



Mapping foundational literacy and numeracy research in four sub-Saharan African countries

Lessons from country-level searches

Authors

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List of abbreviations

APHRC	African Population and Health Research Center
CRES	Consortium pour la Recherche Economique et Sociale
ECD	Early Childhood Development
ESSA	Education Sub Saharan Africa
FLN	Foundational Literacy and Numeracy
HEIs	Higher Education Institutions
ICT	Information and Communications Technology
MHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
REAL	Research for Equitable Access and Learning
SSA	sub-Saharan Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development

1. Summary

This report highlights the main findings exploring the research landscape of Foundational Literacy and Numeracy (FLN) from 2010 to 2023 in four sub-Saharan African (SSA) countries: Ghana, Kenya, Senegal, and Tanzania. FLN serves as the foundation for future learning and development, yet the area is under-prioritised in terms of policy, practices and investment, leading to poor learning outcomes in SSA. Moreover, FLN data and evidence from SSA-based researchers is difficult to access. Drawing on evidence from the four focus countries, this report aims to identify themes, trends and gaps in FLN research, understand critical challenges, and improve the visibility of African FLN research and researchers.

The search process focussed on identifying FLN research outputs available in local databases, repositories and journals in the four countries. After identifying relevant research outputs, we collected metadata on corresponding FLN thematic areas, inequality factors (disability, gender, ethnicity, poverty, religion), funders of FLN research, collaboration patterns, and authors' gender, among others.

The relevance and utilisation of these research outputs in educational policies and practices remains unclear, since the studies were primarily identified in local repositories and academic journals. These are often not captured in international databases and evidence reviews.

Nevertheless, the data analysis provided valuable insights. For example, increasing FLN knowledge production was observed between 2010 and 2023 in all the countries considered. This demonstrated not only the existence of a substantial body of FLN-related evidence in local repositories, but also a promising FLN research landscape in SSA.

FLN researchers prioritised some key thematic areas, including 'literacy', 'language', 'equitable and inclusive education', 'learning and assessment', 'teachers and teaching' and 'curriculum'.

The research outputs identified considered factors of inequality such as disability, ethnicity, gender, poverty and religion. However, a significant proportion of the research outputs in Ghana (66 percent), Kenya (59 percent), Senegal (58 percent)

and Tanzania (33 percent) did not disaggregate FLN findings by these inequality factors.

Most research outputs resulted from collaborative research projects, ranging from 74 percent to 89 percent of the total outputs identified in the four focus countries.

Collaboration at the national level was predominant, followed by collaboration with partners located outside SSA, which outnumbered collaboration within SSA.

Only 8 percent and 11 percent of identified FLN research outputs received funding in Ghana and Kenya, respectively. This was lower than the percentage of research outputs funded in Tanzania and Senegal, at 28 percent and 35 percent respectively. Most of the funding reported upon was provided by international organisations and through external philanthropy.

The following recommendations were identified for FLN research funders, education decision-makers and university leaders, as well as FLN researchers.

For funders

- Fund and support research on topics that are less investigated and help to fill knowledge gaps identified by the thematic analysis.
- Promote and finance FLN research collaboration within SSA (ideally bridging the language divide between Anglophone and Francophone researchers).

For educational decision-makers and university leaders

- Support the setup and regular update of institutional research repositories to promote knowledge dissemination, access and use.
- Allocate part of the national Research & Development (R&D) budget to education research, including research focusing on FLN.
- Liaise with researchers to create learning communities to align knowledge gaps identified with research and national priorities.
- Prioritise the inclusion of female researchers and other minority groups (e.g. early career researchers) in FLN research and projects.

For education researchers

- Align future FLN research with research gaps identified through this bibliometric analysis, and national research priorities.
- Integrate gender equality and social inclusion indicators, including disability, poverty, and religion, into future research.
- Use the results of this bibliometric analysis and the corresponding metadata to access locally available FLN research outputs and use them for thematic reviews.
- Mention the funding source in research outputs if the research project is funded, and clearly specify if unfunded or self-funded when applicable.
- Work in consortia and collaborate with SSA-based counterparts.

2. Introduction

A child's capacity to read with comprehension and perform basic arithmetic, known as Foundational Literacy and Numeracy (FLN), forms the essential basis for future education and skills development, as highlighted in the African Union's Agenda 2063. However, despite its critical importance, FLN is often under-prioritised in educational policy and investments. Consequently, many children in sub-Saharan Africa (SSA) experience poor learning outcomes and are at least five times less likely to acquire fundamental skills compared to their peers in other regions (UNESCO, 2023).

Despite progress in recent years regarding access to basic education, concerns about poor learning outcomes remain widespread in most African nations. In Senegal, for instance, while the gross enrolment rate in primary school was around 84 percent, and approximately 60 percent of enrolled children reached grade 6 in 2020, learning poverty persists. For example, 74 percent of children were unable to read and understand a simple text by age 10 (World Bank, 2019). Similarly, in Ghana, data from evaluating the Early Grade Reading Programme indicated that, when using the Ghanaian language, by the end of Grade 2, 'pupils could read an average of just 2.5 words per minute, with 77 percent being unable to read even a single word' (USAID, 2018). In Kenya and Tanzania, recent assessments by the Usawa Agenda (Uwezo, 2021) and the Tanzania-National Examinations Council (National Examinations Council, 2022), respectively, also reported poor learning outcomes.

These observations call for actions to enhance children's cognitive development and their reading, writing, and arithmetic proficiency, as echoed in continental educational policy spheres such as the Continental Education Strategy for Africa (CESA)'s 2016-2025 Agenda. At country-level, efforts to address the learning crisis, specifically at the foundational level, are exemplified in recent policy instruments in the four countries: Ghana's Ministry of Education (2019), Education Strategic Plan 2018-2030, Kenya's Ministry of Education (2018) National Education Sector Strategic Plan 2018-2022, the Republic of Senegal's (2018) Programme d'Amélioration de la Qualité, de l'Équité et de la Transparence - Education/Formation 2018-2030, and Tanzania's National Multisectoral ECD Programme for the financial year 2021/2022 to 2025/2026 (MHCDGEC, 2021).

3. Research objectives

The learning crisis in sub-Saharan Africa calls not only for reforms in education systems and increased investment in foundational learning but also for a stronger emphasis on research, data, and evidence-based approaches to enhance teaching and learning at the foundational level. Moreover, evidence suggests that researchers 'closest to a development challenge are generally those best positioned to innovate a solution', hence local solutions for local problems (McLean and Sen, 2019).

Therefore, to enhance learning outcomes in sub-Saharan Africa, it is essential to prioritise evidence that is both contextually relevant and driven by local perspectives.

Unfortunately, African education research is often overlooked, and difficult to access, especially when published in local and regional journals, many of which are not available online (Edwards, 2023). This also applies to the field of foundational learning in SSA, which motivated this project to map the knowledge ecosystem in foundational learning focussing on four countries, namely, Ghana, Kenya, Senegal and Tanzania. Specifically, this project aimed to:

- Improve the visibility and accessibility of FLN research by Africa-based researchers.
- Establish a community of practice and strengthen FLN researchers' capacity.
- Promote the uptake and use of the FLN evidence.

As part of the project's research outputs, this report collates evidence, lessons, and recommendations from the different country-level reports. It aims to highlight FLN research outputs, themes, trends and knowledge gaps across the four countries, to understand critical issues impacting research outputs, and to enhance the visibility of SSA-based FLN researchers and their research.

To achieve the project objectives relating to the visibility and accessibility of FLN research, and the uptake and use of FLN evidence, we systematically mapped and analysed research outputs that are less likely to appear in international databases (e.g., Scopus and Web of Science) by searching in local institutional repositories and databases. The criteria for inclusion in the research can be seen in Figure 1 below.

This report purposely avoids duplicating the nuances presented in the country reports. It demonstrates the relevance of considering research outputs that are often disregarded in international databases and offers a comprehensive assessment of the field of FLN research.

4. Methodology

To search for FLN research outputs, we adopted the definition by the Global Education Program of the Bill & Melinda Gates Foundation, where FLN refers to the literacy and numeracy skills among children of primary school age in SSA.

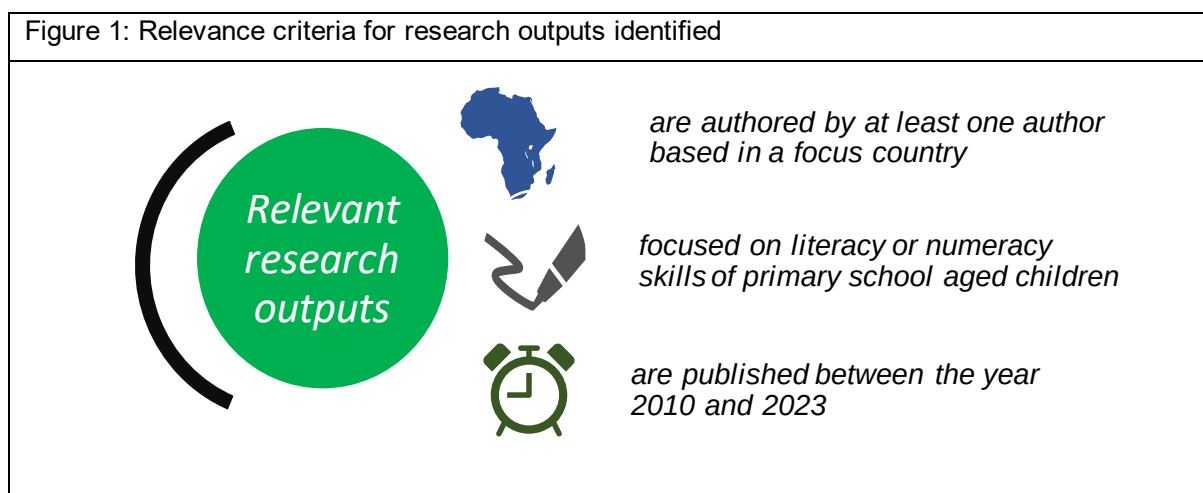
Our approach for searching in local databases and repositories is described in the search protocol by Binesse, Rose & Silva (2023) where the criteria for mapping and evaluating FLN research outputs in SSA are described comprehensively and captured in international research databases (e.g., Scopus, Dimensions and Web of Science for the period 2015 to 2023). In contrast to that search, separate searches were conducted for this study in each of the four focus African countries.

We developed and used search strings containing relevant FLN keywords, such as 'foundational skills', 'basic skills', 'literacy', 'reading', among others, to retrieve the research outputs of interest. However, contrary to the approach for international databases where a single string could be sufficient for searching – depending on the

repository or platform, we adapted our strings using different combinations of keywords including:

("foundation* skills" OR "basic skills" OR "literacy" OR "reading" OR "writing" OR "vocabulary" OR "speech" OR "alphab*" OR "numeracy" OR "math*" OR "arithmetic" OR "calculation" OR "proficiency level*" OR "learning achievement" OR "learning outcome*" OR "learning level*" OR "learning gain*" OR "learning loss*" OR "cognitive skills" OR "socio-emotional") AND ("basic education" OR "early grade" OR "elementary school*" OR "primary school*" OR "primary education" OR "second chance" OR "second-chance" OR "alternative education" OR "complementary basic education" OR "complementary education" OR "accelerated learning" OR "non-formal education" OR "primary-age*" OR "community-based education" OR "community education" OR "learning centres") AND "Ghana" OR "Kenya" OR "Senegal" OR "Tanzania".

It is also worth noting that shorter and longer forms of the example search strings above were tested for identifying FLN research outputs. Following the searches, research outputs meeting all the three criteria in Figure 1 were considered in the analysis.



We searched for FLN research outputs in local/country-level repositories and databases. These included university repositories (e.g. University of Nairobi Research Archive, University of Ghana Digital Collections, Cheikh Anta DIOP University Digital Library, Kenyatta University Institutional Repository), repositories of research institutions (e.g., African Population and Health Research Center's

publications) and local databases (e.g., Kenya Education Research Database, and African Journals Online). Each country report provides a list of all institutions and platforms where searches were conducted.

In cases where our country-specific searches led to research outputs that were also identified by the mapping exercise focusing on international databases for the 2015-2023 period (Binesse & Rose, 2024), those outputs were removed from our country-level results to avoid duplication.

After searching and identifying relevant FLN research outputs, we downloaded and compiled them in an Excel spreadsheet. The spreadsheet included essential columns for reporting key metadata related to the research outputs (e.g., title, abstract, year), researchers (e.g., institutions, contact details, gender), information on inequality factors (e.g., ethnicity, disability, gender, poverty, religion, and location), related keywords (e.g., literacy, reading, writing, speaking skills), funding information (e.g., funders, funding types), collaboration, and other pertinent data.

We used descriptive analysis with graphic illustrations to visually represent the data patterns and trends. To ensure a thorough analysis, several indicators were used, offering comprehensive understanding of the FLN research ecosystem. These included:

- *Accessibility*: This examined if the research output was open access or not.
- *Funding information*: Studies were categorised based on whether they disclosed their funding details or not.
- *Funding type*: This identified the sources of research funding, such as internal institutions, government bodies, external philanthropy, self-funding, local organisations, and international organisations.
- *Top funders*: funding organisations were ranked based on how frequently they were mentioned in the research outputs.
- *Thematic classification*: Thematic areas were developed based on keywords assigned to the studies identified as detailed in Appendix 2. Their relative importance was given by the frequency of the corresponding keywords. Appendix 1 lists the keywords corresponding to each thematic area.

- *Inequality factors*: This involved identifying FLN studies that explicitly addressed or report data on gender, ethnicity, religion, poverty, and disability.
- *Authors' gender*: Information about the researchers was inferred from the names and available biographical data in each study's author list. Data on gender, where feasible, was inferred from researchers' online (institutional) profiles and through online searches.
- *Collaboration*: The geographical location of authors' institutional affiliation was used to analyse collaboration patterns.
- *Top research institutions*: Research institutions were ranked by analysing the frequency of studies attributed to each, based on authors' affiliation data.

5. Findings

This section focuses on the trends of FLN research outputs in the four focus countries over the period 2010–2023. It also highlights the types of these research outputs, their relevance and accessibility, as well as the funding landscape. Additionally, it delves into the thematic areas and design of FLN research, examining existing evidence gaps, poverty and inequality factors, as well as different research settings. Furthermore, it analyses the gender distribution and collaboration patterns of FLN research, as well as highlights the top FLN research institutions.

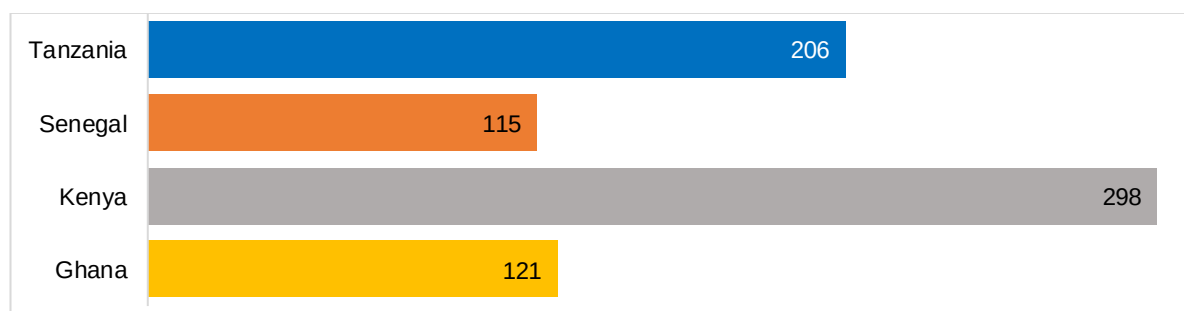
FLN research outputs, types and trends (2010-2023)

Figure 2 shows the number of FLN research outputs identified in each of the four countries between 2010 and 2023. Specifically, a total of 121 research outputs were recorded in Ghana, 298 in Kenya, 115 in Senegal and 206 in Tanzania. These figures demonstrate the existence of a substantial body of FLN-related evidence at country-level, which may not be accessible in international research databases.

In addition to the total number of outputs (Figure 2), we plotted the number of research studies identified each year between 2010 and 2023 (Figure 3). It is worth noting that the peak levels of FLN research outputs were observed at different times across various countries. In Senegal and Ghana, the highest counts of FLN research outputs, 16 studies, were observed in 2017 and 2018, respectively. The figures for

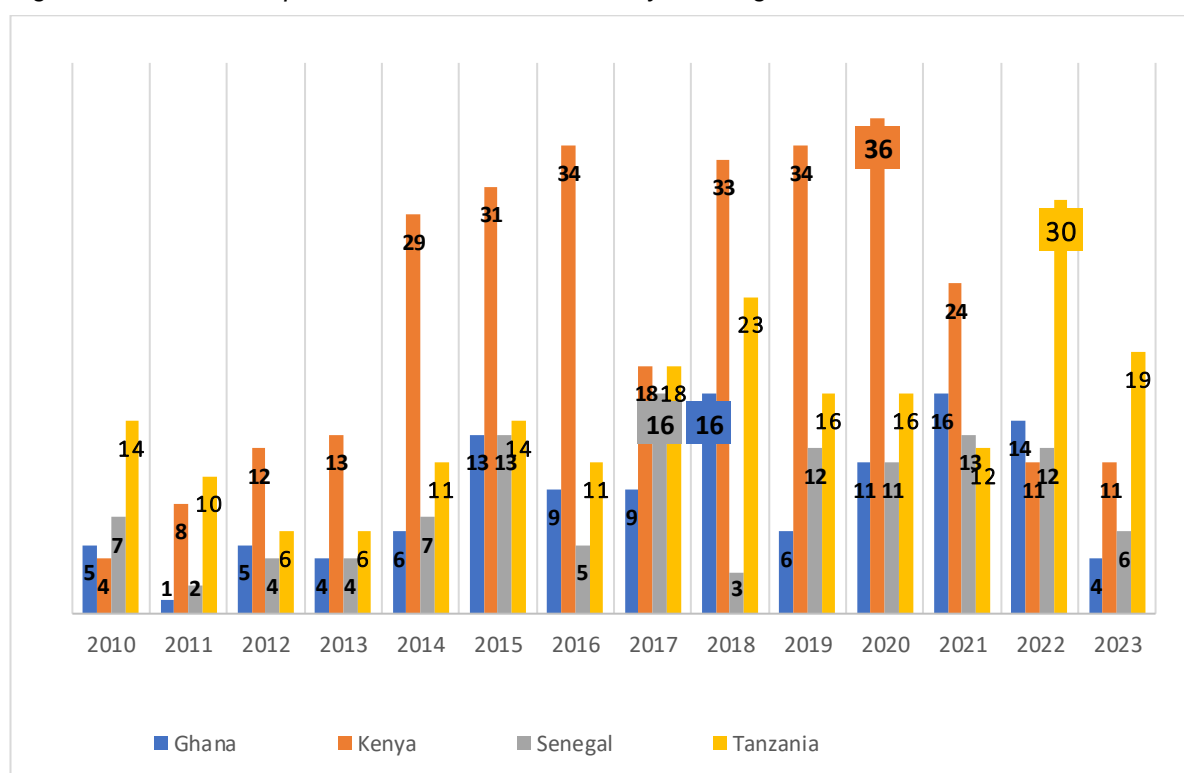
Kenya and Tanzania were almost double those of Senegal and Ghana, with 36 in Kenya in 2020 and 30 in Tanzania in 2022 (Figure 3). Ghana displayed the lowest count of FLN research outputs identified in 2011.

Figure 2: Number of FLN research outputs identified (2010-2023)



Finally, it is important to note that although some additional outputs were identified in university libraries, they could not be considered for this assessment, as they were not available in digital format (not digitised).

Figure 3: Research outputs and trends in Ghana, Kenya, Senegal and Tanzania



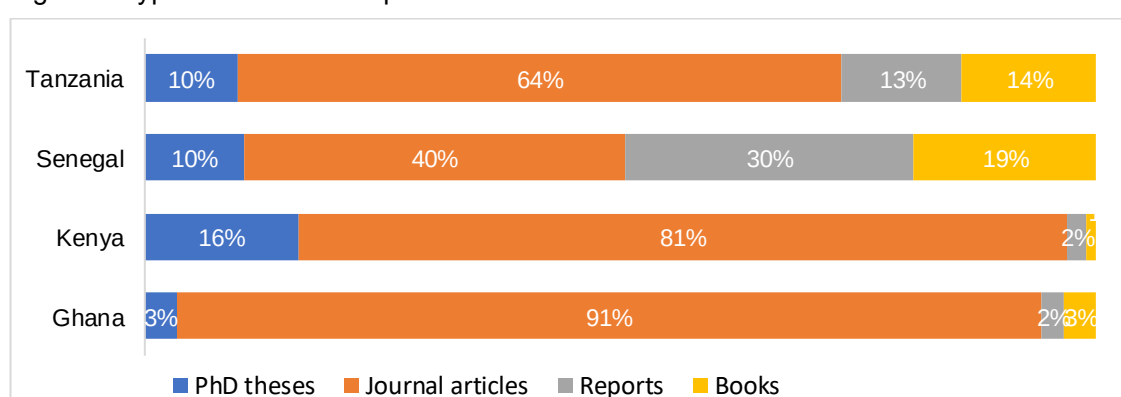
Note: Number of outputs from 2010 to 2023.

Overall, the trend analysis indicates an increase in research outputs in the four countries from 2010 to 2023. Although at different scales across the countries, this upward trend indicates a promising FLN research landscape in terms of knowledge production.

Researchers disseminate their research works through various channels to ensure accessibility and impact. When investigating the types of research outputs researchers undertook, we identified four types of outputs, including journal articles, books (and book chapters), PhD theses, and reports.

Based on the FLN research outputs we identified, it is noticeable that journal articles dominated research outputs in all four countries, with Ghana (91 percent) and Kenya (81 percent) having the highest proportion (Figure 4). Significant differences were observed in Senegal and Tanzania as journal articles accounted for 40 percent and 64 percent respectively. Figure 4 also highlighted that the other types of research outputs were differently distributed across the four countries. Books, for example, accounted for only 1 percent of FLN research outputs identified in Kenya and 3 percent in Ghana. With a slightly higher percentage of outputs in Senegal and Tanzania, books accounted for 19 percent of research outputs in Senegal and 14 percent in Tanzania. Similar observations applied to PhD theses and reports, as shown in Figure 4.

Figure 4: Types of research outputs

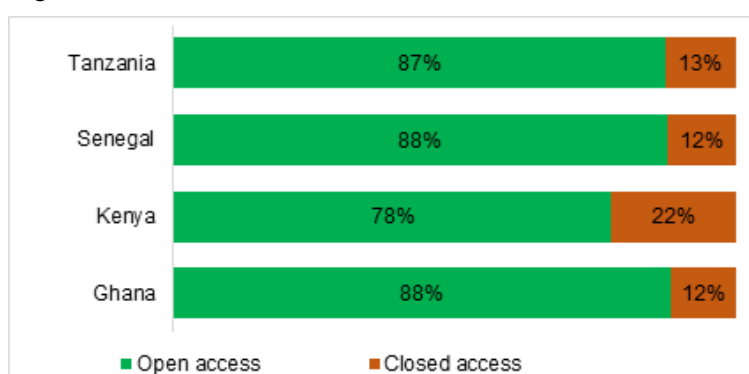


Note: Base = Total research outputs identified per country.

Accessibility of FLN research

Identifying the various types of FLN research does not guarantee its accessibility. Therefore, we examined access to the identified outputs, labeling studies that were freely available for use as 'open access', and those that were not, as 'closed access'. The results of this analysis revealed that Ghana and Senegal (both at 88 percent) had the highest proportions of FLN research outputs in open access, followed by Tanzania (87 percent), and Kenya (78 percent). As most of the research outputs were identified through searches in local repositories, databases and journals, these results raise questions about the types of outputs that were 'closed access'.

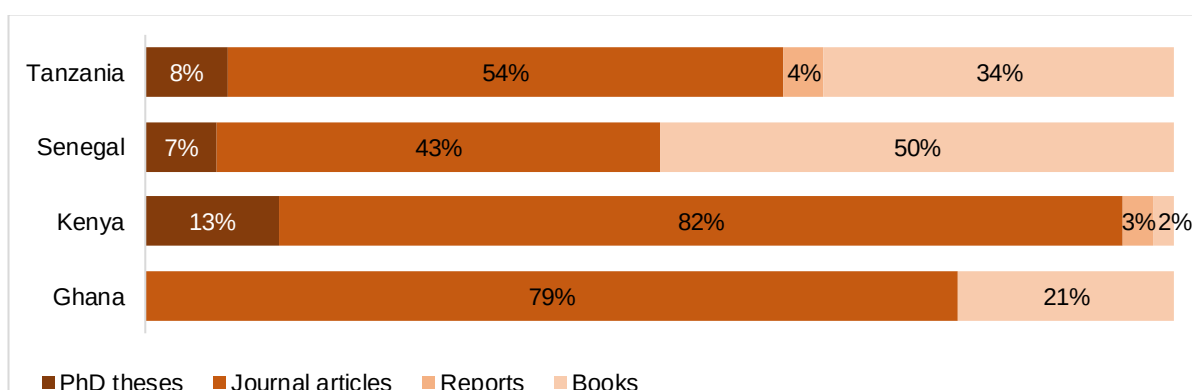
Figure 5: Access to FLN research



Note: Base = Total outputs identified.

The typology of closed access FLN research outputs across Ghana, Kenya, Tanzania, and Senegal revealed varying patterns. In Ghana and Kenya, a significant proportion of journal articles were closed access (79 percent and 82 percent, respectively), whereas online access to books was less restricted (Figure 6). Senegal and Tanzania indicated a different split, with 54 percent of journal articles and 34 percent of books being closed access in Tanzania, while the figures were 43 percent and 50 percent respectively in Senegal (Figure 6). Overall, the data highlighted that while journal articles tended to be more restricted across all four countries, there were notable differences in the accessibility of other research outputs. Also, our search process revealed that some PhD theses, although their cover pages were accessed, they were not available in a digitised format, hence not fully accessible.

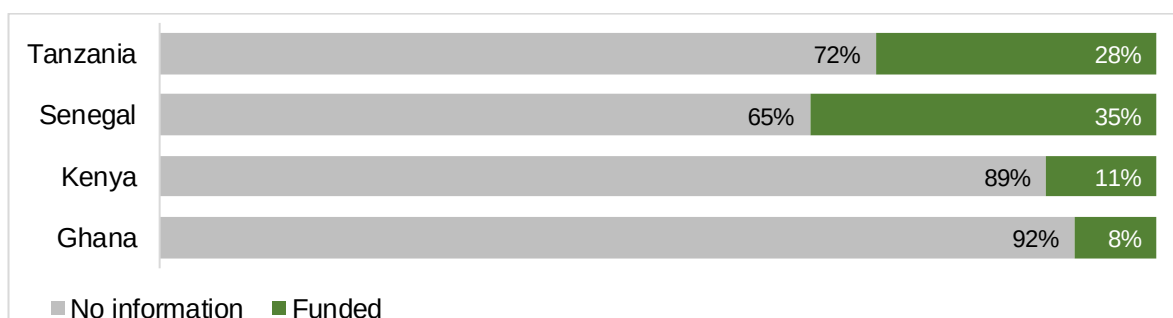
Figure 6: Typology of closed research outputs



Funding of FLN research

Funding plays a crucial role in research, as it contributes to the implementation of innovative research initiatives that help improve the quality of education and learning outcomes. Figure 7 presents the results of assessing FLN research funding in the four countries considered. From the data, only 8 percent and 11 percent of the identified research outputs in Ghana and Kenya, respectively, reported that they received funding. This increased to 28 percent and 35 percent for FLN research outputs in Tanzania and Senegal, respectively.

Figure 7: Funding status of FLN research

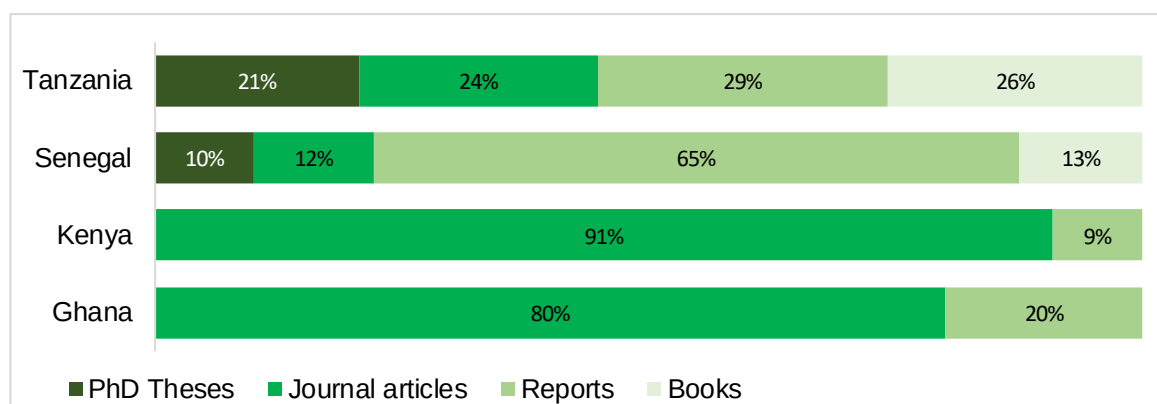


Most research outputs identified however did not mention any source of funding, hence 'no information', accounting for 92 percent in Ghana, 89 percent in Kenya, 65 percent in Senegal and 72 percent in Tanzania. Although no information is not a proxy for no funding, the findings may signal the challenges that researchers face to secure funding for their research. It could also suggest that such research was self-funded rather than funded by an external source. Therefore, further research is needed to provide clarity about the source of funding used to conduct FLN research.

Type of research funded

Using the data on funded studies, we investigated further to determine the types of research outputs that secured funding.

Figure 8: Types of FLN research funded



Note: Base = Funded research outputs

Figure 8 indicates that in Ghana and Kenya, journal articles were the most likely to receive funding, accounting for 80 percent and 91 percent of funded outputs, respectively. In Senegal, reports received the largest share of funding at 65 percent. In Tanzania, in contrast to Ghana, Kenya and Senegal, the various types of research outputs had almost equal chances of securing funding.

Sources of funding for FLN research

In addition, we classified the sources of funding for FLN research in the four countries (Table 1). The common trend across the different countries was that more than 80 percent of funding for FLN research was provided by international organisations and through external philanthropy. Also, the proportion of research funded by government and internal institutions in Ghana and Tanzania, respectively, was promising, as it could signify some local ownership of the research agenda.

Table 1: Sources of funding for FLN research (percent)

	Ghana	Kenya	Senegal	Tanzania
International organisation	44	78	84	82
External philanthropy	38	5	12	3
Internal institution	6	10	0	12
Local organisation	0	5	0	0
Government funding	12	0	4	2
Self-funding	0	2	0	1

Note: Base = Total count of funding sources in each country. The different country reports provide a list of the top institutions funding FLN research.

FLN research focus

This section examines the characteristics of the research outputs identified, focusing on the FLN thematic areas.

The analysis of the thematic areas uses data about the occurrence of different keywords assigned to the research outputs, as listed in Appendix 1. The relative importance of a thematic area is given by the number of times the corresponding keywords were selected. Table 2 presents data for each FLN thematic area in the various countries considered.

Table 2: Distribution of thematic areas by country (percent)

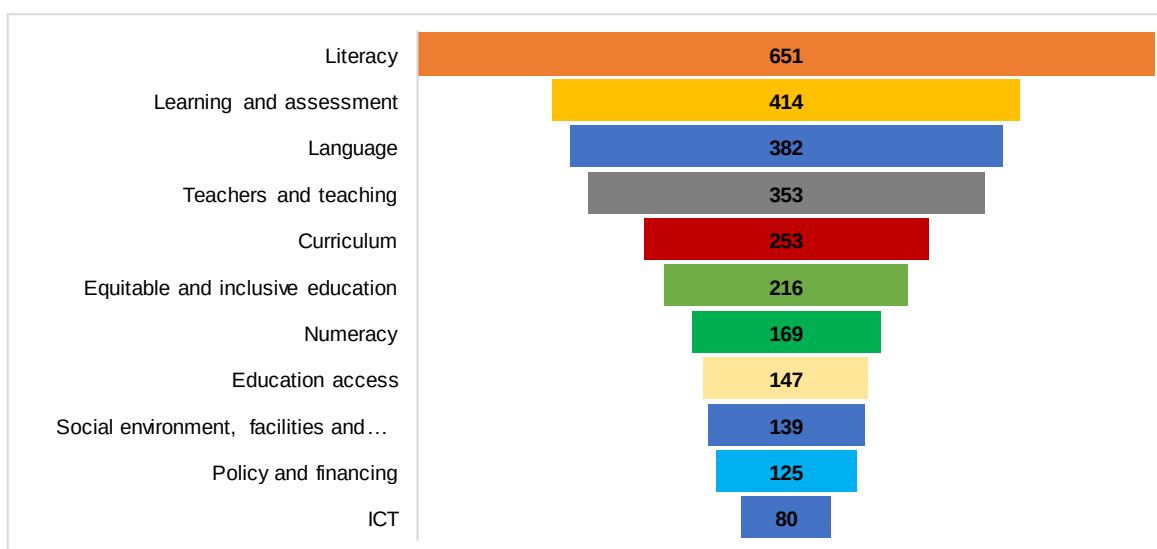
Thematic areas	Ghana	Kenya	Senegal	Tanzania
Curriculum	23	7	5	5
Education access	0	8	3	3
Equitable and inclusive education	8	4	11	14
ICT	0	4	1	1
Language	15	9	18	18
Learning and assessment	5	17	13	12
Literacy	24	23	22	19
Numeracy	11	2	9	10
Policy and financing	2	6	3	2
Social environment, facilities and institutional leadership	1	7	3	3
Teachers and teaching	11	14	10	11

Note: Base = Total research outputs identified. Data on counts of keywords are reported in Appendix 2.

Overall, despite minor heterogeneities, Table 2 demonstrates that FLN research activities in the four countries prioritised (and conversely, overlooked) almost the same thematic areas. The top five themes investigated included 'literacy', 'language', 'equitable and inclusive education', 'learning and assessment', 'teachers and teaching' and 'curriculum'. It appears that 'literacy' and related research topics were the themes most investigated in FLN research in all four countries. Regarding the least investigated themes, a more heterogeneous image appears in the various countries. However, themes related to 'information and communications technology' (ICT), 'education access' and 'policy and financing' were identified in most countries as the least studied.

Figure 9 presents the data on FLN research thematic areas and helps summarise the main lessons from the thematic analysis. Spotlighting 'literacy' and 'numeracy', the results draw attention to the fact that these areas did not receive equal attention in FLN research, despite their equal importance to the development of primary school learners. Specifically, FLN research topics related to literacy received four times more attention than numeracy with 651 and 169 keyword counts respectively (Figure 9) across all four countries. Also, although questions about access to education at the foundational level have been frequently overlooked, learning and assessment and learning of language were examined the most. Finally, considering the relevance of digital literacy as a critical competency of the 21st century, ICT recorded the least keyword counts, which is an issue of concern. This underscores the need for increased research and investment in numeracy as well as a focus on ICT to produce evidence to strengthen FLN.

Figure 9: Thematic areas covered by FLN research across the focus countries

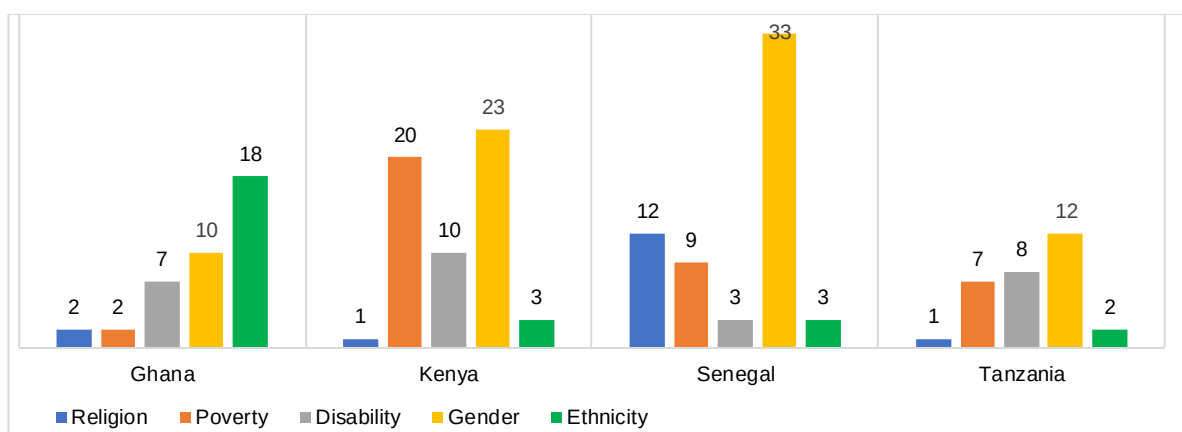


Note: The figures correspond to the counts of keywords for each of the thematic areas.

Inequality included in the research outputs

In line with the Sustainable Development Goal-4, the Africa Union Agenda 2063 and its CESA 2016-25 (African Union, 2015), the identified research outputs were assessed for inclusion of inequality factors such as disability, ethnicity, gender, poverty and religion. Preliminary assessments of the raw data showed that a significant proportion of the research outputs in Ghana (66 percent), Kenya (59 percent), Senegal (58 percent) and Tanzania (33 percent) did not disaggregate FLN findings by either disability, ethnicity, gender, poverty or religion. When available, we used a distribution analysis to probe the relative importance given to the different indicators of inequality.

Figure 10: Inequality factors included in FLN research



Note: Base = Total research outputs identified in each country, see Figure 2. The various factors are not mutually exclusive.

As presented in Figure 10, for studies that targeted these inequality factors in FLN, ethnicity emerged as the most focused in Ghana. In contrast, research from Kenya, Senegal and Tanzania that assessed inequality factors was predominantly focused on gender.

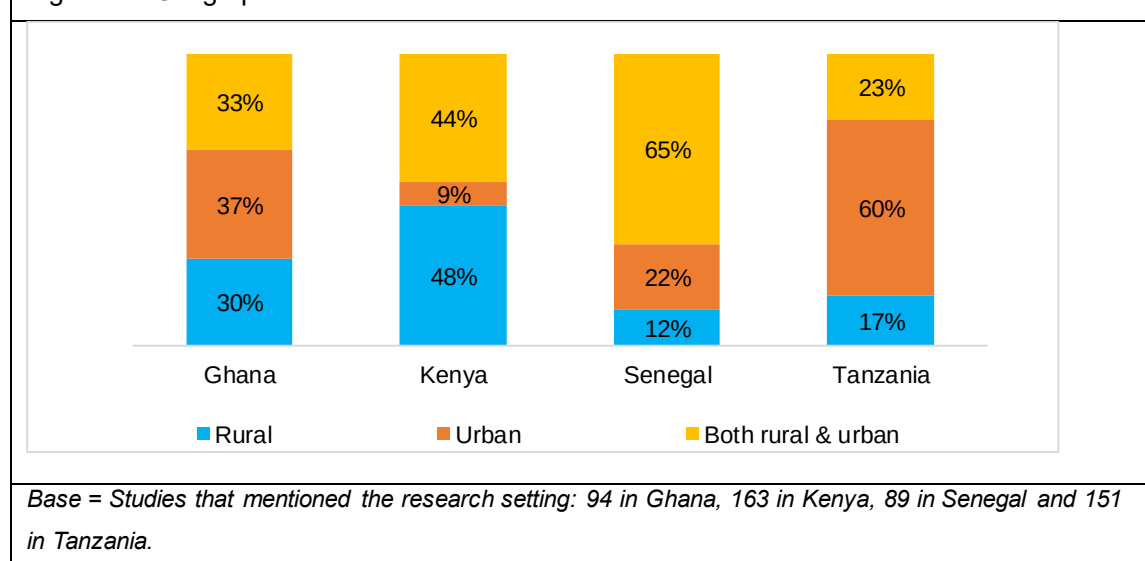
Research location

The location of the research is important when interpreting results, as urban or rural areas may present different circumstances that could affect education opportunities, with rural areas often facing greater deprivation. The research location of the identified FLN studies was examined, which revealed that not all the studies provided information on their specific settings. Upon further investigation, we found that certain research outputs, particularly reviews and studies relying solely on secondary data, did not require a designated location. In Ghana, 22 percent of the studies did not include information on location, while this figure was 23 percent for Senegal and 27 percent for Tanzania. Kenya had the highest proportion, with 45 percent of its studies failing to specify the research location.

For the studies that included the research setting, rural, urban or both (Figure 11), a distinct trend was observed among the focus countries. In Ghana, there was a balanced distribution across the three options. That is, almost equal numbers of studies were conducted in rural, urban, and both urban and rural areas. In Kenya, research in urban areas was limited (9 percent), while in Senegal and Tanzania

research in rural areas was less common, accounting for 12 percent and 17 percent, respectively.

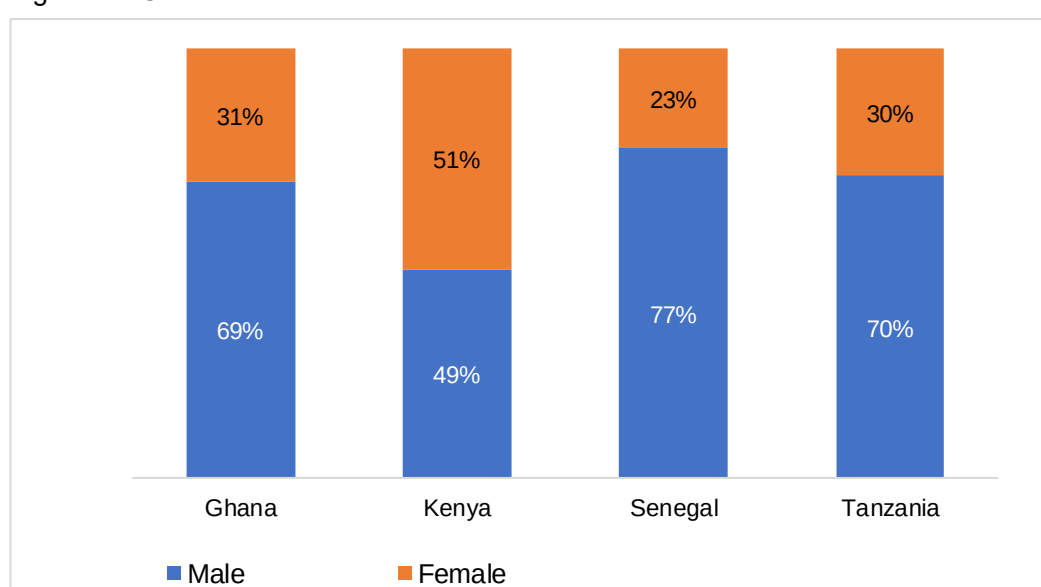
Figure 11: Geographical location of FLN research



Gender of researchers

Existing data has revealed a persistent gender imbalance in higher education and research (ESSA, 2021; ESSA and Southern Hemisphere, 2024). For this study, our assessment used authorship data to examine gender distribution in the field of FLN research in the four focus countries.

Figure 12: Gender distribution in FLN research



Note: Base = Total count of first and co-authors.

Figure 12 presents the data on gender distribution in the four countries considered. It indicated that while a more balanced situation was observed in Kenya, with a 51 percent to 49 percent female-male ratio, an imbalance was observed in the other countries, where male researchers were overrepresented, accounting for 69 percent, 77 percent and 70 percent in Ghana, Senegal and Tanzania, respectively. These figures mirror data from UNESCO, where females constituted only 24 percent of the academic staff for tertiary education (UNESCO, 2020).

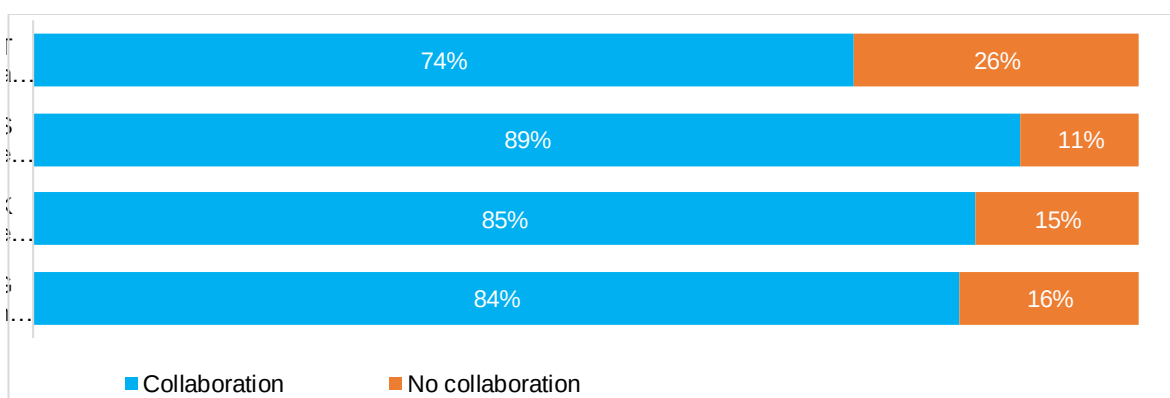
In SSA, the observed imbalance in the gender of authors can be attributed to several factors including the gender norms, which position women primarily as caregivers rather than as professionals seeking academic careers (Ayentimi & Abadi, 2023).

Research collaboration

Collaboration allows researchers to pool their expertise and resources to achieve greater outcomes. This document adopts an authorship-based definition, considering research outputs including more than one author as the result of a collaborative research, irrespective of the authors' institutions or affiliations.

Based on the authorship data, we assessed research collaborations across the four countries. The analysis indicated that African FLN researchers often collaborated to generate knowledge, with 74 percent or more of the outputs identified in all four countries involving collaboration (Figure 13). These figures highlight the interest of most African researchers in collaborative research, which not only involves knowledge sharing, but also correlates with higher impact, as noted by Shen et al. (2021).

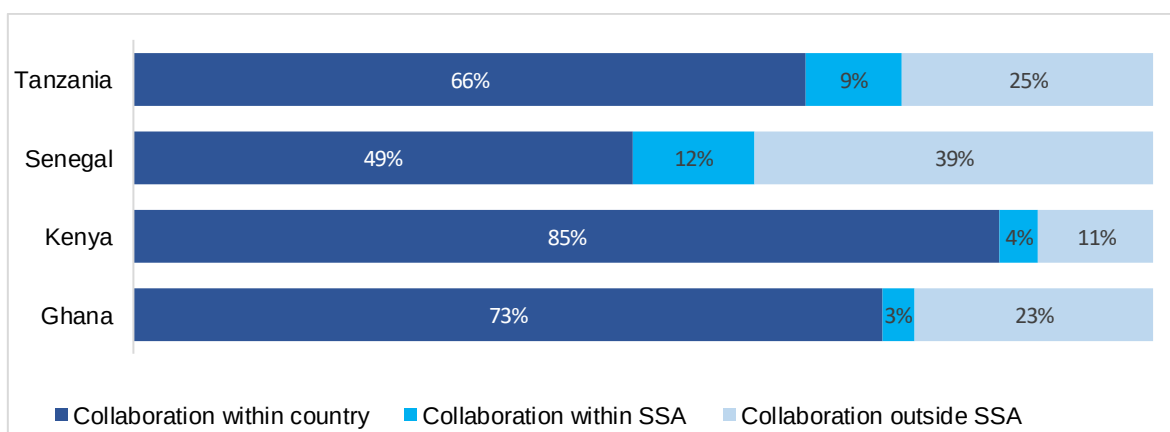
Figure 13: Research collaboration



Note: Base = Total research outputs identified. PhD theses were excluded as they are single-authored.

The collaboration data presented in Figure 13 hides a certain level of heterogeneity since research collaboration involves different levels such as collaboration at the national level and with partners based within SSA or outside SSA. Therefore, we investigated the collaboration in FLN research and its distribution by geographical location (Figure 14).

Figure 12: Collaboration in FLN research by geographical area



Note: Base = Research outputs involving collaboration. PhD theses excluded.

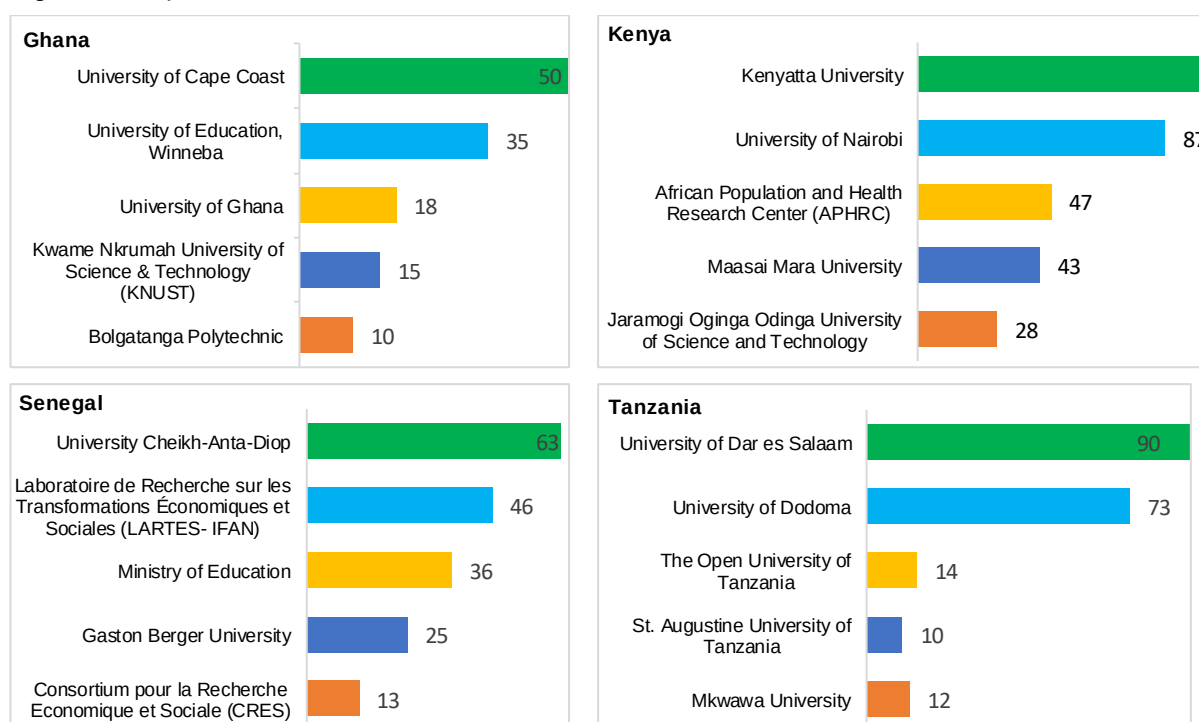
The breakdown of research outputs involving collaboration indicated that national-level collaboration was the predominant form, representing 73 percent in Ghana, 85 percent in Kenya, 49 percent in Senegal, and 66 percent in Tanzania. In all four countries, research outputs resulting from collaboration outside SSA outnumbered those that were the product of collaboration within SSA, with Ghana having the lowest percentage of collaborations within SSA (3 percent), and Senegal the highest (12 percent).

The literature suggests that collaborative research is growing in popularity as it promotes greater dissemination and experience, best practices and expertise sharing (Wray, 2002; Bukvova, 2010). Nevertheless, providing evidence-based explanations for our findings on research collaborations (within versus outside SSA), particularly in the FLN space is not straightforward. A potential explanation for the observed patterns in research collaboration in Africa could be because of funding. Given that most research funding is provided by funders/partners based outside SSA (see the section on funding above), this may favour collaborations outside SSA, compared to collaborations within SSA.

Top institutions in FLN research

To identify institutions contributing to FLN research in the countries considered, we collected data about authors' institutional affiliations. Using this data to rank them, we counted the number of times each institution was mentioned. Figure 15 presents the top five institutions that contributed the most to FLN research in Ghana, Kenya, Senegal and Tanzania. A full list is available in the different country reports.

Figure 13: Top FLN research institutions



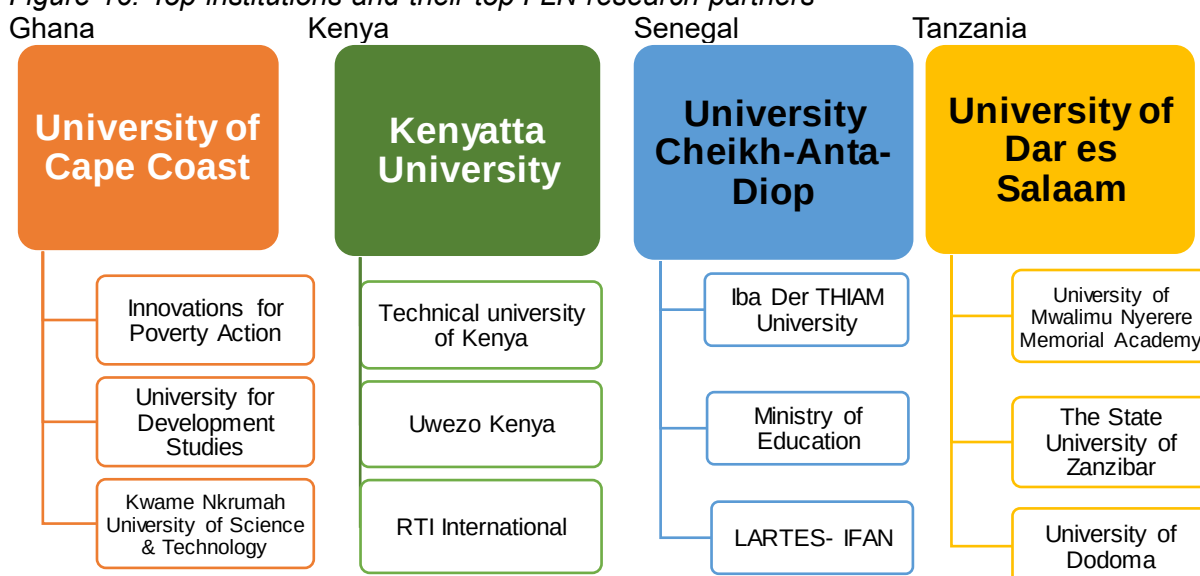
Note: A full list is available in the different country reports. The total count of institutions exceeds research outputs identified. In instances where a single author contributes to multiple research outputs, the institutional affiliation of the author is counted separately for each output.

The top five institutions contributing to FLN research in the countries considered were mainly higher education institutions (HEIs). A few exceptions were observed in Kenya and Senegal, where non-governmental organisations, namely, the African Population and Health Research Center (APHRC) and the Consortium pour la Recherche Economique et Sociale (CRES), significantly contributed to FLN research. Overall, based on Figure 15, we can estimate that 90 percent of top institutions contributing to FLN research in SSA are HEIs, against 10 percent of non-governmental organisations.

Collaboration patterns within top institutions

Using data focusing on collaboration patterns for top institutions in the four countries, we identified their top three FLN research partners (Figure 16). The data shows that most research partners of the top institutions were country-based organisations or institutions. For example, in Senegal, the Ministry of Education was a key contributor to the research and interestingly collaborated with the University of Cheikh-Anta-Diop. The exception was Kenya, where RTI International appears among the top three partners of Kenyatta University. This was not surprising, since our data also showed the predominance of in-country research collaborations (see Figure 13, above).

Figure 16: Top institutions and their top FLN research partners



6. Challenges and limitations

Identifying and mapping locally published or unpublished FLN research is a time-consuming process, as it involves sifting through a vast amount of documents to determine which research outputs meet the project's inclusion criteria. Additionally, most databases were limited for systematic searches, which increased the manual component of the process.

The data presented in this report was sourced from local databases and institutional repositories in the four countries, as well as websites, and academic portals available online. However, we recognise that some research outputs identified from African Journals Online (AJOL) and elsewhere may also be indexed in international databases such as Scopus, Web of Science, and Dimensions. Therefore, in each country report, duplicates from country-level searches and international database searches were searched for and removed from the list of outputs. Final results may not be entirely free of duplication, but we expect the number to be relatively small which should not affect our results significantly.

The availability of Francophone language papers was limited (as was the case for Lusophone papers, see Binesse & Rose, 2024), and far fewer French language research studies were available online with most accessible only in hard copy.

The lack of a centralised database for education research in Senegal and Tanzania was also a major obstacle. Without a comprehensive repository, it was challenging to identify and map the existing research holistically and effectively.

While the searches outlined above yielded a substantial volume of research outputs, there is a chance that some research reports or book chapters not accessible through institutional repositories or online portals, were not included. Many of the research outputs were dispersed and not available online, making it challenging to obtain a holistic and effective understanding of the existing research.

The analysis only considered funding sources as mentioned by researchers. Studies that did not include funding information may have been funded by individual researchers or other external sources. This is a limitation in the data and the analysis, as no funding information is not a proxy for non-funded research.

Finally, identifying authors' gender was challenging when only surnames and initials were provided in some research outputs, despite efforts to trace identities using online resources like Google, Google Scholar, and authors' institutional affiliation profiles. All cases where explicit information was not provided in the identified studies or clearly identified through the authors' online profiles were designated as 'unknown'.

7. Conclusion and recommendations

Despite its importance for child development, FLN often lacks priority in educational policies and investments in SSA, leading to poor learning outcomes for children. Addressing these challenges will require greater collaborative efforts from funders, practitioners and other education decision-makers. There also needs to be greater emphasis on using locally produced research, data, and evidence-based approaches to enhance children's cognitive development and their reading, writing, and arithmetic skills. Through our mapping work, and by engaging with the African FLN researchers directly, we have been able to respond to some key questions, such as those related to the FLN knowledge landscape, challenges faced by FLN researchers in SSA countries (and potential solutions), as well as understanding the researchers' capacity strengthening needs and priorities.

This report presented the findings from the mapping of FLN research focusing on Ghana, Kenya, Senegal and Tanzania, which serve as case studies for understanding the FLN space in SSA. Overall, the mapping exercise aimed not only to identify FLN research outputs, themes and trends, knowledge gaps, and to understand critical issues affecting research output, but also to improve the visibility of SSA-based FLN researchers and their research.

Our results provided evidence of a promising FLN research landscape in SSA in terms of knowledge production, research collaboration, and the variety of themes investigated. Specifically, an upward trend in locally generated research outputs was observed from 2010 to 2023 in the four countries. Regarding research collaboration (multiple authorship), almost 80 percent of all research outputs were the results of

collaborative studies. However, the data indicated that more collaboration within SSA needs to be encouraged and supported through resource provision.

While various research themes were covered in the analysis, the research outputs were dominated by thematic areas such as 'literacy', 'language', 'equitable and inclusive education', 'learning and assessment', 'teachers and teaching' and 'curriculum'. There was however minimal focus on ICT despite its growing importance. Coverage of numeracy was also outweighed by literacy in most of the research outputs in all of the four countries.

When investigating research funding, our results indicated that only eight percent and 11 percent of studies in Ghana and Kenya, respectively, reported that they received funding, while the figures were 28 percent and 35 percent in Tanzania and Senegal, respectively. These low figures may reflect some of the challenges FLN researchers face in securing research funding. However, they also highlight one of the limitations of our work, regarding insufficient data about funding for FLN research. When 'no information' is provided on research outputs, it is impossible to determine whether the study has secured funding or is self-funded.

This study succeeded in conducting a bibliometric analysis of FLN research outputs generated by researchers based in SSA that are unpublished and/or published in local journals and institutional repositories. This will help to improve the visibility and accessibility of the FLN researchers and promote the uptake and use of their outputs by decision-makers.

However, more research is needed (including at the country-level) to further interrogate what other interventions may be needed to enhance the field of FLN research in SSA now and in the future. The following recommendations aimed at funders, decision-makers and researchers hopefully provide some guidance on how this may be achieved.

Recommendations

For funders

- Increase funding for under-researched areas. Fund and support research on topics that are less investigated and help to fill knowledge gaps identified by the thematic analysis. Funding should also support within- and cross-country collaboration, particularly within SSA.
- Promote and finance FLN research collaboration within SSA. Ideally this would also bridge the inequity and language divide between Anglophone and Francophone researchers.
- **For educational decision-makers and university leaders**
- Support the setup and regular update of institutional research repositories. This would promote greater knowledge dissemination, access and use.
- Allocate part of the national Research & Development (R&D) budget to education research, including research focusing on FLN.
- Liaise with researchers to create learning communities to align knowledge gaps identified with research and national priorities.
- Prioritise the inclusion of female researchers and other minority groups (e.g. early career researchers) in FLN research and projects by offering female researchers and minority groups targeted grants, scholarships, mentorships, and fellowships.

For education researchers

- Align future FLN research with research gaps identified through this bibliometric analysis, and national research priorities.
- Integrate gender equality and social inclusion factors into research, including disability, poverty, and religion, to ensure more inclusive and equitable educational outcomes.
- Use the results of this bibliometric analysis and the corresponding metadata to access locally available FLN research outputs and use them for thematic reviews.
- Mention the funding source in research outputs if the research project is funded, and clearly specify if unfunded or self-funded when applicable.
- Work in consortia and collaborate with SSA-based counterparts.

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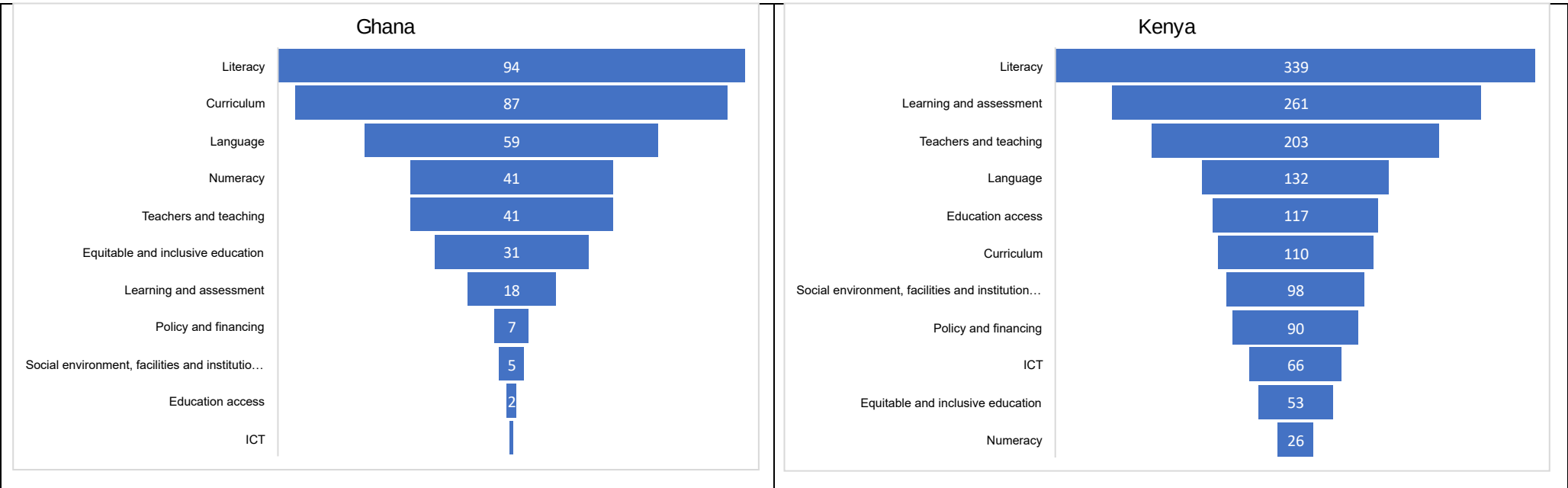
Appendices

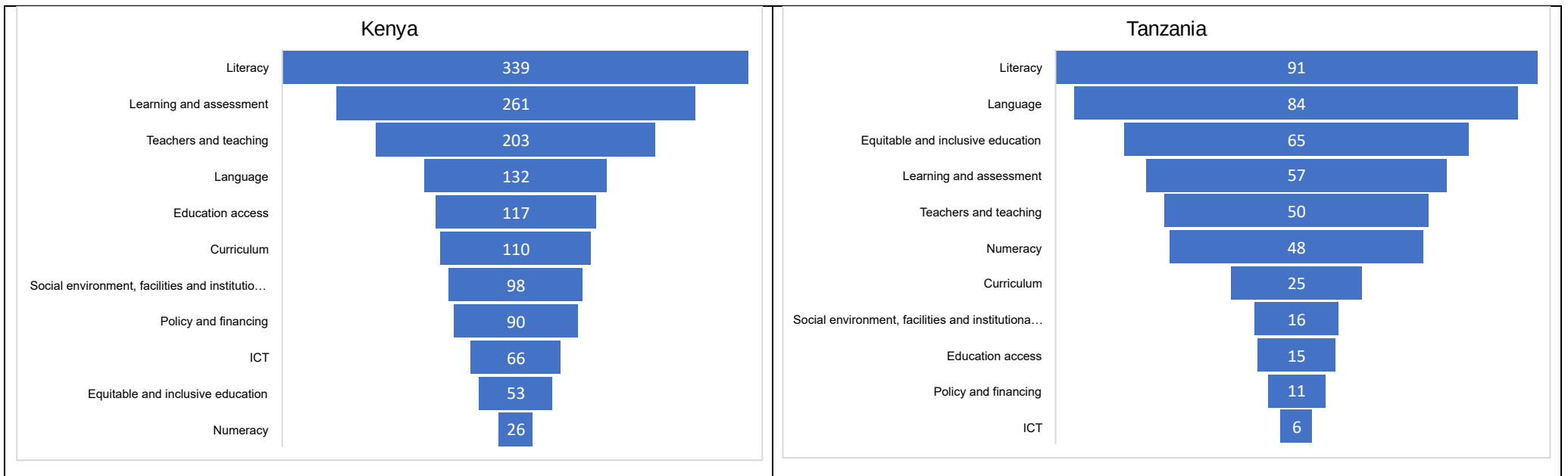
Appendix 1: Keywords and corresponding thematic areas

Thematic areas	Keywords
Literacy	Literacy; Reading; Writing; Speaking skills.
Numeracy	Numeracy; Mathematics Education
Learning and assessment	Assessment; Household factors associated with student learning; Standards of attainment; Student motivation; Learning outcomes.
Curriculum	Textbooks; Curriculum reform; Curriculum relevance; Socio-emotional skills; Health education; Science education; Peace education; Value education; Environmental education.
Teachers and teaching	Peer learning; Teacher-student relations; Teacher education; Teacher capacity; Teacher motivation; Teacher deployment; Indigenous pedagogies; Problem-based learning; Time for learning; Class size; Teacher supervision; Teaching methods.
Social environment, facilities and institutional leadership	Community participation; Local knowledge and practices; Library; Violence; Wellbeing; Home-school relations; Parental engagement; Nutrition; Infrastructure; Student voice; Leadership and management.
Education access	Drop-out; Progression, repetition; Enrolment; Access to education; Distance education; Alternative provision; Out-of-school children; Completion; Emergency education provision; Student attendance; Widening participation.
Language	Language of instruction; African languages; French language; English language; Portuguese language.
Equitable and inclusive education	Special education; Child labour; Psychosocial support; Regional disparities in access and learning; Mental health; Emotional and behavioural difficulties; Low attaining students; Remedial education; Early pregnancy/marriage; Disability; Gender; Ethnicity; Poverty; Religion.
ICT	Learning using mobile phones; ICT in education; E-learning

Policy and financing	Education policy; Government spending; Household spending; Private schools; Public private partnership; Cost-effectiveness; Expansion of provision; National development; Regional disparities in resourcing; Donors and NGOs; Benefits of education; Student financial support; School feeding.
Other	Covid-19; Intervention evaluation.

Appendix 2: Distribution of thematic areas by country





Appendix 3: Top 10 FLN funders

Ghana	
Jacobs Foundation	3
The Institute of Education Sciences	1
The Lego Foundation	1
US Department of Education, Institute of Education Sciences	1
U.S. Department of Education, through Grant	1
UBS Optimus Foundation	1
UK Research and Innovation (UKRI) - Newton Fund	1
UNICEF	1
United States Agency for International Development (USAID)	1
The UK Research and Innovation (UKRI)-Newton Fund	1

Senegal	
United States Agency for International Development (USAID)	9
Francophone University Agency	5
William and Flora Hewlett Foundation	4
International Development Research Centre (IDRC)	4
French Development Agency	4
International Development Research Centre (IDRC)	4
World Bank	3
Australian Development Agency (Ausaid)	3
Partnership for Economic Policy (PEP)	3
Canadian International Development Agency (CIDA)	3

Kenya	
United States Agency for International Development (USAID)	13
William and Flora Hewlett Foundation	7
International Research and Development Centre (IDRC)	2
Dubai Cares	1
World Bank -Education Program Development Fund	1
Department for International Aid (Dfid)	1
Education Program Development Fund	1
Aga Khan Academies Unit	1
Department for International Development (DFID)	1
Professional Development Award	1

Tanzania	
Åbo Akademi Foundation	6
Swedish Council for Research	5
The Open University of Tanzania	4
United States Agency for International Development (USAID)	4
SIDA	3
UNICEF	3
William and Flora Hewlett Foundation	3
World Bank	3
Partnership to Strengthen Innovation and Practice in Secondary Education (PSIPSE)	2
United Kingdom's Foreign, Commonwealth and Development Office	2

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