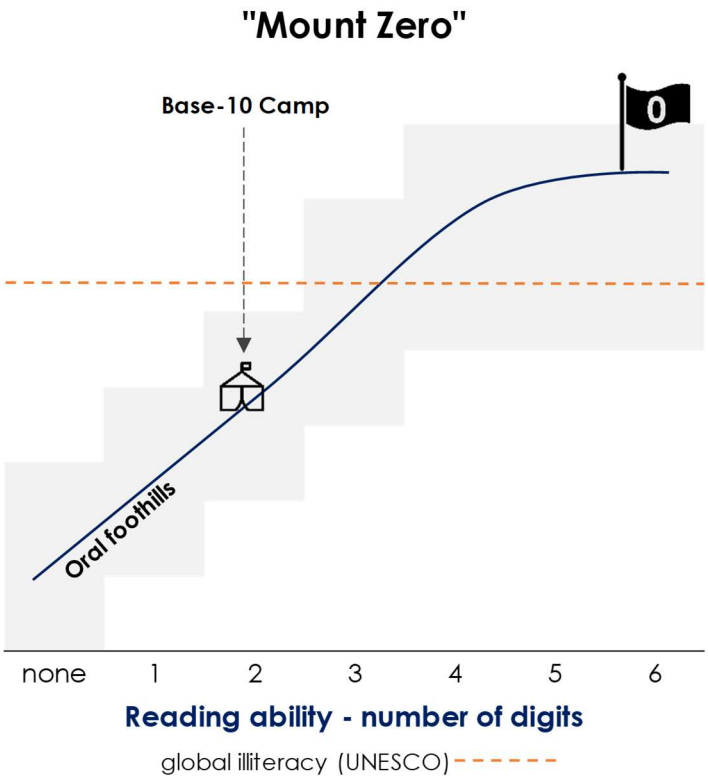
My Oral Village

Measuring Numeracy for Financial Inclusion

Results of a Pilot Test



Working Paper #4

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My Oral Village is a social enterprise working at the oral-digital frontier to build safe and usable financial solutions for the unbanked, in both the digital and pre-digital domains. To do this, MOVE is catalyzing a science and design/assistive technology practice of 'oral information management' (OIM). OIM refers to the ways in which people store, retrieve and share vital information without alpha-numeric text.

Catalyzing the Science and Practice of Oral Information Management for Digital Financial Inclusion

Resource List

Publications, My Oral Village
Papers posted on the FinDev Gateway
Blog posts, LinkedIn
Blog posts, CGAP

My Oral Village

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> Brett Hudson Matthews, Principal Researcher.

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Measuring Numeracy for Financial Inclusion

~ Results of a Pilot Test Conducted in Côte d'Ivoire and Myanmar ~

March 6, 2019

Abstract

This paper reviews a pilot study of financial numeracy capabilities in two nationally randomized surveys conducted in 2017 as part of Wave 5 of the multi-year Financial Inclusion Insights program by InterMedia. Financial inclusion is widely viewed as a critical tool in the effort to end poverty. But – in spite of high hopes for digital financial services - most measures of progress towards financial inclusion do little or nothing to assess the capabilities of users and potential users.

The 'financial numeracy indicator' developed by My Oral Village and tested in the 2017 wave of the FII begins to address this omission by identifying an important capability gap that can readily be field-tested and is within the ability of financial practitioners to correct. Three measures were tested here:

1. ability to read a single-digit number,
2. ability to read a 'long' number equal to between US $10 and US $99.99 in the national currency, and
3. ability to make a mental calculation with a single digit number and an intermediate-length number.

Key findings from the field evidence collected during this study include the following:

- Both Cote d'Ivoire and Myanmar have very large populations without the fluency in long, written numbers required to perform an independent mobile money transaction.
- In attempting to read a long number, millions of smartphone owners made errors, including order-of-magnitude errors.
- Financial numeracy is different from school numeracy and is not improving as quickly among youth.
- Men, phone owners and those with mobile money accounts are substantially more financially numerate than women and non-owners of phones/mobile money accounts.

Measuring Numeracy for Financial Inclusion

~ Results of a Pilot Test Conducted in Côte d'Ivoire and Myanmar ~

March 6, 2019

Introduction

Rationale for a Financial Numeracy Indicator

Most measures of progress towards mobile financial inclusion (such as those used in the World Bank's Global Findex, GSMA's Mobile Connectivity Index, and research commissioned by central banks and UN agencies) do too little to assess the relevant capabilities of potential users of digital financial services. At the least, users must have certain basic numeracy, literacy, and digital capabilities.

Without measuring the capabilities of users and potential users, the number of people who find existing financial services offerings entirely or partly unusable cannot be known. Modes of keeping financial transaction records have evolved side by side with the capabilities of national populations for thousands of years. The emergence in recent centuries – and especially since World War II – of a global economy centred on a single Indio-Arabic notation system created substantial misalignments with local human capabilities. While much of this has been addressed by schooling, traditional curricula in arithmetic may not prepare children for effective participation in formal finance: especially if they leave school after a few years, as many still do.

However, it is possible to correct or alleviate some capability constraints using human-centred design techniques at the retail interface. For example, if people cannot read long numbers, it is possible to provide them with the option of directly inputting images of cash notes and coins.[1]

To accurately measure financial numeracy, My Oral Village (MOVE) developed a pilot indicator, based on extensive prior field testing, for two national surveys funded by the Consultative Group to Assist the Poor (CGAP), in Myanmar and Côte d'Ivoire. These surveys were part of the 2017 wave of the 'Financial Inclusion Insights' surveys of national financial inclusion and financial behavior conducted by InterMedia, a research firm. The 'financial numeracy indicator' developed and tested seeks to identify important capability gaps that can readily be field-tested and are within the ability of financial practitioners to correct. The indicator was conceptualized to enable comparability across nations internationally.

These surveys provided the first opportunity to test financial numeracy in a randomized sample of an entire national population. The Financial Inclusion Insights (FII) surveys, funded principally by the Bill and Melinda Gates Foundation, have been conducted since 2013. During Waves 1-2 (2013-14) no data on either literacy or numeracy was collected. However, beginning with Wave 3 (2015) both these issues were identified as potentially important constraints to digital financial inclusion, and efforts were made to integrate relevant indicators. InterMedia has developed a fairly robust proxy for direct testing of literacy (i.e., has the respondent ever sent an SMS?). However, their numeracy indicator doesn't pinpoint financial capabilities.

Specifically, it suffers from two basic weaknesses:

1. It doesn't measure the ability to read written numbers, focusing solely on mental calculation skills.
2. Mental calculation focuses on 1-digit and 2-digit numbers, which are largely irrelevant to decisions concerning cash in most participating nations (including Myanmar and Côte d'Ivoire) due to low currency values.

[1] Matthews, Brett Hudson. *Oral information management tools: lighting the path out of poverty*. My Oral Village, Inc., Toronto, 2014.

Previous exploratory studies by My Oral Village have identified the following issues with financial numeracy among many financially excluded people.[2] These studies were substantially smaller than the current ones, and focused on specific population segments, such as illiterate or rural adults who use financial services.

Our studies observed that illiterate adults have certain numeracy **strengths**, including:

- the ability to count cash with reasonable accuracy within the scope of their daily economic lives, regardless of the size of the numbers,
- certain basic mental calculation skills in all four basic operations (+, -, x, ÷), and
- often, the ability to read (and sometimes also write) single-digit numbers.

All the strengths noted above vary widely from one country to another, with local monetization levels, practices in the informal economy, and schooling – among other factors – all contributing to relative skill levels.

The defining **weakness** of illiterate adults, for purposes of financial inclusion (digital or otherwise), is an inability to read arithmetic notation and more specifically, long numbers – a skill governed by fluency in place value notation (the role and placement of zeros, as well as the number of digits, in a numeral string).

- This weakness is very evident everywhere we have tested for it, including India, Tanzania, Cambodia, Bangladesh, Timor-Leste and the Solomon Islands.
- Recent studies (India, Timor-Leste) clearly show that this is a weakness for many literate people, as well. The inability to decode place value appears to be a larger challenge globally than the inability to decode basic text.
- Many developing countries have low-value currencies, so the personal financial transactions of poor people are recorded in 4-, 5-, 6-, or even 7- digit numbers.

This research led us to theorize that oral individuals use cash as an *intermediate numeric system*, between the verbal and written numeracy systems. The cash numeric system is more useful than verbal numeracy alone – with its limitations in content storage and transmission, and laborious procedures for long and complex calculations. While the cash system is less useful than written numeracy, oral individuals cannot use this safely due to poor schooling - *especially* in high-stakes situations like a formal financial transaction.

We further hypothesized that:

- inability to read long numbers severely corrodes both independent use of financial services by poor people and their trust in the offerings of financial services providers; and
- this inability can be overcome, at least partially, by improved designs of transactional interfaces.

More generally, we wondered if efforts to achieve global financial inclusion by 2030 were missing an important opportunity: *financial numeracy*.

Financial numeracy:
the numeracy skills required to carry out financial transactions with understanding, in real time, without help from a third person.

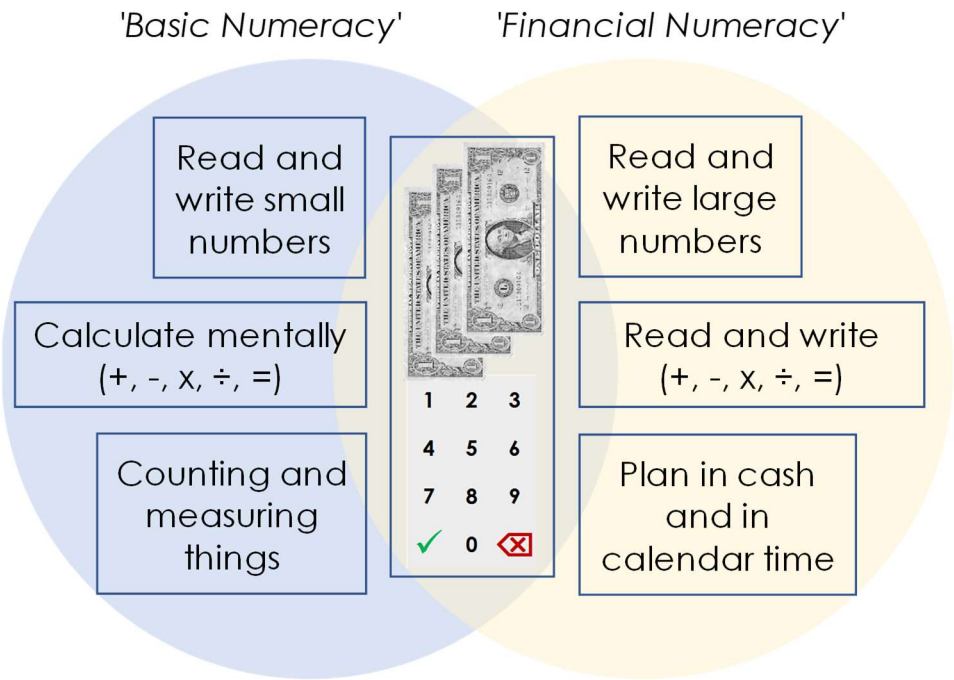
[2] See Matthews, Brett Hudson. *Oral financial numeracy: a hypothesis and exploratory test*. My Oral Village, Inc. Toronto, 2016. DOI: 10.13140/RG.2.2.22297.42080

A financially numerate person may notice and correct any errors made in transaction records, even if those errors are apparent *only* in text (e.g., are not expressed verbally, are not evident in the cash count, etc.). Inability to spot such errors naturally leads to aversion from formal finance.

As we began field testing for the numeracy skills needed in financial transactions, it became apparent that for adults who did not complete primary school, economic experience explained actual skill levels at least as well, if not better, than years of schooling. People with no schooling at all could outperform people with several years of it. We realized that there is a distinctive cluster of 'financial numeracy' skills, often learned through engagement in the formal economic and financial sectors, that is quite different from schooled numeracy.

These differences are summarized in **DIAGRAM 1**.

DIAGRAM 1: 'Basic Numeracy' and 'Financial Numeracy' Compared



At the heart of this distinction is a defining challenge that paper money and the resulting cash economy presents in an oral world that still relies predominantly on the land for a livelihood. The modern economy is built on written records of financial time-value. Traditional livelihoods simply don't require written records of 4-,5- or 6-digit numbers – much less multi-year records of time that are exact to the day or hour. To read or write these long numbers one must learn the signature arithmetic code of the modern economy: place value, or the role of zero in a multi-digit numeral string.

This code appears to be decidedly more difficult to learn than its easy acquisition among well schooled adults in early childhood might suggest. In our research, it was notable that a substantial majority of those who could not read this code could readily decipher 1-digit numbers, and often 2-digit ones as well.

The longer the digit string, and the further it is possible for the zero to drift to the left (or to the right in a right-to-left notational system), the more difficult the numerical meaning becomes for a poorly schooled person to decipher. For more details on the nature of this code, see our blog,

Scaling Mount Zero. "Mount 0 (Zero) is one of the most heavily traveled sites in the entire geography of human cognition. It is also virtually obligatory for a successful life."[3]

A New Financial Numeracy Indicator for FII

The structure of the new indicator is summarized in **TABLE 1**. The three variables are equally weighted, based on a simple average. The indicator is intended to be brief and as incisive as possible, so as to deliver maximum information without overburdening surveyors who must already conduct a very long survey. There are, however, important complementary variables that could be included in a survey where there was more scope. The most important of these would measure the ability to use calendar time and written numerical operators.

FL19:[4] Digit Recognition

To read or write a long number in any arithmetic notation system requires two cognitive fluencies:

1. recognition of single-digit numbers, and
2. ability to decode place value.

TABLE 1: Target outputs (example for 'n+2' country – see Table 2 for denotation)

Variable	Respondents	Description	Output
FL19	ALL	[Tablet displays a random number of dots (about 1 cm in diameter, all the same colour) between 1-9 on the screen. Swipes to next page where the digits 1-9 are shown, along with the previous page dot configuration, small in the upper right corner.] Please tell me how many dots you see, and select the correct digit. [Interviewer verifies the written and spoken number is correct]	1 = Correct 2 = Incorrect
FL20	ALL	[Interviewer – read out the amount in local currency units: "107,500 LCU".] Please identify the amount I just read out from the list below. [Interviewer turns the screen towards the respondent to select the appropriate response]	1 = 17,500 LCU 2 = 1,075,000 LCU 3 = 275,000 LCU 4 = 107,500 LCU 5 = 100,750 LCU
FL21	ALL	You decide to save 20,000 LCUs a month. How much will you have saved after 3 months? [Interviewer – 60,000 LCUs correct]	1 = Correct 2 = Incorrect

The first skill is a necessary – but insufficient – condition for the second. Prior field research suggests that the number of adults who cannot decode place value may equal or exceed the number who cannot read a simple 10-word sentence in any language: in other words, may be in the range of one billion people aged 15 years of age or older.[5 6 7] A significant minority of these cannot read a single-digit number.

[3] Matthews, Brett Hudson. *Scaling Mount Zero*. LinkedIn Blog Post, Feb 20, 2018. https://www.linkedin.com/pulse/scaling-mount-zero-brett-matthews/

[4] 'FL19 and subsequent references to variables are to InterMedia's survey code.

[5] The word "adults" refers to individuals aged 15 or older, as per the global standard used by FII and UNESCO.

[6] This finding emerged from a sample of 300 adults in northern India in 2016. Valechha, Poddar, Kushwaha, Anand, Ohri and Matthews. *Digital wallet adoption for the oral segment in India: concept development for MoWO (Mobile Wallet for Oral)*. MicroSave and My Oral Village, Lucknow, 2017.

[7] *Oral financial numeracy*; especially pp. 14-16 and 29-30.

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It is therefore essential for any design intervention addressing formal financial interfaces, including digital ones, to know the national status of both abilities.

FL20: Place Value
Economic life generally involves transactions that range in value between about US $1 and US $1,000 in local currency. People who would benefit from financial inclusion almost all use cash for transactions in their daily lives, and even if they are poor, they are likely to have to deal with cash amounts in the range of US $10 to US $100 in their national currencies. This provides a basis for a consistent indicator that used in different contexts, regardless of nominal currency values, and for purposes of this paper, will be referred to as the economically relevant 'reference range' for a nation and its currency.

For FL20 we therefore recommend that when a currency is currently trading at *n* digits to $1 US dollar, the place value question should use *n*+2-digit numbers. Where fractions of the currency are also widely used (e.g., cents) these should be additional.

With respect the pilot countries, see **TABLE 2**.

TABLE 2: National financial numeracy reference ranges

	Approx. LCU value: $1 US	LCU digits: US $	FL20: Digits, place value and large number questions	FL21 Mental calculations, multiplication
General rule	*X*	*N*	*n+2*	*n+1*
Myanmar	1,400	4	6	5
Côte d'Ivoire	600	3	5	4

Care must be taken to display large written numbers in the same format that is used for them in the local cash economy. For example, in various contexts '100,000' would be written 100000 (most commonly), 100 000 or even 100.000.

For the pilot, we wanted to know if respondents with low skills were able to differentiate the choices at a better-than-random rate. We therefore included one option ("27,500" for *n*+5 and "275,000" for *n*+6) to test for this effect.

FL21: Mental Calculation
For our purposes, mental calculation involves a single digit number and a 'moderately large' number in the reference range of the national currency (*n*+1). This skill allows consumers to buy several items, or several kgs or litres of an item, and be able to mentally check the price. In principle, it may also allow someone to plan a loan or investment. For example, in Myanmar the selected question involved saving 20,000 *kyat* over 3 months, because the currency trades at 4 digits to one US dollar.

[8] This finding emerged from a sample of 300 adults in northern India in 2016. Valechha, Poddar, Kushwaha, Anand, Ohri and Matthews. *Digital wallet adoption for the oral segment in India: concept development for MoWO (Mobile Wallet for Oral).* MicroSave and My Oral Village, Lucknow, 2017.
[9] *Oral financial numeracy*; especially pp. 14-16 and 29-30.

Division might be a useful supplementary question. However, it is more advanced, and less essential for basic financial inclusion.

The Samples

Background data on the two national samples is contained in **TABLE 3**. The study was conducted among nationally randomized samples of people aged 15 years and over.

TABLE 3: Background Data on the Study

	Myanmar		Côte d'Ivoire	
Sample size (adults aged 15 and over)	3,003		3,059	
Value of local currency to $US 1 (Oct 1, 2017)	1,364		555	
Currency name	kyat		CFA	
Long number - number of digits	6		5	
Long number used in FL20	107,500		10,750	
Economic value of long number	$ 78.84		$ 19.36	
Total population (2015 - World Bank)	52,403,669		23,108,472	
Population 15+ (World Bank, 2015)	37,795,098	72%	13,240,692	57%

Observations

Data from the 2017 FII Wave 5 surveys in Myanmar and Côte d'Ivoire yielded nine observations oriented around three key questions.

- How many people are affected?
- How does the gap affect different population segments? And
- How are financial numeracy capabilities correlated to phone ownership and mobile money use?

1. There is a very large population without the required fluency in long, written numbers (valued between US $10 and $99.99 in their own currency) to perform an independent mobile money transaction.

2. In attempting to read a long number, millions of smartphone owners made errors, including order-of-magnitude errors.

3. Place value errors affect a majority of the unschooled population, and many students struggle with them well into secondary school.

4. Youth are not performing much better than their parents.

5. Women are substantially less financially numerate than men.

6. The skills of shop owners and tradespeople are relatively strong, while the skills of farmers and those with no occupation are relatively weak.

7. Financial numeracy correlates strongly to phone ownership and use.

8. In Côte d'Ivoire, financial numeracy correlates strongly with mobile money account ownership and use (in Myanmar the sample of mobile money users is too small to analyze).

9. In Côte d'Ivoire, those who rely on over-the-counter services, whether account owners or not, demonstrate less skill than active services users, but more than the average person.

Each observation is discussed below. For consistency and to avoid confusion, all observations, in both text and tables, report *the rate of respondent error - not* the rate of correct answers.

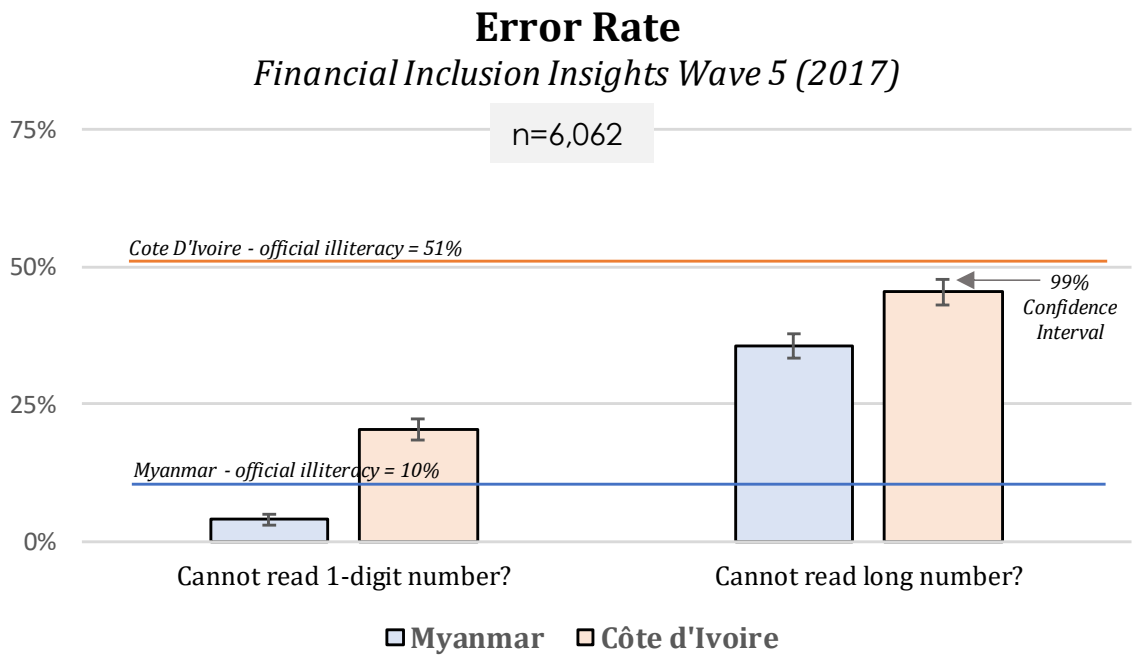
Scale of the Financial Numeracy Gap

1. *There is a very large population without the required fluency in long, written numbers (valued between US $10 and $99.99 in their own currency) to perform an independent mobile money transaction*.
   Based on direct extrapolation from the samples:
   - about 13 million adults can't read a long number in Myanmar (36% of the population aged 15+); and
   - about 6 million adults can't read a long number in Côte d'Ivoire (45% of the population aged 15+).

Fluency in long, written numbers requires two related, but distinctly different, skills: numeral recognition and ability to decode place value. The skill of numeral recognition is necessary, but not sufficient, for decoding place value.

In **FIGURE 1** the error rates for the two variables that involve reading numbers are shown, with the national illiteracy rate presented for comparison. (In this figure and those that follow, the sample size of "n=6,062" refers to the two samples together: Myanmar – 3,003 *plus* Côte d'Ivoire – 3,059).[10] In Myanmar 36% of respondents were unable to read a 6-digit number representing between US $10 and US $100 US in their currency (the *kyat*). This is nearly four times the official illiteracy rate (10% of the population). In Côte d'Ivoire 45% of respondents were unable to read a 5-digit number in the same range of economic value in their currency (the CFA *franc*). This is below the official illiteracy rate of 51%.

FIGURE 1: Ability to read long numbers in the pilot nations



A minority of respondents made 1-digit number errors; however, there was substantial variation between the two countries. Only 4% of adults in Myanmar made these errors, compared to 20% of adults in Côte d'Ivoire. This capability is usually acquired before ending primary school in both nations.

It is often assumed that a person who can read a 1-digit number can read a long number. Based on the sample sizes and confidence intervals (see Figure 1), there is virtually no possibility that the two capabilities are the same. Rather, long number recognition appears to be the *larger* of the two capability gaps.

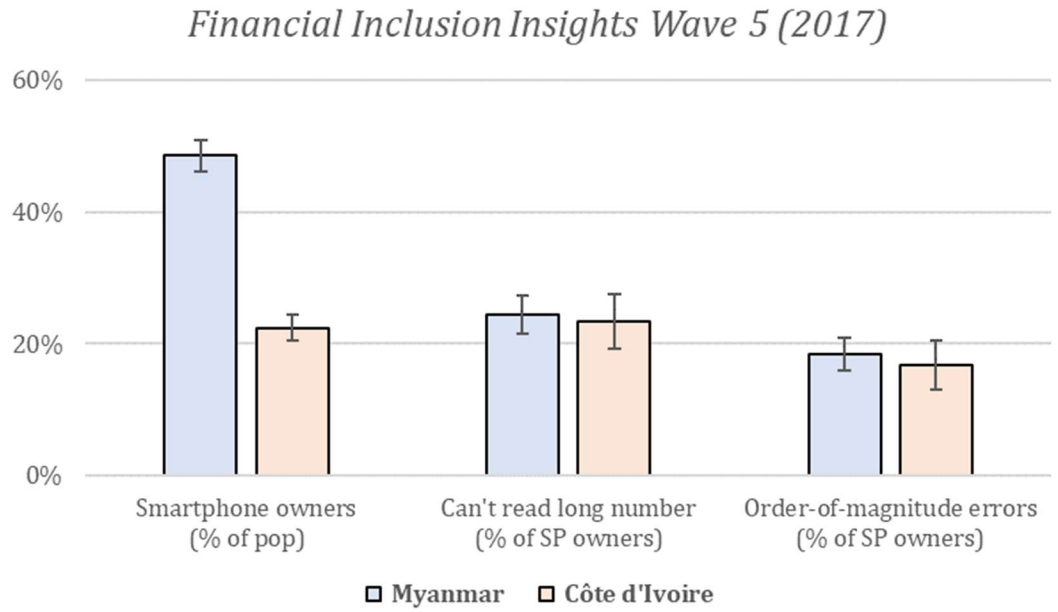
Far fewer adults in Myanmar than Côte d'Ivoire reported never having attended school (12% and 47% of the respective samples). There appear to also be factors affecting financial numeracy outside the school system, since unschooled adults in Myanmar were much less

[10] The small bar resembling an 'I' above each data column indicates the 99% confidence interval for the data. This means that there is a 99% probability that the actual incidence of this error rate in the whole national population lies in within that range. For example, the 99% confidence interval for the inability to read a 1-digit number is about twice as large in Côte d'Ivoire as in Myanmar.

likely to make a 1-digit error than their counterparts in Côte d'Ivoire (16% and 35% respectively). This reinforces exploratory observations in northern India, in which adults in their forties and fifties demonstrated substantially better financial numeracy than adults with comparable schooling in their twenties.[11] A number of factors may affect this: e.g., national levels of urbanization, monetization and formality of economic and financial activity.

2. *In attempting to read a long number, millions of smartphone owners made errors, including order-of-magnitude errors.*

FIGURE 2: Smartphone owners by long number



Smartphone owners are more likely to be able read a long number than other respondents. However, they are still prone to error (see **FIGURE 2**). Extrapolating from the sample, about 4.5 million smartphone owners are unable to read a long number in Myanmar. Based on 99% confidence interval, the actual number falls between 4.0-5.0 million, or 11-13%% of the country's adult population. The corresponding number in Côte d'Ivoire is approximately 0.7 million, or 5% of the adult population.

Order-of-magnitude errors, in which respondents chose a number with more or fewer digits than the correct response, are particularly worrying. Most of the errors respondents made involved order-of-magnitude sums, although only two of four available incorrect choices were in this category.

It seems unlikely that a smartphone owner who senses the risk of misreading a number at this scale would voluntarily choose to risk their own money in an independent payment transaction.

Gap Segmentation

3. *Place value errors affect a majority of the unschooled population, and many students struggle with them well into secondary school.*
   There is a very strong relationship between financial numeracy and years of schooling, with financial numeracy skills improving throughout the school course.

[11] *Digital wallet adoption for the oral segment in India.* p. 15.

In Myanmar (**FIGURE 3.1**) 88% of respondents had attended school at some point in their lives, compared to only 53% in Côte d'Ivoire (**FIGURE 3.2**). In both countries, a majority of the unschooled population are unable to read long numbers. In both countries, a skill gap in place value lingers far longer than gaps in digit recognition or mental multiplication within the meaning used for this study.

While fewer children receive schooling in Côte d'Ivoire, the school system appears more efficient at addressing place value. In Côte d'Ivoire 16% of primary school graduates still

FIGURE 3.1: Error rate by schooling - Myanmar

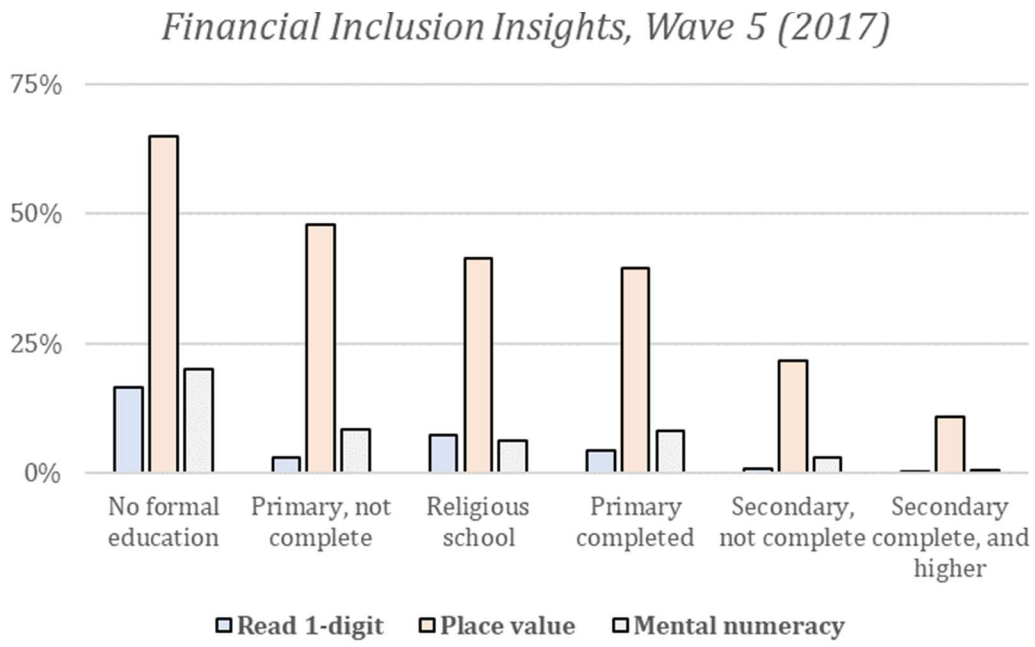
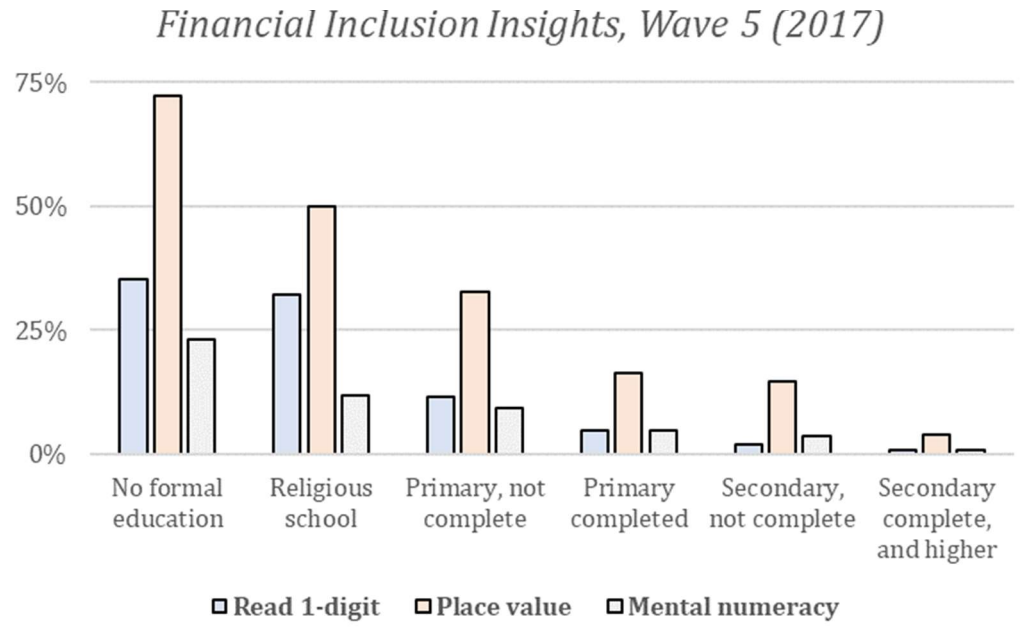


FIGURE 3.2: Error rate by schooling – Côte d'Ivoire

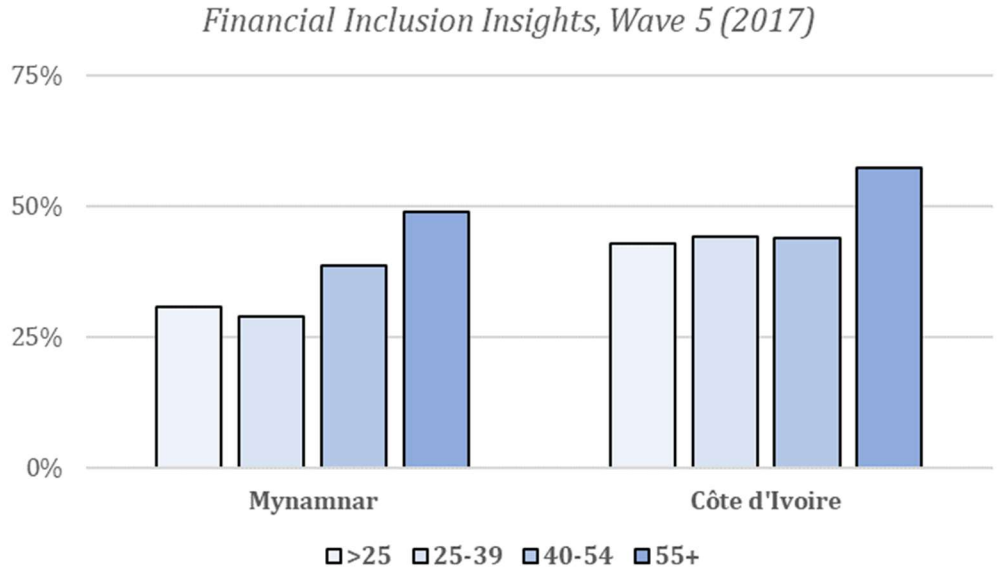


make place value errors, while in Myanmar the figure is 39%. In Côte d'Ivoire, 4% of secondary school graduates still make them, while the figure is 11% for Myanmar.

Unschooled adults can often read 1-digit numbers and engage in basic mental calculations. These requires verbal numeracy, but not familiarity with written operators (+, -, x, ÷, =) or written place value notation. A study by Nunes et al. (1993) in Brazil suggests that in primary school, many children struggle to link their oral skills with the written operators (+, -, x, ÷, =) and arithmetic notation system and therefore prefer to rely on verbal skill only. If they don't complete primary school, they may default to this mode throughout their adult lives.[12]

4. *Youth are not performing much better than their parents.*

FIGURE 4: Error rate by age cohort



In Myanmar, 69% of youth (ages 15-25) can read a long number, compared to 57% of the comparable Côte d'Ivoire cohort (see **FIGURE 4**). The largest and most significant gains from one generation to the next are those between the oldest cohort (55 and older) and the next oldest cohort (40-54). The gains are not significant for the youngest cohort (25 and younger), and in Myanmar show a modest, though not statistically significant, reversal.

It is important to note that the pilot did not control for difficulties with eyesight, whether due to aging or other reasons. The five choices appeared in small text on the enumeration tablets (see **APPENDIX 1**). Therefore, progress relative to the older generations may actually be *over*-estimated. As noted above, the factors affecting the acquisition of financial numeracy skills extend beyond the school system to the impact of literate processes and systems on local livelihoods, markets and institutions.

It is often argued that youth will be the vanguard of consumer adoption of technology, including mobile money. In Myanmar and Côte d'Ivoire the trendline suggests that universal financial numeracy, at the foundational level measured here, is still some distance off.

[12] Nunes, Terezina, Analucia Dias Schliemann, and William Carraher (1993). Street Mathematics and School Mathematics, Cambridge, New York, pp. 28-48.

5. *Women are substantially less financially numerate than men.*
   Women are particularly disadvantaged in understanding place value, and experience a significant deficit compared to men, at 99% confidence, in both countries (see **FIGURES 5.1** and **5.2**). The differences are greater on all elements of the indicator in Côte d'Ivoire than in Myanmar, suggesting factors that affect both skill (such as schooling) and the motivations to acquire it (such as the prevalence of the formal economy).

FIGURE 5.1: Financial numeracy error rates, by sex - Myanmar

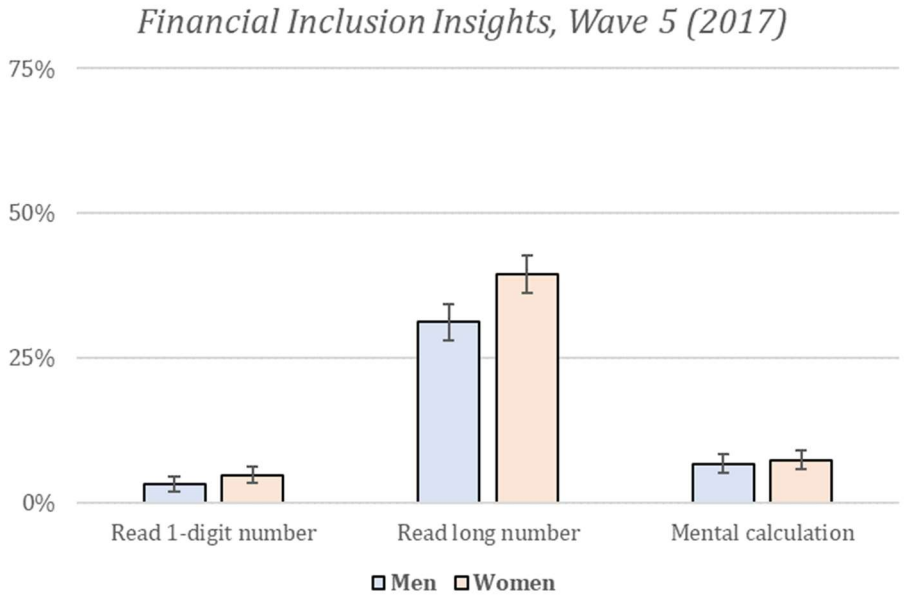
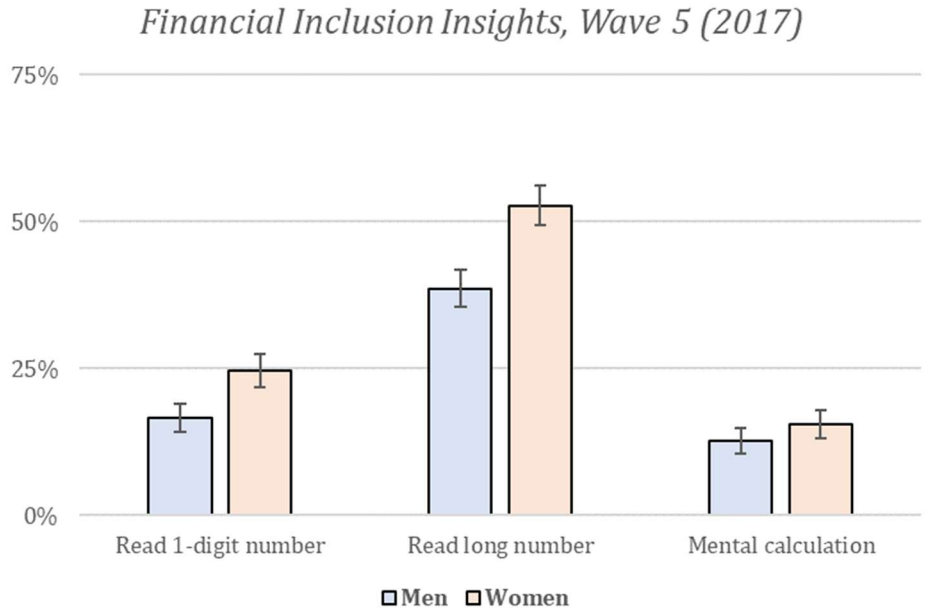


FIGURE 5.2: Financial numeracy error rates, by sex – Côte d'Ivoire



6. *The skills of shop owners and tradespeople are relatively strong, while the skills of farmers and those with no occupation are relatively weak.*
   In Myanmar 67% of respondents reported an occupation (Côte d'Ivoire 60%). Farmers had the weakest basic numeracy skills in both samples. See **FIGURES 6.1** and **6.2** for data on selected occupation types, where sample sizes permitted useful comparison. Even street vendors prove to be significantly better than farmers in both mental calculations and reading of numeric text. Shop owners, factory employees and others working in the formal sector were substantially more financially numerate.

FIGURE 6.1: Error rate by livelihood type - Myanmar

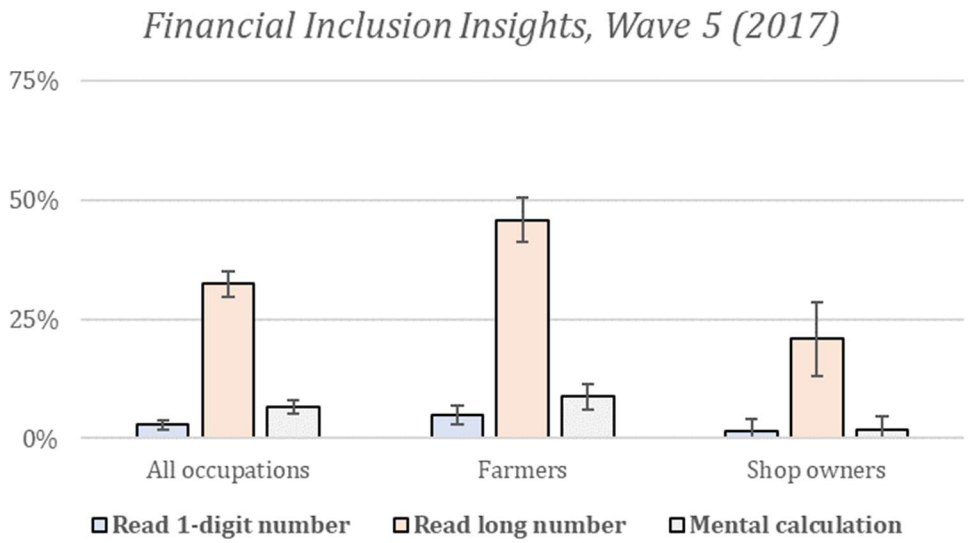
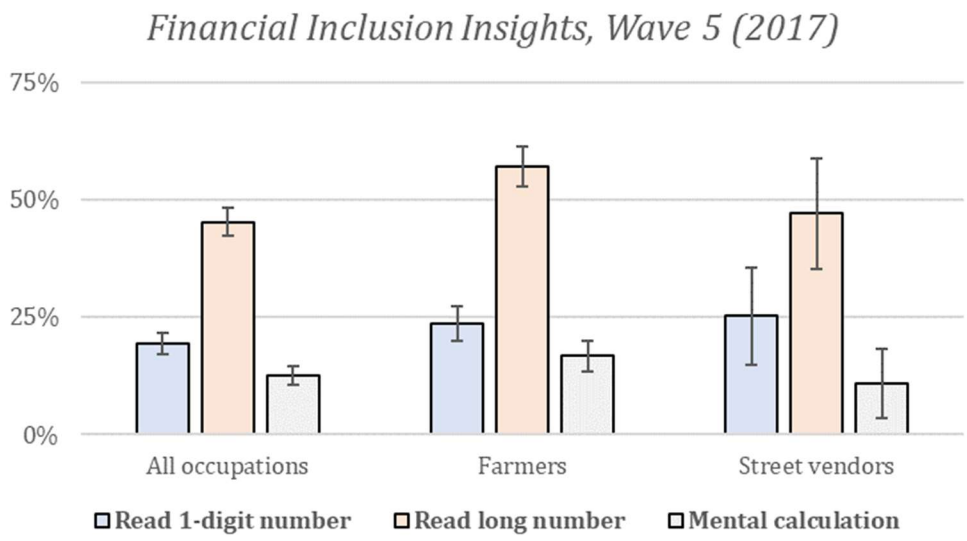


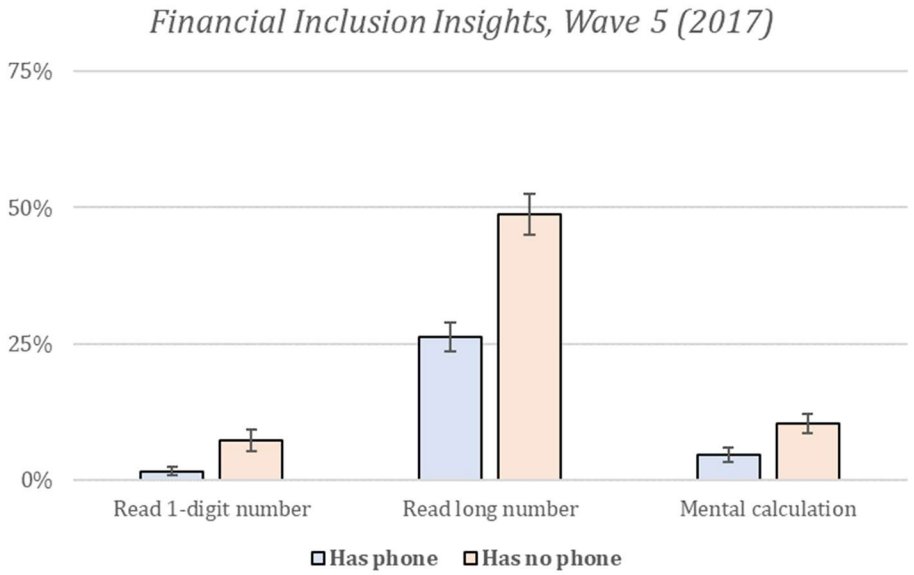
FIGURE 6.2: Error rate by livelihood type – Côte d'Ivoire



Phone Ownership and Mobile Money Use

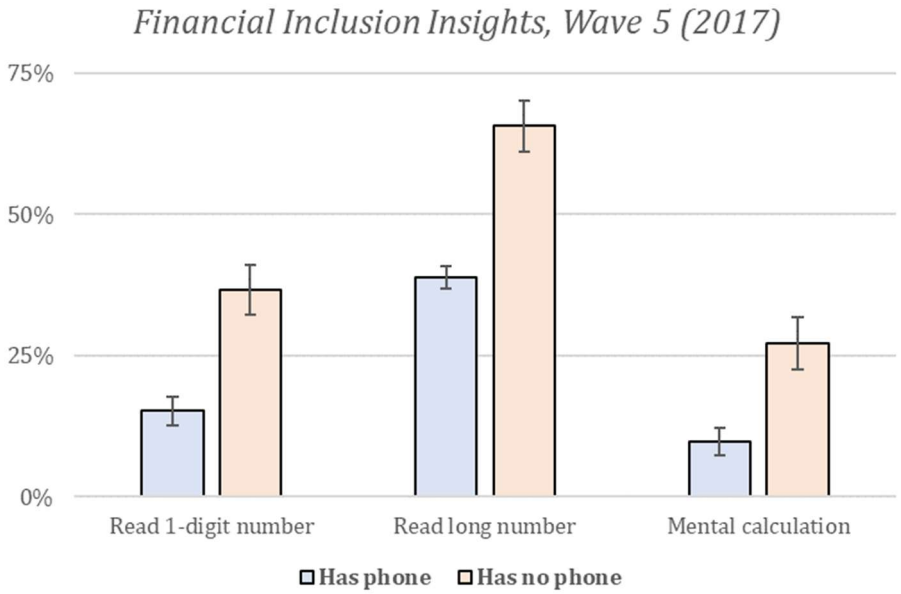
7. *Financial numeracy correlates strongly to phone ownership and use.*
   FIGURES 7.1 and **7.2** show error rates for the three indicators of financial numeracy, by phone ownership. Those who do not own a phone (1,239 in Myanmar and 748 in Côte d'Ivoire) are substantially less financially numerate than phone owners. While this is particularly true of their place value ability, the skill deficit is emphatic in both numeral recognition and mental calculation.

FIGURE 7.1: Error rate by phone ownership - Myanmar



Non-phone owners possess lower financial numeracy skills than almost any group in the survey: including women, the cohort 55 years of age and older, farmers and those with 'some' primary school. There have recently been tests of whether it is possible to encourage

FIGURE 7.2: Error rate by phone ownership – Côte d'Ivoire



financial inclusion by removing the obstacle of phone ownership. In one of these, most of the smartphones received by participants were sold, or traded down for feature phones, by endline.[13] This suggests a 'last mile' barrier involving phone ownership, skills, and the motivation to acquire skills. An oral smallholder may see little value in access to the internet, or in a mobile money app filled with unintelligible code. Giving away smartphones can't solve this problem. Designing more intelligible interfaces holds more promise.

FIGURES 7.3 and **7.4** show the relationship between respondents' self-assessed capacity to navigate through the menus in their mobile phones, and their error rates on reading 1-digit and long numbers. Actual error rates drop with each increment in self-assessed ability.

FIGURE 7.3: Error rate by self-assessed ability to navigate a phone menu - Myanmar

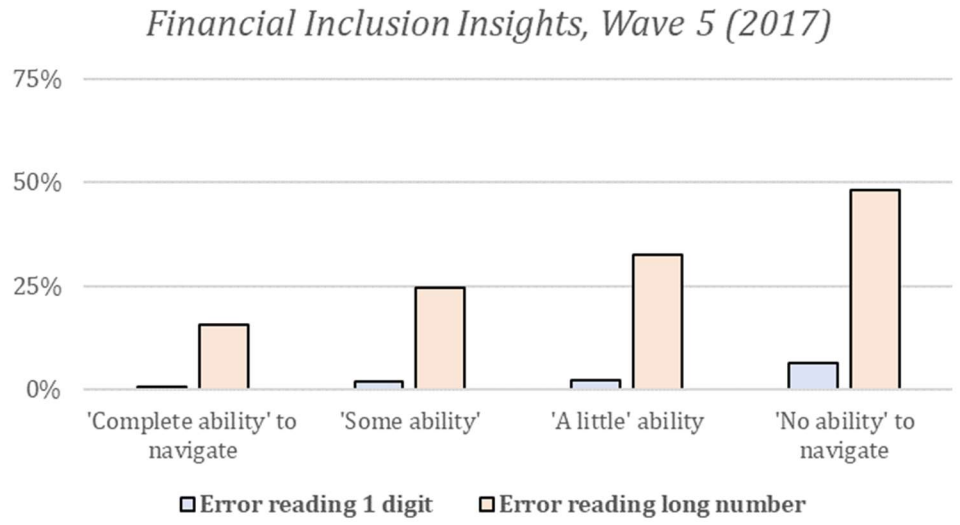
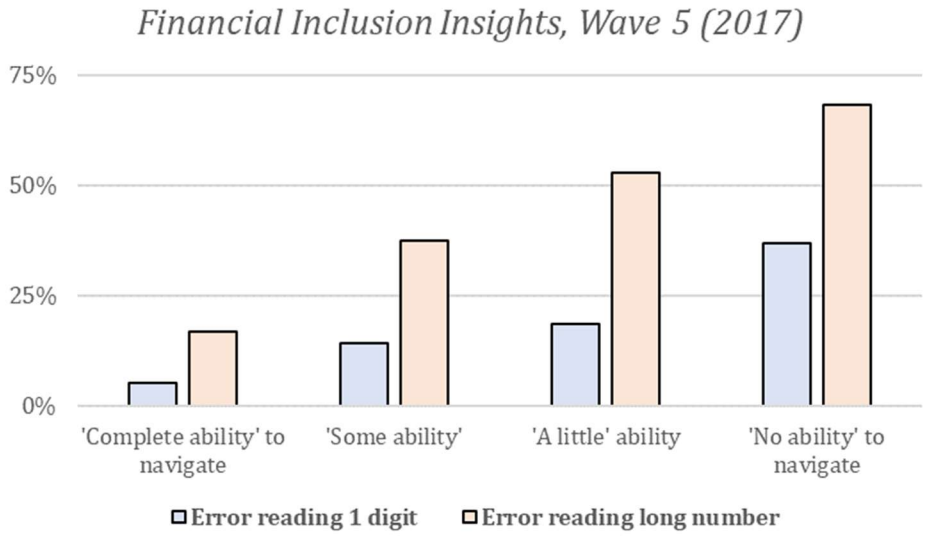


FIGURE 7.4: Error rate by self-assessed ability to navigate a phone menu – Côte d'Ivoire



[13] Interview with Philip Roessler (Associate Professor in the Department of Government, College of William and Mary), November 2017. Dr. Roessler led a research project asking this question in late 2017.

8. *In Côte d'Ivoire, financial numeracy correlates strongly with mobile money account ownership and use.*
TABLE 6 shows activity of mobile money owners in Côte d'Ivoire (n=1,223). Due to the nascent state of development of the mobile money market in Myanmar, the corresponding sample size was very small (n=57); and no comparison was undertaken. Only 24% of account owners made errors in reading a 5-digit numeral string denoting about $18 US in CFA francs, compared to 59% of non-owners of mobile money accounts (n=1,836). Account owners are also stronger in every other element of financial numeracy.

TABLE 6: Error rate by mobile account ownership and use of services - Côte d'Ivoire

	N	Error rate			
		1-digit number	**Long number**	**Order-of-magnitude**	**Mental calculation**
Mobile money account owners	1,223	10%	24%	18%	5%
Non-account owners	1,836	27%	59%	38%	20%
Use of digital financial services					
_2 ... bought airtime top-up or paid phone bill?	447	3%	10%	9%	3%
_6A ... sent money to any individual?	664	9%	18%	13%	4%
_11 ... save for any reason?	488	6%	19%	14%	5%
_6B ... received money from any individual?	953	9%	21%	15%	5%
_1 ... deposit or withdraw money?	1,143	9%	24%	17%	5%
Note: whole sample	3,059	20%	45%	30%	14%

Services are listed from the highest-skill user-groups down. The skills of every user-group are at least as high as the average for all mobile money owners. Those buying airtime top-ups and making phone bill payments demonstrate substantially stronger skills than other user-groups.

It is likely that skill differences in these cases are muted by widespread OTC practices, which may make independent use of these services unnecessary. In spite of this effect, the close correlation between demonstrated and capabilities and the use of services strongly suggests the presence and operation of some capacity-based 'barriers to use'.

9. *In Côte d'Ivoire, those who rely on over-the-counter services, whether account owners or not, demonstrate less skill than active services users, but more than the average person.*
TABLE 7 shows the error rate by use of over-the-counter (OTC) services. Again, Myanmar is excluded because of small sample sizes. Services are listed from the highest-skill user-groups

TABLE 7: Error rate by use of over-the-counter (OTC) services – Côte d'Ivoire

	N	Error rate			
		1-digit number	**Long number**	**Order-of-magnitude**	**Mental calculation**
Mobile money account owners	1,223	10%	24%	18%	5%
Over the counter - respondent has ...					
... used agent account for financial transaction	815	11%	24%	16%	6%
... received agent help to use own MM account	378	14%	26%	18%	5%
... used MM through account of family membe	266	15%	33%	26%	8%
... no account but has used MM services?	181	18%	44%	31%	9%
Note: whole sample	3,059	20%	45%	30%	14%

down. All forms of active OTC use involve sub-groups with financial numeracy skills that are above the average for the whole sample, but below the average for mobile money account owners.

Recommendations for Future Surveys

The pilot validated the utility of financial numeracy as a conceptual construct, and generated useful empirical insights based on the exploratory groundwork conducted earlier. The following refinements are recommended for future implementation and scale-up. The assumptions presented in the introduction about the design of the indicator have been largely validated, including the selection of numerical orders-of-magnitude for testing outlined in Table 16, which can effectively be scaled up to a larger multi-national framework such as the whole FII.

Refinements from the Pilot

1. See **TABLES 7-8** for the recommended approach to testing during scale-up, based on learning from the pilot.

TABLE 7: Target outputs (example for 'n+2' country – see **TABLE 8** for denotation)

Variable	Respondents	Description	Output
FL19	ALL	[Tablet displays a random number of dots (about 1 cm in diameter, all the same colour) between 1-9 on the screen. Swipes to next page where the digits 1-9 are shown, along with the previous page dot configuration, small in the upper right corner.] Please tell me how many dots you see, and select the correct digit. [Interviewer verifies the written and spoken number is correct]	1 = Correct 2 = Incorrect 3 = Don't Know
FL20	FL19=Correct	[Interviewer – read out the amount in local currency units: "107,500 LCU".] Please identify the amount I just read out from the list below. [Interviewer turns the screen towards the respondent to select the appropriate response. There is no time limit, and the interviewer may repeat the number on request.]	1 = 17,500 LCU 2 = 1,075,000 LCU 3 = 175,000 LCU 4 = 107,500 LCU 5 = 100,750 LCU 6 = Don't Know
FL21	ALL	You decide to save 25,000 LCUs a month. How much will you have saved after 3 months? [Interviewer – verifies correct response]	1 = Correct 2 = Incorrect 3 = Don't Know

In nations with high value currencies (1 digit to each $US) decimals are usually a normal part of written economic life, and should be included in the test.

TABLE 8: National financial numeracy reference ranges

	Approx. LCU value: $1 US	LCU digits: US $	FL20: Digits, place value and large number questions	FL21 Mental calculations, multiplication
General rule	*X*	*N*	*n+2*	*n+1*
Example 1	1	1	3 (+ decimals)	2 (+ decimals)
Example 2	80	2	4	3
Example 3	1,600	4	6	5

2. The testing of numeral recognition (FL19) and the test of place value (FL20) should be clearly separated. This requires the following changes:

- FL19 and FL20 will both have an option of responding "I don't know" to reduce random noise in the data.
- Available answers to the place value question will not include any options with incorrect digits (e.g. the '2' in the third option in FL20). FL20 will include place-value only options that vary the number of zeros and their location, but not the order in which non-zero digits appear.

3. For those with weaker eyesight (and possibly without glasses) including the elderly poor, the reading choices in FL19 and FL20 should support larger display.
   - Ideally pinch-to-zoom-in action should be available for those who need it.

4. Datasets should include the following supplementary data, especially if this data is unlikely to be easily available in the public domain, as in the case of long-tail languages.
   - The written equivalent of the spoken numbers spoken by the surveyor (e.g., "one thousand and seventy-five").
   - A table including written equivalents for all spoken numbers in ordinary use, from 1-100, all 100s from 100-1000, all thousands from 1000 to 10000 and (if relevant) all decimals from 0.1 to 1.0.

Broadening the Scope of the Indicator

5. A key goal during the pilot was to keep the financial numeracy questions extremely short. By increasing this component from 3 questions to 5 questions (expanding the time commitment for financial numeracy proportionately – that is, by 5/3) it would be possible to add two extremely useful refinements:
   - a new question on recognition of arithmetic operators (+, -, x, ÷, =); and
   - a new question using a 3-digit number (e.g. is "three hundred and fifty LCUs" written "350", "530", "3,500", "305" or 5,300?) to capture
     - mid-length number skill, which is a prerequisite to long-number skill, and
     - ability to transcode from verbal to written number, and
     - ability to read left-right.

6. To address the gap in knowledge on this important barrier to usable financial services for poor people, scale this indicator up to a global survey.
   - This will allow specific gaps in financial numeracy to be pinpointed, and potential solutions tested.
   - This will make it possible to compare each nation to a population-weighted average of all participating nations, which will be a valuable guide for national practitioners and policy-makers.

Limitations

7. An aggregated 'single data point' that summarizes the results by nation should be deferred until the indicator has been fully developed (see point #4 above).

Recommendations for Stakeholders in Financial Inclusion

Research

1. A correlation between financial innumeracy and non-use of digital financial services explains neither direction or causation, nor the forces perpetuating or reducing exclusion. There are many unanswered questions, and many untested solutions. These range from the design of digital and paper-based financial services interfaces to the design of national currencies and other formal sector information infrastructure to recommendations for accelerating place value knowledge in school systems.
   - To support follow-up research and ongoing development of this indicator and other data sets, the primary data can be reported back to My Oral Village, or published in an open source repository, to support global knowledge management. My Oral Village commits to sharing all such data in an open source repository.

2. In both Côte d'Ivoire and Myanmar, there is clear and immediate scope for testing mobile wallet designs that address the skill gap in place value notation.

3. Future surveys of financial inclusion, such as the Global Findex, Financial Inclusion Insights, FinAccess and others, should go beyond the basic financial numeracy testing conducted here to test other dimensions this skill: ability to understand calendar time/time stamps, arithmetic operators, tabular format and percentages.
   - Understanding financial numeracy country by country, extending the indicator to track other key aspects like calculations and calendars, and continuously tracking numeracy in the future may be vital to making progress toward an era in which all adults can use digital financial services independently.

4. Many of the gaps in the usability of digital financial services among oral populations are covered by the financial numeracy indicator reported here or contemplated in the broader scope in point #3 above. However, some usability gaps in DFS – such as interface navigation or app downloads - fall outside the scope of financial numeracy. This approach to pinpointing gaps in financial numeracy could also pinpoint gaps in broader DFS usability through empirical tests that use Android-based devices, with oral populations.
   - These gaps can be reported in one or more companion indicators.

Financial Services Providers

5. Financial services providers interested in serving the oral market can use financial numeracy tests such as this one as a low-cost, low-commitment entry point into addressing the information needs of this segment.

6. FSPs committed to serving this large segment of present and future customers should use existing oral information management tools, such as cash scrollbars and keyboards, cash-based place value guides in savings group passbooks and on loan contracts, and play money in mobile money offices. Learning financial numeracy skills is an uphill climb, but user-interface refinements in digital finance can ease and accelerate the process, shifting user orientation from fear of making mistakes towards curiosity about the meaning of experiences they know they will encounter again in future.

Governments

7. A test of basic financial numeracy should be conducted as a routine part of all financial inclusion surveys in the future and should be conducted at least once in every developing financial market. Such tests can be complemented with sections on the regional levels of monetization and assessments of the usability of national currency designs for oral adaptation to formal financial markets.

8. Central banks could take a more pro-active approach to designing currency units that empower users to learn arithmetic notation. For example, long digit-strings are best grouped in 3-digits clusters according to the global standard, (e.g. 10,000 or 10 000; not 10000).

9. Governments should focus on financial numeracy in schools. Since the ability to read long numbers is vital to success in the formal economy, this skill should be mainstreamed into the school curriculum as early in primary school as possible.

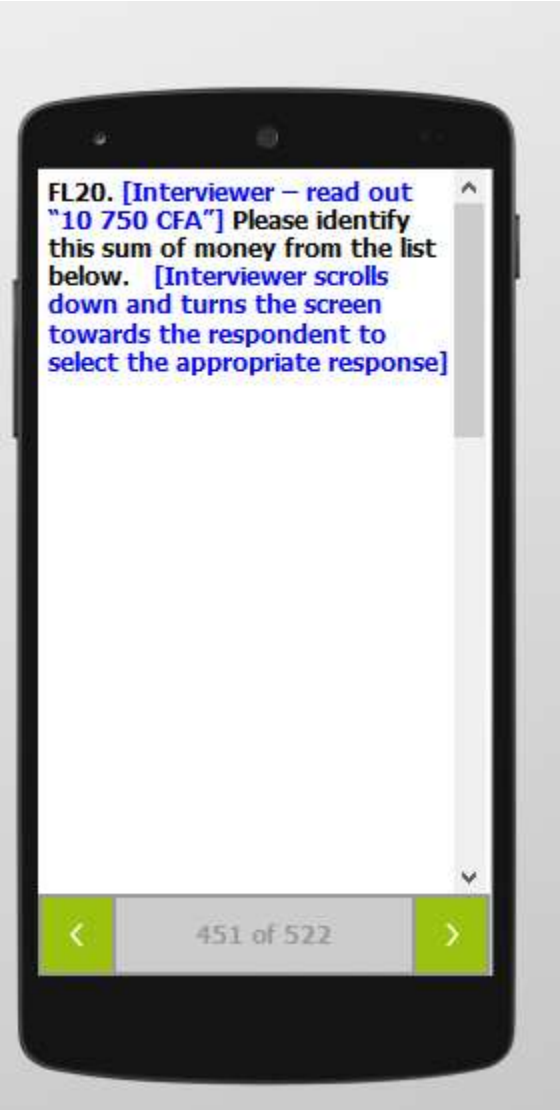
Development Organizations

10. Development organizations should invest in integrating basic financial numeracy into global databases so that it can tracked comparably across nations. This would help both governments and private financial services suppliers to benchmark readiness for digital financial inclusion among populations that matter to them.

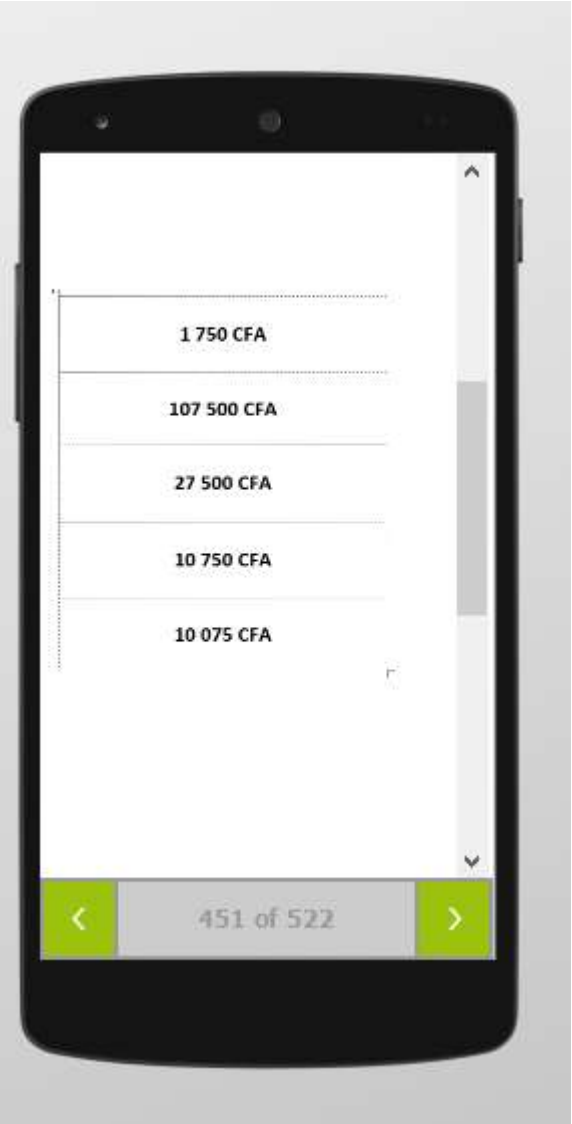
Appendix 1: Implementation Screenshots

FL19 Screen shot:

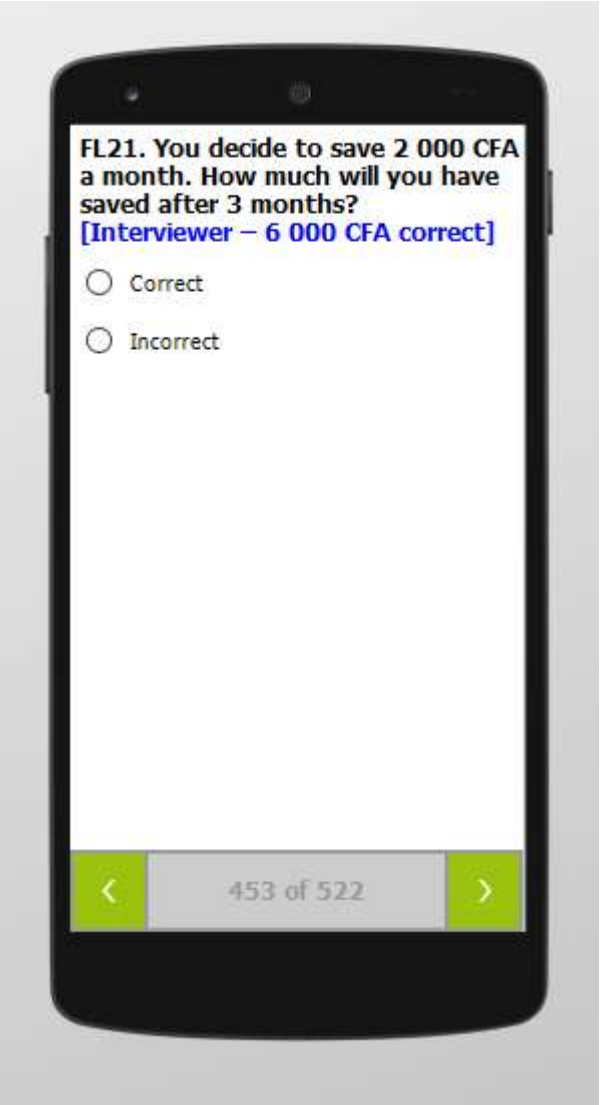
FL20.1


FL20. [Interviewer – read out "10 750 CFA"] Please identify this sum of money from the list below. [Interviewer scrolls down and turns the screen towards the respondent to select the appropriate response]
451 of 522

FL20.2



FL21


FL21. You decide to save 2 000 CFA a month. How much will you have saved after 3 months?
[Interviewer – 6 000 CFA correct]
Correct
Incorrect
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