (+, -, x, ÷), such as calculating the correct change, comparing prices, and establishing the daily time commitment required by a course when given the total number of weekly hours. Some of them may be able to use some very routine percentages or fractions of whole numbers (e.g. 10% or ½) but will struggle to apply the same logic to more complex numbers or with less routine percentages or fractions (e.g. 7% or 3/5)

30% of all young people in Maputo and Beira are at Level 2 for everyday numeracy. They are able to perform some familiar everyday calculations, such as adding up monetary amounts or hours in a time sheet. They can recognise geometric shapes and numbers up to 1,000.

Finally, 14% of young people have skills associated with everyday numeracy Level 1. This means they can recognise whole numbers between 0 and 10, possibly up to 100, as well as common notes and coins. They may be able to describe geometric shapes (e.g. round, straight etc) but without being able to identify them (e.g. circle, square, triangle etc). The majority of the people in this group will struggle to perform simple calculations.

Figure 6. Distribution of everyday numeracy levels



In order to more easily compare young people's performance in literacy to their performance in numeracy, we can categorise Levels 1 and 2 as 'low', Level 3 as 'medium', and Levels 4 and 5 as 'high' (Table 8). What becomes clear is that, compared to literacy, there are more young people at the lower and medium levels of numeracy and fewer young people at the higher levels.

Table 8. Literacy categories versus numeracy categories

	Literacy	Numeracy
Low (Levels 1 and 2)	34%	44%
Medium (Level 3)	38%	53%
High (Levels 4 and 5)	29%	3%

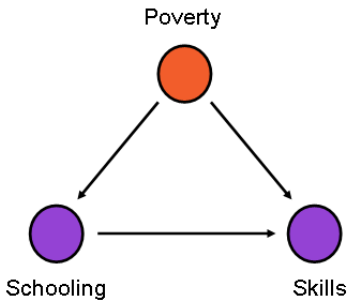
3.2 What explains a person's level of everyday literacy and numeracy?

To find out what factors explain an individual's everyday literacy and numeracy skills we analyse correlations between an individual's skill level and their background characteristics.

However, it is necessary to look beyond simple binary correlations as other confounding factors may drive an apparent relationships between skill level and a particular background characteristic. An example to illustrate the problem of confounding factors can be found in Box 1 below.

Box 1. The problem of confounding factors explained

For example, we may be interested in the relationship between **level of schooling** and young people's **levels of everyday literacy and numeracy skills**. However, we also know that there is another factor – **poverty** – that is likely to affect both the level of schooling achieved by the individual as well as their level of everyday literacy and numeracy skills.



Thus, failing to control for poverty could be problematic. We might conclude that level of skills is low because level of schooling is low, when in reality this is only the case because there is another factor – poverty – that is negatively affecting both level of schooling and level of skills. What this means is that we cannot be sure that any relationship we might observe between level of schooling and skills is really driven by lower levels of schooling, or whether in reality it is driven by poverty (i.e. poverty makes people have less schooling, which makes them have less skills).

In order to control for such confounding factors, we perform a multivariate regression analysis. This means that we try to understand how certain background characteristics are related to a variable of interest while holding a set of other background characteristics constant. Multivariate regression analysis typically looks at one specific outcome variable, sometimes called the dependent variable (in this case, the skill level), and tries to assess how well a set of other variables can explain changes in this dependent variable. These variables are sometimes referred to as explanatory variables.

By controlling for several explanatory variables at the same time we can see whether certain relevant relationships that we see in binary correlations hold, which would give an indication of a stronger underlying relationship.[8]

The explanatory variables (confounding factors) included in the model have been chosen based on their relevance and include:

- gender;
- level of schooling;
- poverty quintile of the respondent's household;
- city/municipal district;
- having a child or not;
- main language spoken at home; and
- having engaged in a remunerated economic activity in the last seven days or not.

In the following sections, we present the results with respect to each one of these variables separately. The results for each variable take into account all of the above confounding factors.[9]

[8] To model the effect of a number of explanatory variables on a set of binary variables (the probability of being at Level 1, 2, etc), we set up a logit regression that estimates the parameters of a logit model. We use marginal effects to estimate the discrete change.

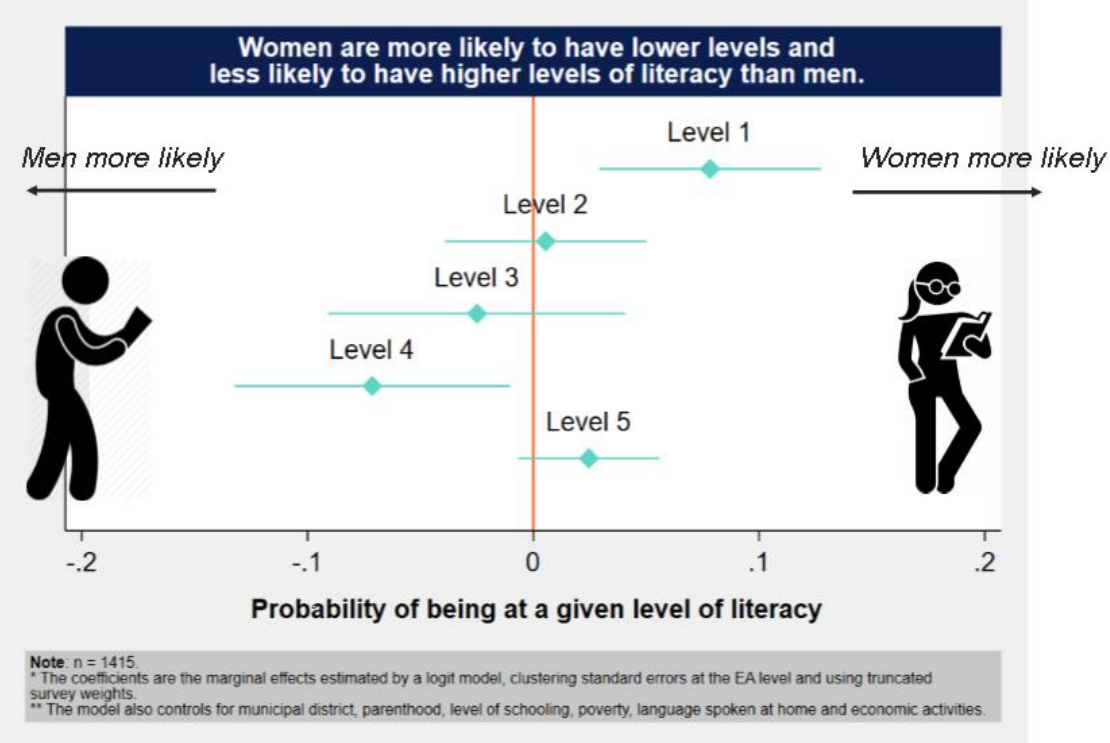
[9] The results displayed in this section have been estimated using 10 logit regressions (one with each level of literacy and numeracy as the dependent binary variable). All regressions have been estimated using normalised survey weights.

3.2.1 Gender

We find that, compared to young men (16–26 years), young women in Maputo and Beira are less likely to be found at higher levels of literacy and numeracy, and more likely to be found at lower levels of literacy and numeracy. This relationship holds even after controlling for other factors, such as, for example, levels of schooling and municipal district.[10] In other words, when comparing young people with similar levels of schooling from the same municipal districts, on average, young women will have lower levels of literacy and numeracy than young men.

In terms of everyday literacy, this finding mainly manifests itself when looking at Levels 1 and 4 (Figure 7). We find that young women are 8 percentage points more likely to be at Level 1 than men, holding everything else constant. On the other hand, they are 7 percentage points less likely to perform at Level 4 of literacy. We do not find a statistically significant relationship between Levels 2, 3, or 5 of literacy and gender.[11]

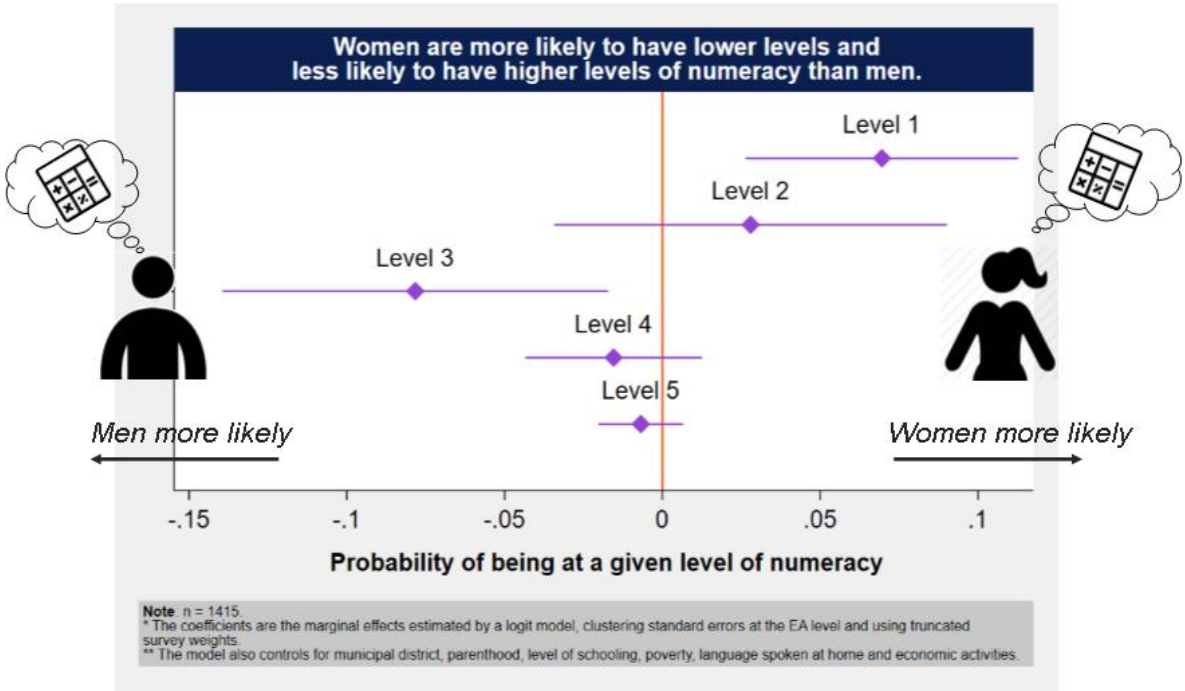
Figure 7. Relationship between levels of everyday literacy and gender



[10] As well as all other factors listed in the section above.

[11] This can be concluded because the confidence intervals for these levels overlap with the line at 0, which suggests that p-values > 0.1.

Figure 8. Relationship between levels of everyday numeracy and gender



In terms of everyday numeracy, we find significant differences for Levels 1 and 3 (Figure 8). Compared to young men, for young women in Maputo and Beira the probability of being at Level 1 for numeracy is 7 percentage points higher. On the other hand, the probability of being at Level 3 is 8 percentage points lower.

The relationships between numeracy Levels 2, 4, and 5 and gender are not statistically significant. In terms of Levels 4 and 5 there are only very few young people at these levels to begin with. The data do show that there are slightly more young men than women at those higher levels; however, due to the small numbers, the relationship is not a significant one.

Contextualization workshop

During the field work of this study, it emerged that the experience of the interviewers in the field provides in itself useful and rich information that would help to contextualise the quantitative findings coming from the assessment instrument. To capture this information, we conducted a contextualisation workshop with the field interviewers. This workshop took place in Maputo two weeks after the end of field work and before the start of the data analysis.

Methodology

The objective of the workshop was to answer the following research question:

How did the respondents (young people) behave during the interview process?

Were there any differences in terms of behaviour between young women and young men? If so, what were they and how did they affect the performance in the assessment?

The methodology employed was a number of participatory exercises and focus group discussions. Firstly, the interviewers were divided into smaller groups in order to build the expected distribution

of the levels with the help of 'sponges' (or building blocks). There were two different colours for each gender. Then each group of interviewers presented their results to the other group, followed by a focus group discussion that focused on asking interviewers about their experiences in the field that could help explain the differences in results between men and women. During the focus group decision the researchers used a range of probing techniques to extract more reflexive conclusions. At the same time researchers made sure to emphasise that the conclusions should be based on experiences the interviewers had in the field, rather than preconceived ideas of gender norms.

Results

The results that emerged from the contextualisation workshop can be structured around three main themes: (i) time use; (ii) social norms relating to women's abilities; and (iii) mobility and use of skills.

1. Time use

Interviewers reported that, in contrast to young men, young women rarely managed to complete the assessment undisturbed. In particular, they observed that young women were significantly more likely to be occupied with other tasks, such as taking care of children, preparing meals, or other household chores, during the visits of the interviewers. Many interviewers reported having to hold and take care of babies or young children in order to allow the young women to complete the tasks of the assessment. They also reported having to take significantly more breaks during the interview in order to allow the young women to carry out household-related duties that arose over the course of the assessment. Contrastingly, interviewers reported than young men were generally more 'free' and undisturbed, and 'less tired', when doing the assessment.

These observations are important because they have two implications:

- Distractions during the interview process mean that it may have been more difficult for young women to focus on the tasks of the assessment, which in turn may have negatively affected their performance.
- It also points to a wider problem of women having to shoulder a double work burden of household- and family-related tasks and tasks related to their education or economic activities. In the *MUVA* Urban Youth Survey (2017) we found that the same young women that participated in the Everyday Literacy and Numeracy survey spent on average two hours more per day on work (household + economic) than their male peers. This has consequences for the time women can devote to activities that build and stimulate their literacy and numeracy skills, such as doing homework, reading, or browsing the internet.

2. Social norms around women's abilities

Interviewers also reported a number of cases in which the families of female respondents openly demeaned their ability to complete the assessment. For example, several interviewers told us about cases in which family members would say 'this one doesn't know anything, you don't need to bother with her' in front of the young woman. Many interviewers said that in their experience in these sorts of situations the young women displayed much lower levels of confidence when completing the assessment. In general, interviewers also observed that they had to be more encouraging and supportive with young women, in order to try to counter-balance low levels of confidence and self-esteem.

While interviewers reported that extreme 'fear of failure' was a common problem for both young men and women, particularly for those at lower levels, and disproportionately so for the numeracy tasks, most of them agreed that it was a significantly more common problem for young women than men.

This problem was further exacerbated by the fact that for the majority of interviews with young women another family member was present. While interviewers were instructed to conduct the assessments in private, they reported that in reality this was significantly more difficult to do for female respondents than for male respondents. They felt that the presence of other family members may have increased the pressure and the fear of giving a wrong answer.

3. Mobility and use of skills

Interviewers also observed that it was mainly 'young married women with children and without jobs' who were found to be at the lower levels of literacy and numeracy. According to their interpretation, this is due to the fact that after they get married young women mainly stay at home. On the other hand, men 'go out and do things', during which they use and develop their everyday literacy and numeracy skills – they learn '*como fazer*' (how to do/apply their skills). Interviewers made a connection between the notices, signs, and price lists that are part of the assessment and people's mobility. They argued that men are exposed to these type of problems on a more regular basis as they leave the house more frequently.

Another indication of this is that young women more regularly said during the interviews: 'I knew how to do this once but I cannot remember'. According to the interviewers, young women said this much more frequently than young men, which suggests that young women struggle to retain knowledge as they have fewer opportunities to use it in their everyday life compared to men.

Box 2. How to interpret the findings from the contextualisation workshop

The data from the contextualisation workshop presented above are meant to suggest a range of possible explanations for the differences in levels of literacy and numeracy skills attained by young women versus men. The findings are based on the experiences and interpretations of the interviewers. Therefore, they are neither absolute in truth nor representative.

In addition, when interpreting the findings from the workshop one must take into account the following limitations:

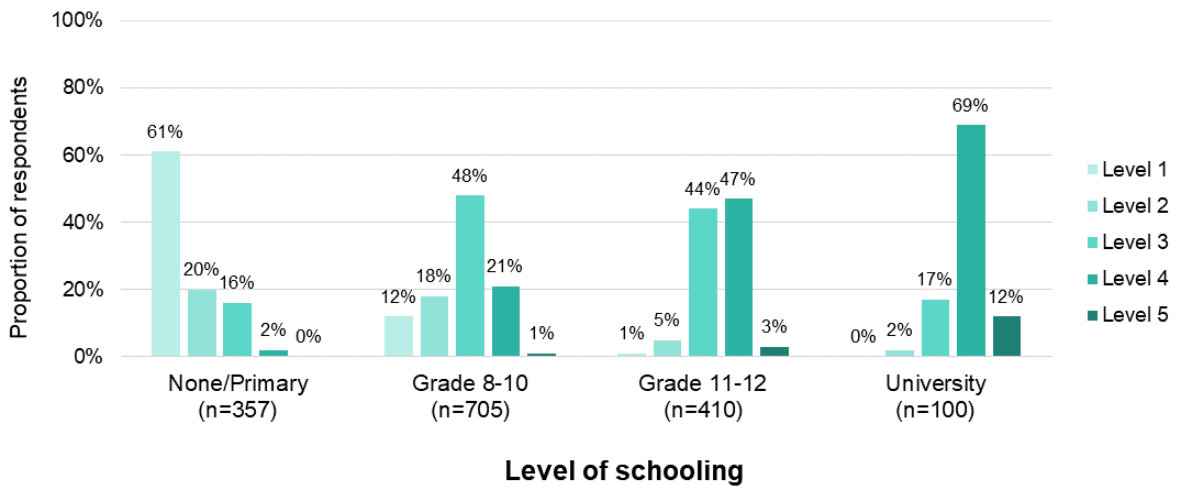
- Recall bias – interviewers will not systematically have remembered everything. The workshop was conducted two weeks after the end of field work and interviewers may have forgotten many experiences already, or only have remembered the experiences that were the most impressive to them.
- Personal bias – of course, interviewers themselves have certain preconceived biases that lead them to have certain opinions and ideas. Most of them have worked with *MUVA* on other assignments, which means that they have become more sensitised to gender issues.

3.2.2 Level of schooling and poverty

Next, we look at the distribution of everyday literacy levels across the different levels of schooling (Figure 9). The following points become clear:

- The majority of young people with no or only primary school education are at Level 1 for literacy.
- Among young people with lower secondary education (8th to 10th grade) the picture is very mixed – almost 30% are at lower levels (1 and 2), about half are at medium Level 3, and a bit less than a quarter are at higher levels.
- Among young people with upper secondary education (11th and 12th grade) the vast majority have Level 3 or 4 for everyday literacy. There are still a few at the lower levels but even less at the highest level.
- Even among university students not a lot of young people reach Level 5 for literacy. The majority are at Level 4 but there is still a significant proportion (almost 20%) who are at medium/medium lower levels of literacy.

Figure 9. Distribution of everyday literacy levels across levels of schooling

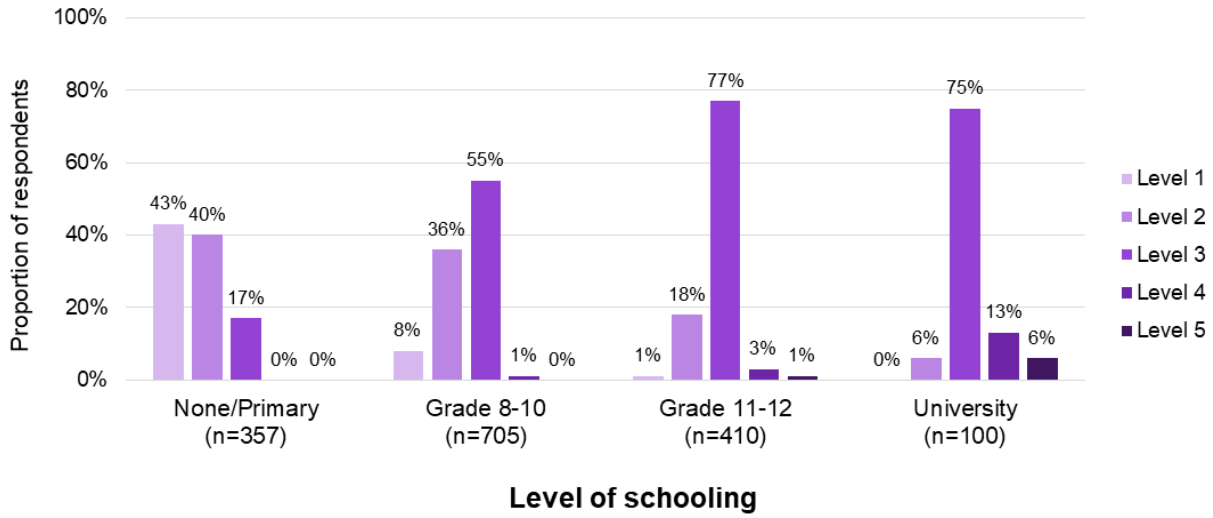


Note: These are binary correlations between level of schooling and literacy levels. We are not controlling for other background characteristics.

Turning to the distribution of everyday numeracy levels across the different levels of schooling we conclude the following (Figure 10):

- The majority of young people with no or only primary school education are at Level 1 or 2 for numeracy.
- Again, lower secondary (8th to 10th grade) has the most mixed outcomes: while over half are at the medium Level 3, there is still a very significant proportion of young people at the lower levels.
- Among young people with upper secondary education (11th and 12th grade) the vast majority are at Level 3 for everyday numeracy. There is still a significant proportion at Level 2 (18%) but close to no one at Levels 4 or 5 (total of 4% combined).
- Even among university students not a lot of young people reach Levels 4 or 5 for numeracy (total is around 20% combined). The vast majority are at Level 3 for numeracy.

Figure 10. Distribution of everyday numeracy levels across levels of schooling



Note: These are binary correlations between level of schooling and numeracy levels. We are not controlling for other background characteristics.

In the *MUVA* Urban Youth Survey (2017) we found a strong correlation between young people's level of schooling and the poverty levels of their households. Young people from households in the lower poverty quintiles are significantly less likely to complete 10th and 12th grade and they are significantly less likely to go to university.[12]

Controlling for both level of schooling and poverty, along with a range of other factors listed earlier, we find that higher levels of schooling translate into significantly higher levels of everyday literacy and numeracy. In fact, level of schooling appears to be one of the most important driving factors for literacy and numeracy levels. However, we find that household poverty also affects young people's everyday literacy and numeracy skills, even after accounting for factors such as level of schooling, geography, or language spoken at home.

In the paragraphs below we present detailed findings for the relationship between level of schooling, poverty, and literacy and numeracy Levels 1, 3, and 5. The results for Levels 2 and 4 can be found in Annex B.

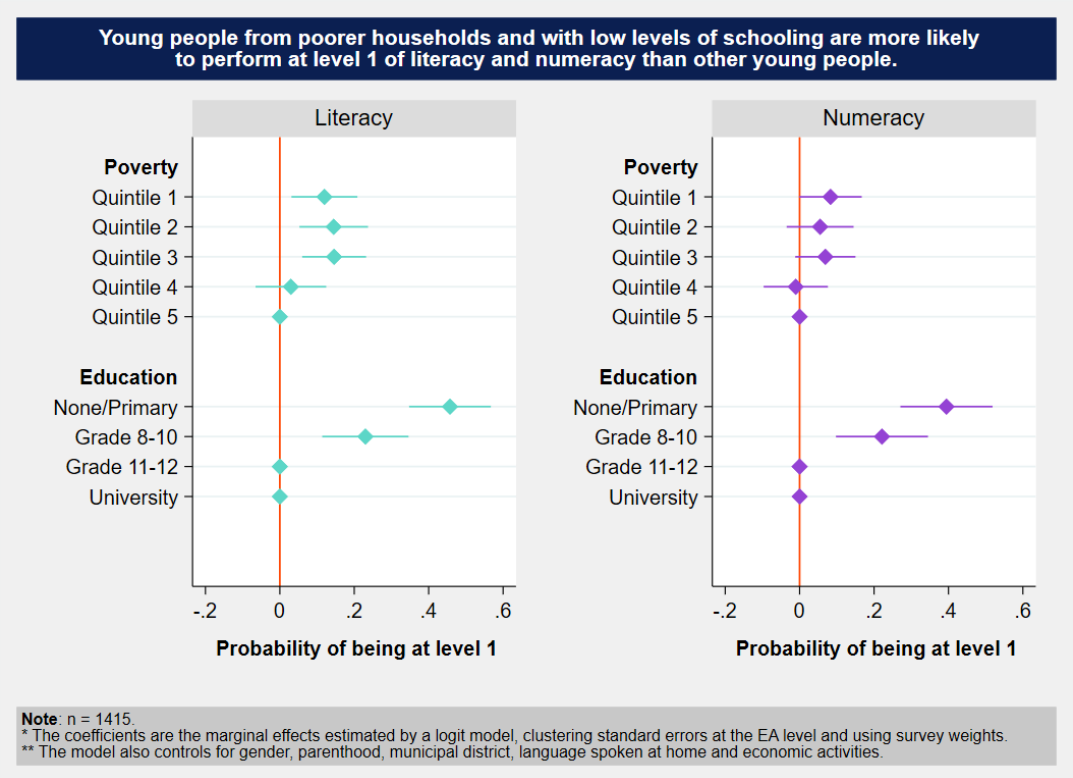
Figure 11 shows the relationship between level of schooling, poverty, and the probability of being at Level 1 for everyday literacy and numeracy. We can see the following:

- Compared to poverty quintile 5 (least poor), respondents from lower poverty quintiles are significantly more likely to be at literacy and numeracy Level 1.
- There are no young people who have reached university at literacy or numeracy Level 1.
- The likelihood of being at literacy Level 1 increases by over 45 percentage points for young people who have either never studied or only studied up until primary level (compared to those in grade 11 or 12). For young people between the 8th to 10th grade the likelihood increases by over 20 percentage points.

[12] In poverty quintile 1, 27% have completed 10th grade, compared to 75% in poverty quintile 5; in poverty quintile 1, 9% have completed 12th grade, compared to 40% in quintile 5; in poverty quintile 1, 2% have completed at least one year at university, compared to 20% in poverty quintile 5.

- The likelihood of being at numeracy Level 1 increases by over 40 percentage points for young people who have either never studied or only studied up until primary level (compared to those in grade 11 or 12). For young people between the 8th to 10th grade the likelihood increases by over 20 percentage points.

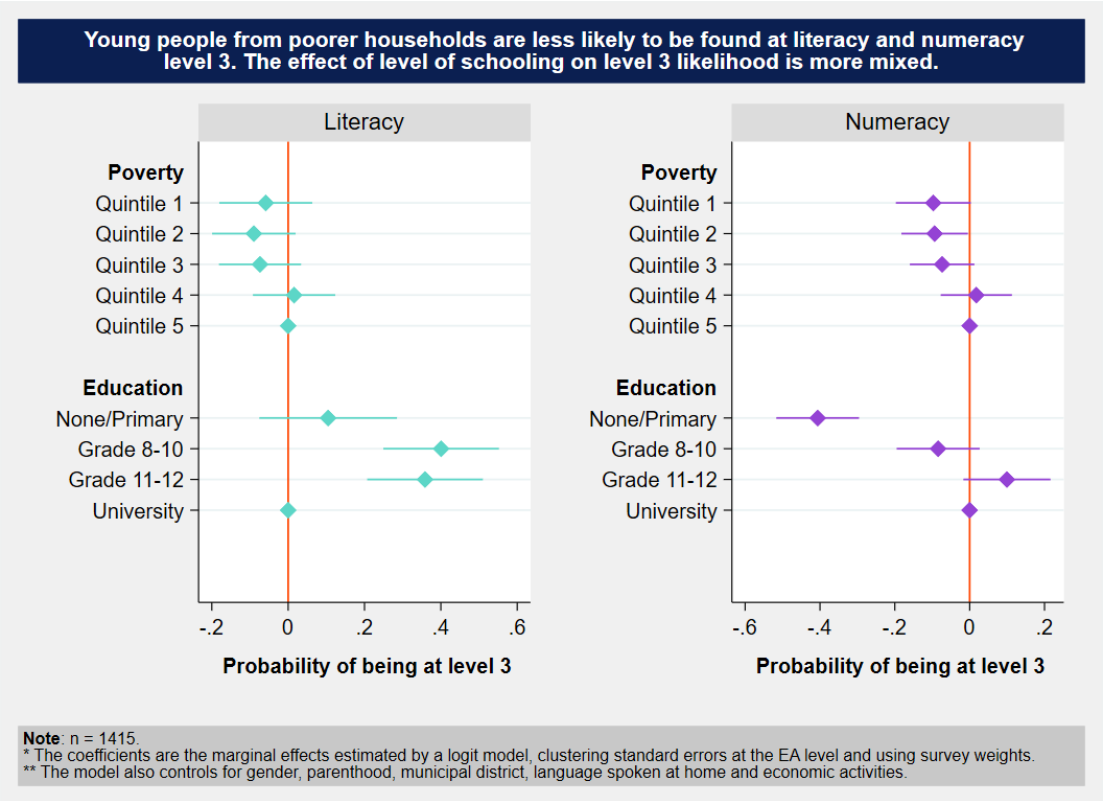
Figure 11. Relationship between Level 1 for everyday literacy and numeracy, level of schooling, and level of poverty



Looking at the relationship between level of schooling, poverty, and the probability of being at Level 3 for everyday literacy and numeracy Figure 12 reveals the following:

- Poverty does not affect the likelihood of being at literacy Level 3. However, it does negatively affect the likelihood of being at numeracy Level 3.
- Compared to those who have attended university, young people who have 'only' attended secondary education are more likely to be at Level 3. In other words, young people who have attended university are less likely to be at Level 3 and more likely to be at Level 4 or 5.
- However, compared to young people who have attended university, young people who have only attended primary or lower secondary level are significantly less likely to achieve numeracy Level 3. Young people with upper secondary (11th/12th) seem to have a similar likelihood of achieving Level 3 as people at university.

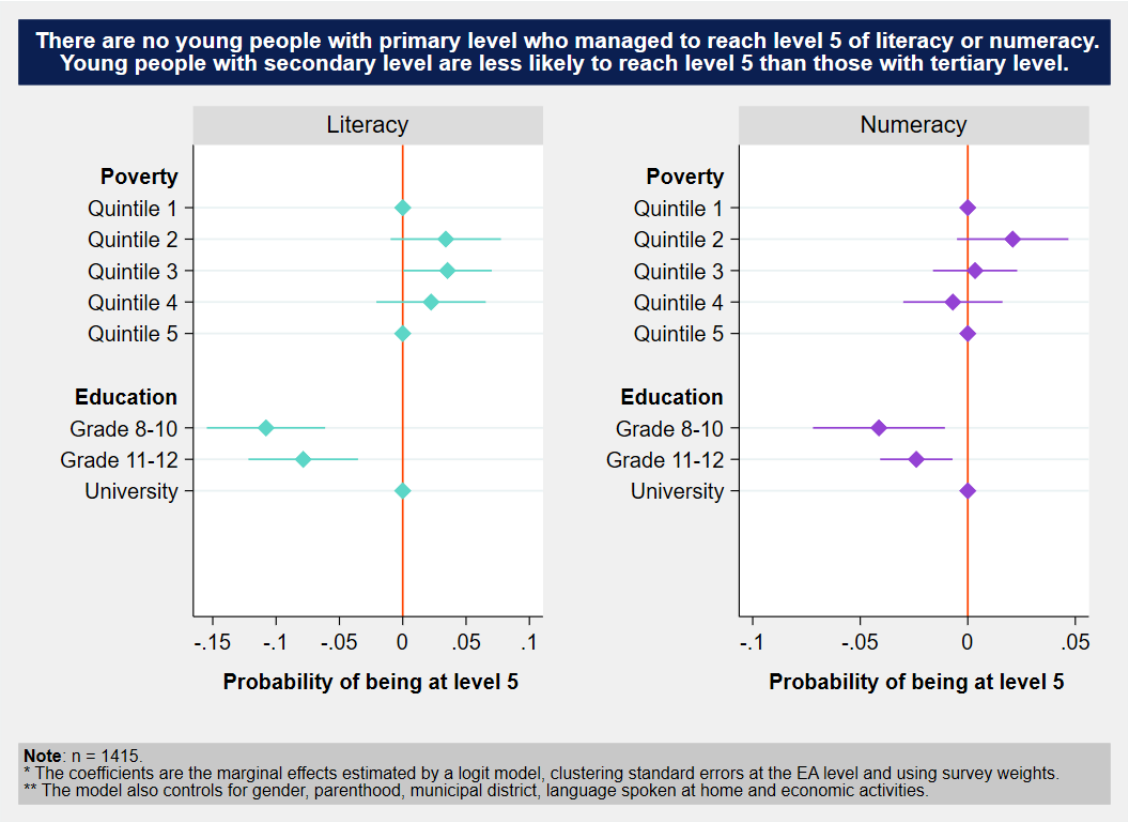
Figure 12. Relationship between Level 3 for everyday literacy and numeracy, level of schooling, and level of poverty



Finally, looking at the relationship between level of schooling, poverty, and the probability of being at Level 5 for everyday literacy and numeracy Figure 13 reveals the following:

- There is no young person from the lowest poverty quintile who reached the highest level for literacy and numeracy (Level 5).
- There is also no young person with no or primary-level schooling who reached the highest level for literacy and numeracy (Level 5).
- Compared to having attended university, the probability of being at Level 5 for literacy and numeracy is significantly lower for young people with lower (8^{th} – 10^{th} grade) or upper secondary (11^{th}/12^{th}) level of schooling. Conversely, this means that young people who have attended university are more likely to achieve Level 5 for literacy and numeracy.

Figure 13. Relationship between Level 5 for everyday literacy and numeracy, level of schooling, and level of poverty



3.2.3 Geography[13]

As shown in the previous section, there is a clear relationship between level of schooling and everyday literacy and numeracy skills. There is also some indication that young people from poorer households are more likely to be found at the lower levels, independent of schooling levels.

From the *MUVA* Urban Youth Survey (2017) we know that households in Beira are on average poorer than households in Maputo.[14] However, we also know that young people in Beira have similar levels of schooling as young people in Maputo in terms of years completed.[15]

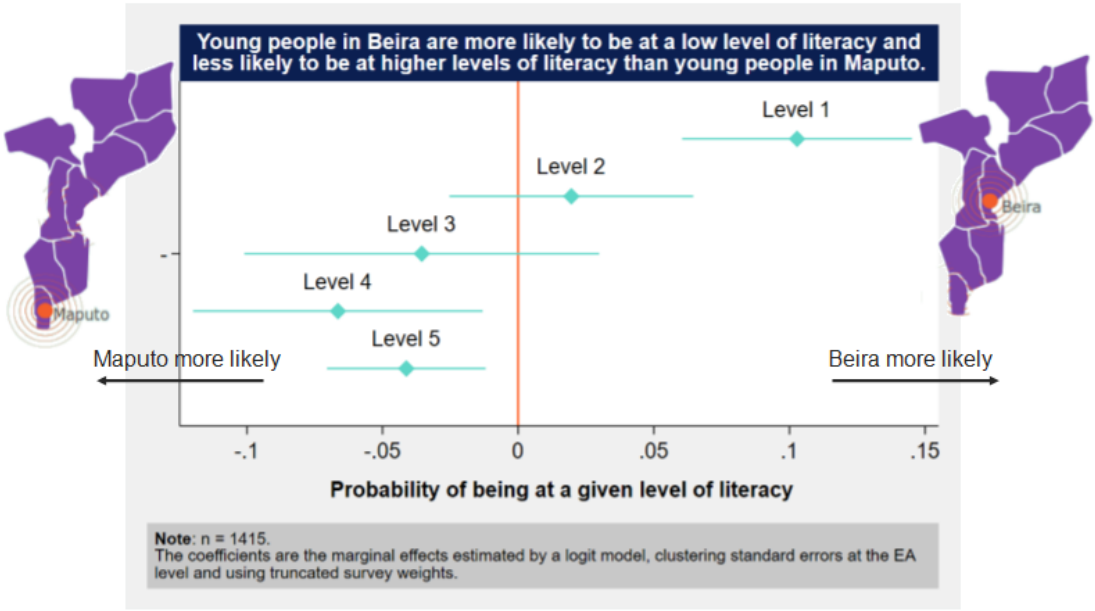
We find that even when controlling for levels of schooling and household poverty (and a host of other background characteristics), young people in Beira have significantly lower levels of everyday literacy and numeracy skills compared to young people in Maputo.

Compared to young people in Maputo, the probability of being at Level 1 for literacy increases by 10 percentage points for young people in Beira (Figure 14). The probability of being at Levels 4

[13] This study was conducted before cyclone Idai in Beira, and therefore represents the situation before the effects of the cyclone and the humanitarian disaster that followed.
[14] In Beira, 58% of young people live in households that live on less than $2.50/day compared to 43% in Maputo.
[15] There are no statistically significant differences in terms of percentage of young people who completed 10th and 12th grade in Beira and Maputo. However, there are slightly more young people who have completed at least one year of university in Beira than in Maputo (10% versus 5%).

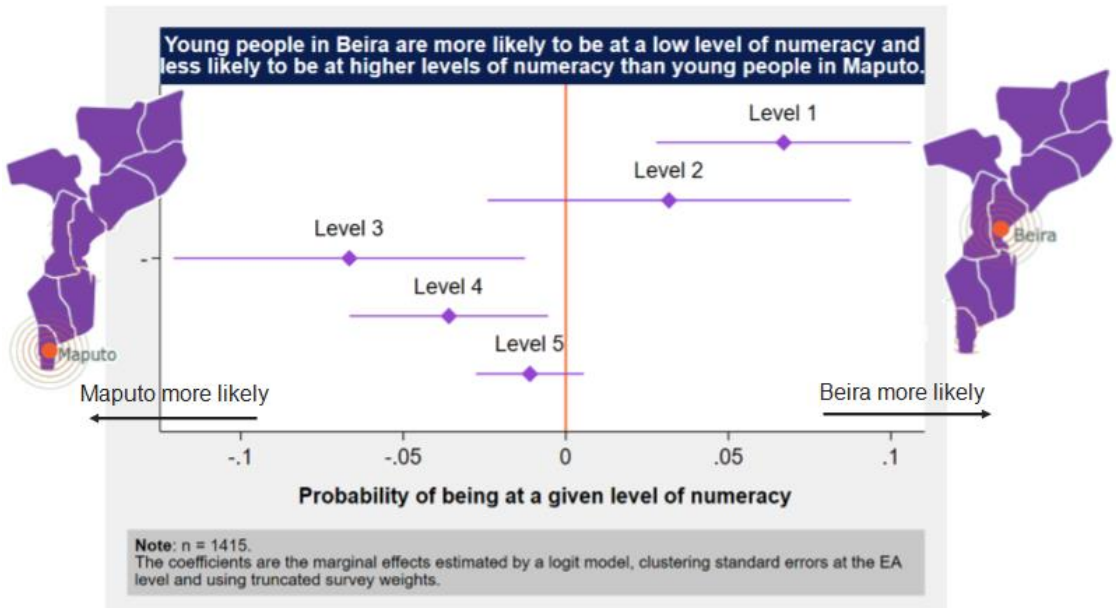
and 5 for literacy decreases by 6 and 4 percentage points, respectively, for young people in Beira. There is no statistically significant relationship between being at Levels 2 and 3 for literacy and city.

Figure 14. Relationship between levels of everyday literacy and city



In terms of numeracy, the probability of being at Level 1 increases by 7 percentage points for young people in Beira relative to Maputo (Figure 15). The probability of being at Levels 3 and 4 for numeracy decreases by 6 and 4 percentage points, respectively, for young people in Beira. There is no statistically significant relationship between being at Levels 2 and 5 of numeracy and city.

Figure 15. Relationship between levels of everyday numeracy and city

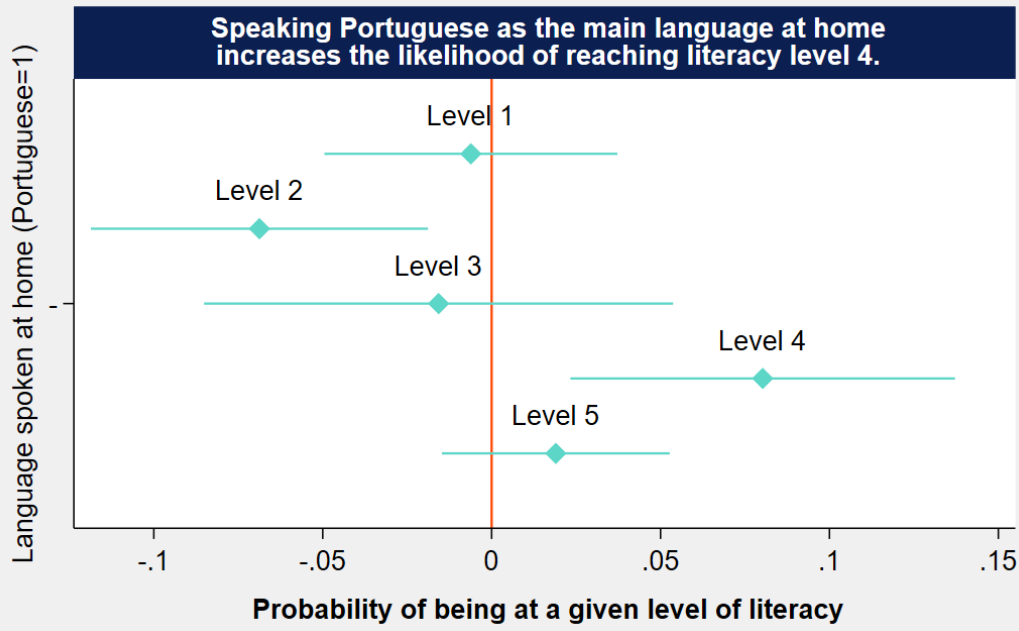


3.2.4 Language

As explained in Section 2.2, both the literacy and the numeracy assessment instruments were administered in Portuguese, the main language of the urban (formal) labour market, the education system, and the administration. However, most young Mozambicans speak other languages besides Portuguese and Portuguese is not always the main language spoken at home.

We find that young people who speak Portuguese at home are more likely to reach Level 4 of and less likely to reach Level 2 of literacy (Figure 16). In other words, young people who do not speak Portuguese as the main language at home are less likely to reach a higher level of everyday literacy (by 8 percentage points). However, it should be noted that after controlling for level of schooling the language spoken at home does not significantly affect the probability of being at the lowest level, Level 1. This means that holding the level of schooling constant, young people who speak Portuguese at home are just as likely to be at Level 1 for literacy as young people who do not speak Portuguese at home. This suggests that other factors, such as schooling or poverty, may be a lot more relevant than language in explaining why a young person would perform at Level 1 for literacy.

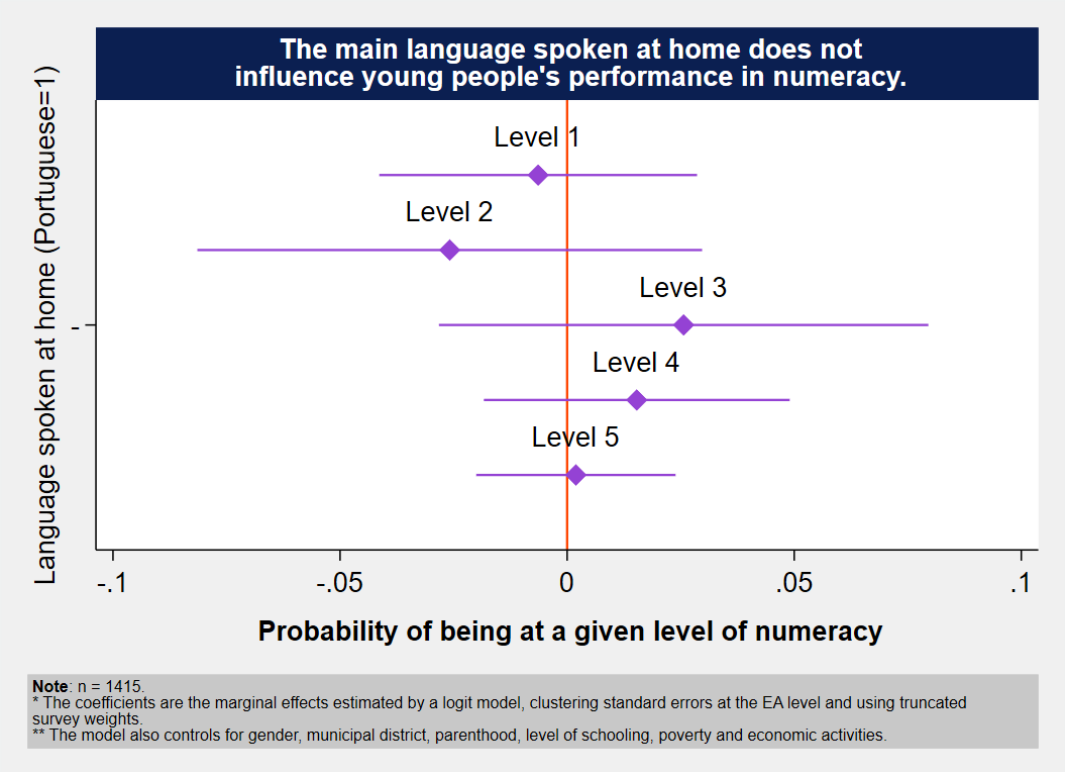
Figure 16. Relationship between levels of literacy and main language spoken at home



Note: n = 1415.
* The coefficients are the marginal effects estimated by a logit model, clustering standard errors at the EA level and using truncated survey weights.
** The model also controls for gender, municipal district, parenthood, level of schooling, poverty and economic activities.

The main language spoken at home does not make a difference with respect to the level of everyday numeracy that young people have (Figure 17). This means that young people who do not speak Portuguese at home are just as likely to reach the lower or the higher levels of numeracy as young people who do not speak Portuguese at home.

Figure 17. Relationship between levels of numeracy and main language spoken at home



3.3 Does everyday literacy and numeracy matter for labour market outcomes?

In a next step, we analyse whether there is a correlation between young people's everyday literacy and numeracy skills and their labour market outcomes.

We employ a logit model again, but this time with labour market outcomes as the dependent variables and the literacy and numeracy levels as the explanatory variables (along with a range of other factors, such as gender, poverty, parenthood, and city of residence). In other words, we test whether a young person's everyday literacy and numeracy skill level has an effect on their labour market outcomes.[16]

The three labour market outcome variables that we explore are as follows:

- Whether the young person performed any remunerated economic activity in the last seven days (prior to the day of their interview for the survey in 2018). This includes any kind of activity a young person does to earn money, no matter whether it is formal or informal, regular or irregular, full-time, part-time, or just for a few hours a week.

[16] Note that we do not include the level of schooling as an explanatory variable. We know that level of schooling and literacy and numeracy levels are very tightly connected. This relationship might introduce collinearity and mask any relationship between literacy/numeracy levels and labour market outcomes.

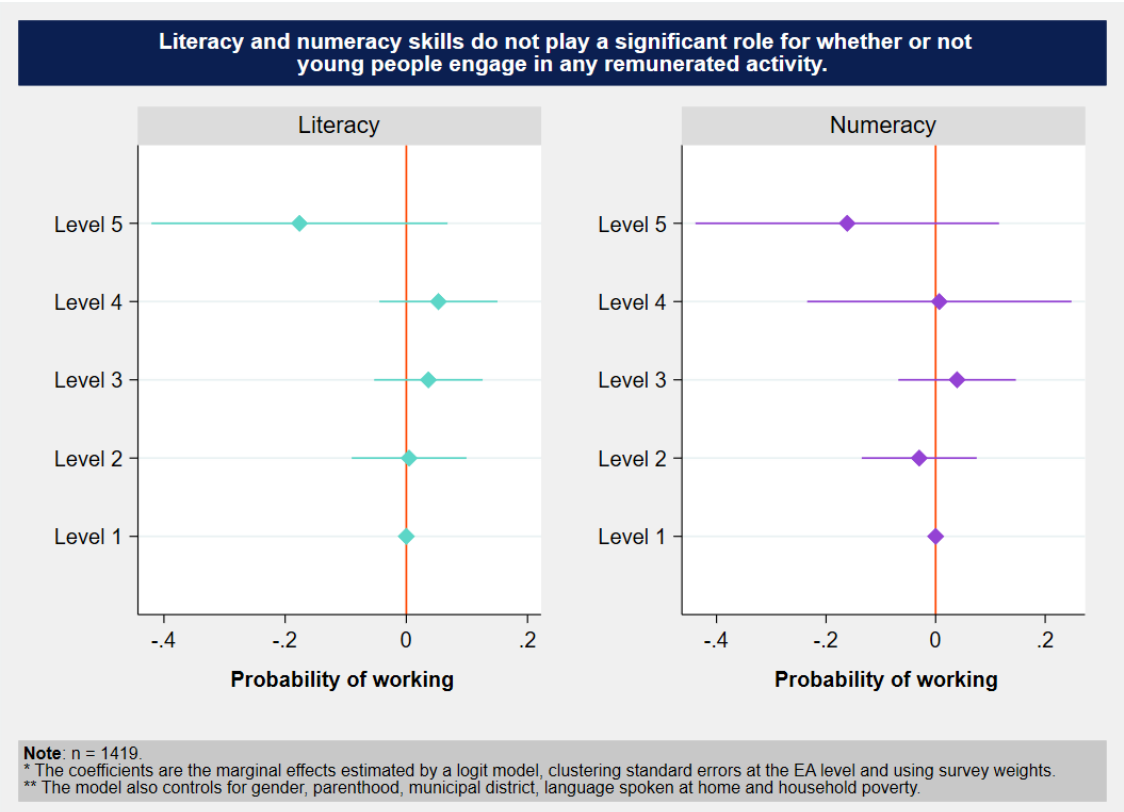
- Whether the economic activity of the young person is a formal job (wage employment with formal contract).
- Whether the economic activity of the young person is classified as a semi-skilled or skilled occupation (not elementary).

3.3.1 Everyday literacy and numeracy skills and having any remunerated economic activity

We do not find any significant relationship between a young person's everyday literacy and numeracy skills and their likelihood of engaging in any type of remunerated economic activity. Compared to young people with Level 1 for literacy and numeracy, young people with higher levels are not more likely to have engaged in a remunerated economic activity (Figure 18).

This is not surprising given the fact that most young people in the survey sample are from households in poor neighbourhoods. As such, they have no choice but to work in order to support their families, even if they still go to school. This reality applies to those with high and with low levels of literacy and numeracy.

Figure 18. Effect of everyday literacy and numeracy levels on the probability of engaging in any remunerated economic activity



Young people with lower levels of literacy and numeracy are just as likely to engage in *any* economic activity as young people with higher levels. However, the next question is whether there is a difference with regards to the type of economic activity that young people with lower levels of literacy and numeracy engage in compared to those with higher levels.

3.3.2 Everyday literacy and numeracy skills and having formal employment

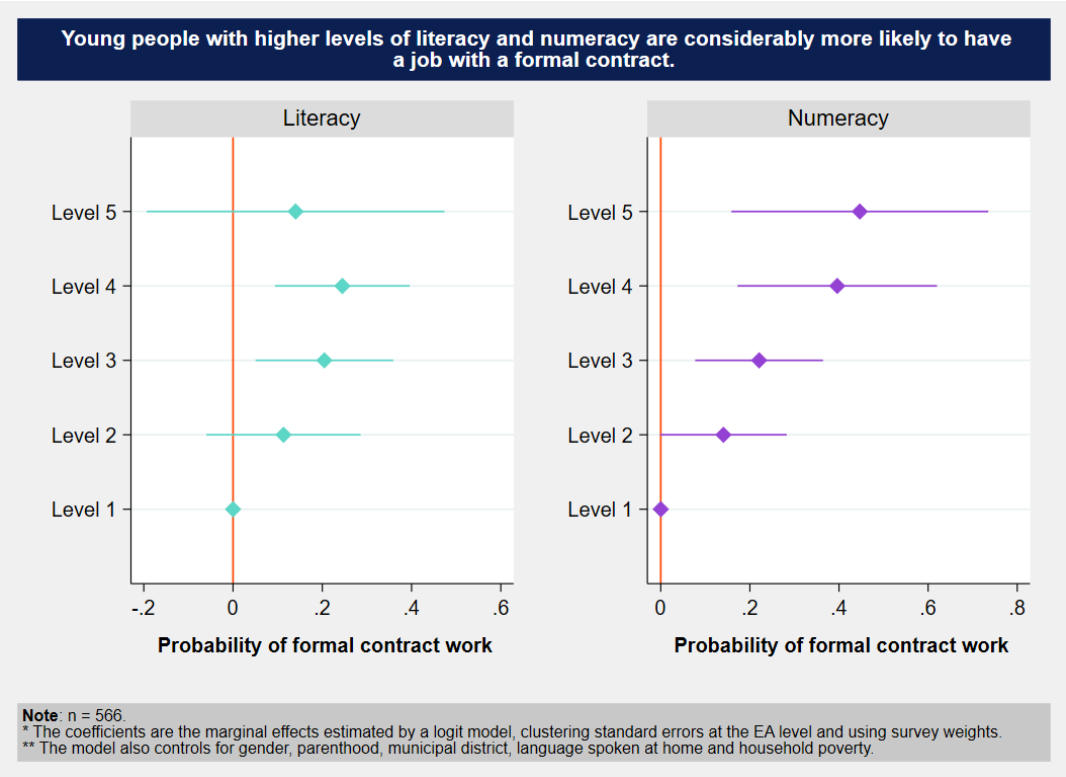
A person's contract status is often used as a proxy for informal employment (Henley *et al*. 2006). A formal written contract signals employment in the formal sector, while having only a verbal or no contract/agreement at all may suggest informal employment. Formal employment is often associated with fewer hours worked, higher income, and better conditions of employment (for example, paid leave and sick leave). In contrast, informal employment is associated with increased vulnerability in the form of excessive hours worked, low wages, and limited or no benefits.

We find that young people with higher everyday literacy and numeracy skills are significantly more likely to have a job with a formal contract. This relationship is particularly strong and remarkably linear for everyday numeracy skills.

Compared to a young person at literacy Level 1, the likelihood of having a formal contract increases by 20 percentage points for young people at literacy Level 3 and by 24 percentage points for those at literacy Level 4 (Figure 19).

The effect sizes for everyday numeracy levels are even greater. Compared to young people at numeracy Level 1, the likelihood of having a formal contract increases by 14 percentage points for young people at numeracy Level 2, by 22 percentage points for those at numeracy Level 3, by 40 percentage points for those at Level 4, and by 47 percentage points for those at Level 5. (Figure 19). This suggests that the higher the numeracy level, the greater the likelihood of having a formal contract, or the lower the likelihood of working in the informal sector. It also suggests that the pay-off of investing in young people's everyday numeracy skills may potentially be very large.

Figure 19. Effect of everyday literacy and numeracy levels on the probability of having a job with a formal contract



3.3.3 Everyday literacy and numeracy skills and having a semi-skilled or skilled occupation

The skill level of the young persons' occupations was classified based on the categories of the International Standard Classification of Occupations (ISCO), as determined by the International Labour Organization (2007). The ISCO distinguishes 10 major occupation groups. Each group has several subgroups, as well as associated skill levels. The ISCO distinguishes four skill levels that are linked to the major occupation groups. The skill levels are linked to the educational level that is needed to perform the tasks and duties related to the occupational group.[17]

According to our definition, an occupation is semi-skilled or skilled if it falls into any of the ISCO categories 1–8 or 10.[18] Occupations in category 9 (elementary occupations) are defined as neither semi-skilled nor skilled, as they have very low skill requirements. Examples for such occupations include petty traders, day labourers, and cleaners. The majority of young people in Maputo and Beira have occupations that fall into this category (63%).

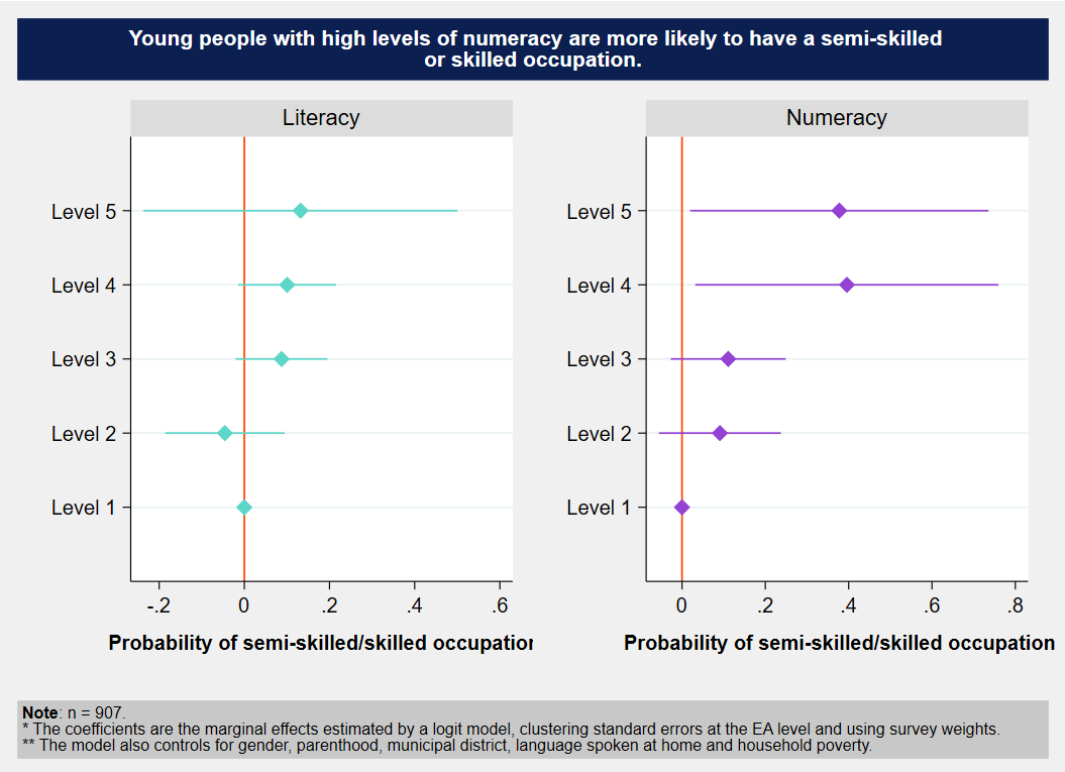
We find that young people with high everyday numeracy skills have a greater likelihood of working in a semi-skilled or skilled occupation. We do not find a significant relationship between everyday literacy skills and working in a semi-skilled or skilled occupation, although there

[17] See Section 6.2 of the *MUVA* Urban Youth Survey report (2017) for a detailed explanation of how we categorised people's occupations, including examples for each category.
[18] These categories include managers (1), professionals (2), technicians and associated professionals (3), clerical support workers (4), service and sales workers (5), skilled agricultural workers (6), craft and related trades workers (7), plant and machine operators and assemblers (8), and armed forces (10).

is some indication that there may be a positive relationship between Levels 3 and 4 for everyday literacy skills and having a semi-skilled or skilled occupation (Figure 20).[19]

Compared to young people at numeracy Level 1, the likelihood of having a semi-skilled or skilled occupation increases by 39 percentage points and 38 percentage points for young people at Levels 4 and 5 for numeracy, respectively.

Figure 20. Effect of everyday literacy and numeracy levels on the probability of working in a semi-skilled or skilled occupation



[19] The relationship is strictly not statistically significant, using a cut-off of a p-value of 0.05. However, relaxing the p-value to 0.1 would make it statistically significant.

4 Conclusion

In 2018, we surveyed 1,600 young people between the ages of 16 and 26 living in densely populated, low-income neighbourhoods in Maputo and Beira, to assess their everyday literacy and numeracy levels.

We designed an assessment instrument that is based on tasks and exercises young people come across in their daily lives at work and their communities. In terms of the assessment instrument, our analysis shows that the results are highly reliable. We aimed for a reliability of 70% at the individual level – meaning that for someone judged to be at Level 2, there is at least a 70% chance that they are actually at Level 2. Comparing our results to IRT scores, we conclude that on average the assessment yielded a reliability of 88%.

To summarise, we draw the following conclusions from the findings:

- The majority of young people are at Levels 3 or 4 for literacy (64%). A very small proportion only are at Level 5 – the highest level (2%). A considerable proportion can be found at the lower levels (34%).

- Overall, numeracy levels are lower than literacy levels. About half of all young people are at Level 3 for numeracy (53%). Very few are at Levels 4 or 5 (3%). The remainder of the young people are at lower Levels 1 or 2 (44%).

- Despite similar levels of schooling, young women performed significantly worse on the assessment than men. Potential reasons for this are low levels of self-confidence, adverse social norms that discourage women from building and using their skills, and limited time and mobility.

- There is a clear positive relationship between level of schooling and literacy and numeracy skills. However, we find that even in the higher levels of schooling (upper secondary and university), there are only few young people at the higher levels of literacy and numeracy. The most mixed picture in terms of levels can be observed for young people between the 8th and 10th grade. This may explain why many private sector employers and training programmes struggle to use level of schooling as an adequate selection criterion.

- Young people from Beira have lower levels of literacy and numeracy, even after controlling for level of schooling and poverty. This means that other factors that mark differences between the two cities, such as, for example, differences in infrastructure, school quality, or opportunities, negatively affect young people's ability to build and apply literacy and numeracy skills in Beira, relative to Maputo.

- Everyday literacy and numeracy skills seem to be relevant for formal employment but not for informal employment. Young people with higher skills are not any more or less likely to engage in any sort of income-generating activity. However, young people with higher literacy and numeracy levels are considerably more likely to have a job with a formal contract than young people at lower levels. This effect is especially pronounced for numeracy skills.

- High everyday numeracy skills seem to have a great relevance for the quality of the type of jobs young people do. Young people at the higher levels of numeracy are far less likely

to engage in elementary occupations (e.g. petty trading, day labourers, cleaners etc), and far more likely to have a semi-skilled or skilled occupation. This suggests that there may be high returns to high numeracy skills in the urban Mozambican labour market, which may be linked to their overall scarcity.

Furthermore, we conclude that the instrument has strong potential to be used as an assessment instrument for selection and training purposes by the private sector or training institutions. It has revealed a clear relationship between young people's everyday skills and their performance in the labour market. This gives us an indication that it is indeed measuring the 'right' skills required by the labour market.

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Annex A Example questions from the assessment

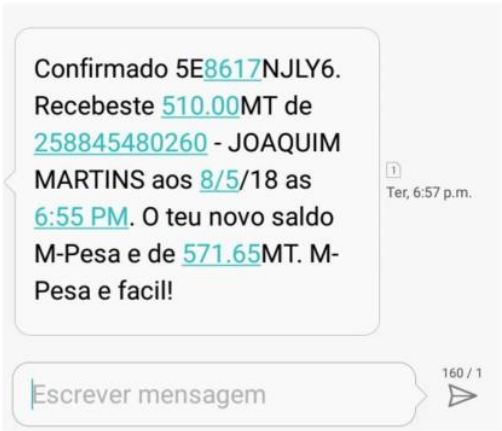
A.1 Literacy questions

Figure 21. Example question at literacy Level 1

1. Please read the word on this sign and tell me what it means.

Figure 22. Example question at literacy Level 2

6. **Please read this MPESA message out loud and answer the following questions:**



What happened on the 8th of May 2018? [Who? How much?] How much money does the person have now?

Figure 23. Example question at literacy Level 3

1. Please explain the purpose of this notice.

Figure 24. Example question at literacy Level 4

Choose one of the reasons below and write an official letter explaining why you cannot take part in the military service, requesting adjournment of military service.

ADIAMENTO DE PROVAS DE CLASSIFICAÇÃO E SELECÇÃO

POR MOTIVOS DE ESTUDOS

Estudos no Pais ou no estrangeiro em estabelecimento de ensino superior ou equiparado sendo o limite máximo do adiamento até 31 de Dezembro do ano em que completar 28 anos de idade.

O requerimento a solicitar o adiamento deve ser dirigido ao MDN e entregue no CPRM recenseador instruíc com os necessários elementos probatórios.

POR RESIDÊNCIA NO ESTRANGEIRO

A residência no estrangeiro com carácter permanente e contínuo iniciada anteriormente ao ano em que completarem 18 anos de idade.

O requerimento acompanhado do atestado de residência, deve ser ao MDN, através do posto consultar ond o cidadão esta registado durante os meses de Janeiro e Fevereiro, devendo o primeiro pedido ser formulad no ano em que o cidadão completarb18 anos de idade.

POR MOTIVO DE DOENÇA

Doença prolongada comprovada pela autoridade pública competente.

O requerimento deve ser acompanhado de atestado medico ou por documento passado pelo competente serviço de saúde da área de resistência do requerente que comprove o caracter prolongado da doença.

POR MOTIVO DE DISPOSIÇÕES ESTATUARIAS

Os cidadãos cujo estatuto legal lhes confira adiamento devem requerer ao MDN através do CPRM recenseados até 30 dias antes das PCS instruído com os necessários elementos probatórios.

Figure 25. Example question for literacy Level 5

Read the two texts below and write a comparative summary of the main similarities and differences between the two texts.[20]

Extrato Um

A questão de fundo: Os alunos não dominam a língua portuguesa, que é oficial e de unidade nacional. Eles não conseguem interpretar alguma ideia expressa num extracto ou texto, ou numa frase, não conseguem ler e nem escrever. Como consequência dessa realidade, os alunos não conseguem entender as ideias expressas noutras disciplinas curriculares. Esta situação parte do ensino primário, passa pelo ensino secundário e estende-se até ao ensino superior.

Quais são as causas então? Estas são várias, e posso avançar algumas:

- As políticas educacionais desenhadas para o processo e aprendizagem não são adequadas;
- O fenómeno "refresco" já atingiu a educação, em que muitos alunos já mentalizaram que para ter boa nota precisa aproximar ao professor para ser padrinho ou "caso" do professor. A maior parte dos professores é promotora do fenómeno de apadrinhamento de alunos fracos, que

Extrato Dois

O Sector da Educação possui uma nova Estratégia de Género (2016-2020) que visa promover a transversalização do género no Sector.
Apesar destas iniciativas, persistem desigualdades de género no sistema educacional como um todo.

Em relação à retenção, a variação entre a taxa de desistência de rapazes e raparigas é em função do nível de ensino e variam em função da zona de residência, onde nas zonas rurais observa-se que aretenção das raparigas começa a diminuir a partir do EP2, e nas zonas urbanas inicia no ESG2.

No geral, os níveis altos de pobreza levam as famílias a ter expectativas de que os filhos e filhas cedo passem a contribuir para a renda da família ou de que a filha deixe de ser um peso económico casando-se. Existe a crença de que é melhor investir no rapaz do que na rapariga, porque ao casar esta passará a contribuir para a outra família.

A.2 Numeracy questions

Figure 26. Example question at numeracy Level 1

3. Please put these cards into order, starting with the smallest.

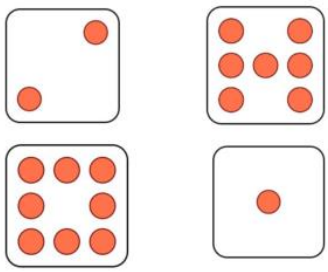


Figure 27. Example question at numeracy Level 2

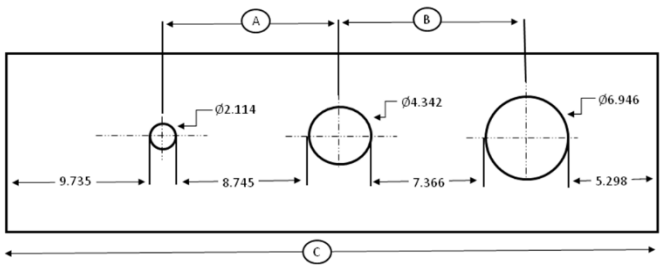
Please tell me what the total sum of money displayed is here.

[20] Please note that the texts displayed below are extracts. The texts that were part of the assessment are considerably longer.

Figure 28. Example question at numeracy Level 3

If you buy five Chocolaites and pay with 1,000 meticais, how much change do you expect to get?

Figure 29. Example question at numeracy Level 4



1. Calculate the length of A.
2. Calculate the length of B.
3. Calculate the length of C.

Figure 30. Example question at numeracy Level 5

An employees job is to supervise workers who use a machine to produce building blocks (blocos) used to build houses. With the machine, the workers can produce 1 block every 90 seconds.

1. What's the ratio of blocks produced per hour?
2. How many seconds does it take to produce 100 blocks?
3. The records show that they started using the machine at 08:13 and finished at 14:43. The machine stopped between 12:17 and 12:32 for repairs. How many blocks have been produced?

Annex B Additional graphs

B.1 What determines everyday literacy and numeracy levels?

Figure 31. Relationship between Level 2 for everyday literacy and numeracy, level of schooling, and level of poverty

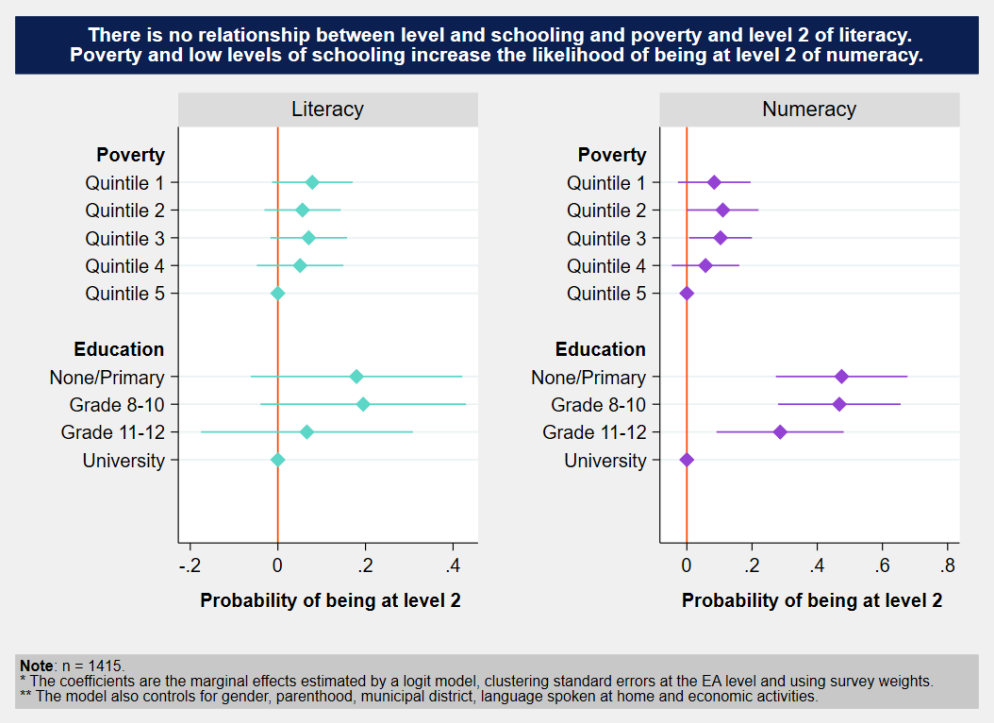
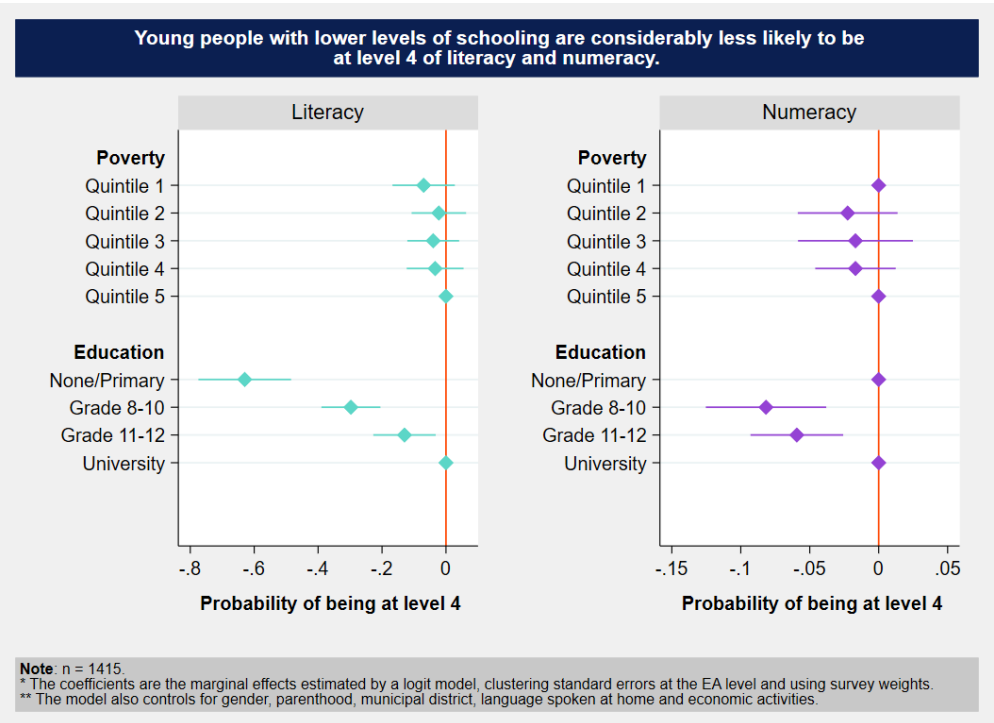


Figure 32. Relationship between Level 4 for everyday literacy and numeracy, level of schooling, and poverty



Annex C Fitting an IRT model to test reliability

Basic IRT models[21] are based on an assumption that a single latent trait (or ability) is measured by a test. The probability that a person will get an item right, says the model, is a function of a person's ability and the characteristics of an item. Some items, the model says, are 'harder', and so a person must have a 'higher' ability to do well at this item. And some items, the model says, are 'easier', and so a person needs only a 'lower' ability to do well at this item.

This relationship can be described using a probability curve, relating the probability that a person will get a particular result on an item ('gets it correct') to the person's ability.

Such a curve is specified by its mathematical form and two parameters: a location (interpretable for dichotomous items as a difficulty) and a slope (interpretable as discrimination – steep curves mean that the probability of getting the item right changes rapidly with ability).[22]

IRT fits a mathematical model to test data. The model assumes that people have a level of ability, that items have characteristics (e.g. difficulty and discrimination), and that the probability of an individual person getting an item 'correct' is a function of their 'ability' and the characteristics of the item. Modern IRT methods can deal with multidimensional abilities, with items that have multiple categories and with latent traits (abilities) that are not symmetric.

In this case, it was sufficient to use two-parameter IRT to model literacy estimates and numeracy estimates. Two-parameter IRT – as used in this analysis – assumes that items can discriminate differently and therefore have different slope parameters.

IRT requires that items are locally independent – the chance of getting any item correct is dependent on ability, not on getting another item correct. The structure of the data (a lot of data missing by design) means that we were not able to assess item covariances, and therefore test for local independence. However, we were able to convert each data set into observed pair-wise preferences ('this person did better than that person on this task') and then to derive an estimate of overall standing. Andrich (1978) shows the equivalence that should be expected, assuming that there is a single underlying trait, between this scale and a one-parameter IRT. **In this study we found an acceptable relationship between the IRT estimates and the estimates derived from the pair-wise comparisons.**

In effect, IRT produces estimates as if the missing data were not missing. The strength of the relationship between the IRT estimates and the levels derived by the application of rules tells us about the extent to which the literacy and numeracy levels are well-defined by a single construct.

The IRT model was applied to two data sets: literacy (all the evidently literacy items and the initial screening item) and numeracy (all the evidently numeracy items and the initial screening item). The summary intermediate scores used to determine the sequence of tasks were not included.

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[21] Here and below the term 'model' is used in the sense of fitting (by some process) a model specified mathematically to some set of data, reducing its variability to the set of parameters that specify the model together with estimates of the fit and misfit.

[22] A dynamic illustration of an item characteristic curve can be found at http://demonstrations.wolfram.com/ItemCharacteristicCurves/

The IRT estimates have reasonable reliabilities: EAP (expected *a posteriori*) reliabilities of 0.95 (numeracy) and 0.946 (literacy). EAP reliabilities give a sense of the estimated precision (reliability) of the person estimates that the model has derived. These are stated as numbers between 0 to 1.0, with higher reliabilities indicating higher precision.