Data-Driven Teacher Deployment in Sierra Leone

Practicalities and quantitative analysis of using a matching algorithm in the 2024/25 recruitment cycle

About this document

Recommended citation

Koutecký, T., Mackintosh, A., Huti, M., Adam, T., Godwin, K., & Frazer, M. M. (2025). *Data-Driven Teacher Deployment in Sierra Leone: Practicalities and quantitative analysis of using a matching algorithm in the 2024/25 deployment cycle* [Report]. EdTech Hub. https://doi.org/10.53832/edtechhub.1115. Available at https://docs.edtechhub.org/lib/ICRSXHTV. Available under Creative Commons Attribution 4.0 International.

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Contents

Figures

Tables

Abbreviations and acronyms

ASC   Annual School Census

BECE   Basic Education Certificate Examination

EMIS   Education management information system

FQSE   Free Quality School Education

GPE   Global Partnership for Education

HQ   Headquarters

HTC   Higher Teaching Certificate

JSS   Junior Secondary School

LGI   Learning Generation Initiative

MTHE   Ministry of Technical and Higher Education

NIN   National Identity Number

NPSE   National Primary School Examination

PIN   Payroll Identification Number

PPTR   Pupil-to-payroll-teacher ratio

SGLA   Sierra Leone Secondary Grade Learning Assessment

SLEIC   Sierra Leone Education Innovation Challenge

SSS   Senior Secondary School

StatsSL   Statistics Sierra Leone

TC   Teaching Certificate

TMIS   Teacher management information system

TSC   Teaching Service Commission

WASSCE   West African Senior School Certificate Examination

Background to the multi-year research

This report is part of the multi-year EdTech-Hub-Led project (HLR 3) on the Impact of GIS-Supported Teacher Allocation in Sierra Leone[1] where EdTech Hub and research partners Fab Inc. and the Learning Generation Initiative (LGI) are undertaking a series of research studies with the Sierra Leone Teaching Service Commission (TSC) to explore the most feasible approach to improving teacher allocation. The HLR 3 project aims to help government decision-makers by generating new evidence and providing insights on critical elements of teacher recruitment and deployment, such as teacher preferences, teacher mobility, and retention patterns. Table 1 below lists the research activities and studies in this series since 2021. The final studies in this series seek to understand whether using geographic information system (GIS) data and preference matching can help the TSC meet its policy goals around teacher deployment, such as ensuring a gender balance and improving allocation to remote schools.

The education workforce is the most important school-level determinant of student learning (⭡Education Commission, 2019). Sierra Leone faces a particular challenge of a high number of non-payroll teachers, high pupil-to-teacher ratios, and difficulties with deploying teachers to rural and hard-to-reach areas. For example, the pupil-to-qualified-teacher ratio rises from 44:1 for schools in urban centres to 76:1 for schools in rural areas (⭡Mackintosh et al., 2020a). Even though the Teaching Service Commission (TSC) has developed different approaches to teacher deployment over the past few years, these reforms have not yet achieved the intended results.

In this context, the TSC has explored new options to address teacher deployment challenges, including an algorithm that uses an innovative preference matching model, harnesses geospatial data, and takes into account teacher preferences and school needs (such as pupil-to-teacher ratio, among others) to strengthen workforce allocation. This report details findings from the final study in this series, which aimed to assess the impact of the new process using the algorithm on teacher deployment decision-making in 2024.

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[1] See https://edtechhub.org/evidence/edtech-hub-research-portfolio/impact-of-gis-supported-teacher-allocation-sierra-leone/. Retrieved 15 May 2025.

Table 1. *Timeline of HLR3 research activities and outputs*

Date	Phase	Activities
2021	Proposal	EdTech Hub, Fab Inc., and the Education Commission worked on a technical proposal to present to the Teaching Service Commission (TSC) on supporting teacher allocation using GIS and a preference matching model. 🔖 **Key output:** Factors Related to Teacher Absenteeism in Sierra Leone—Literature review (No. 2) (↑Vijil et al.,2023)
2022	Kick-off	Worked with the TSC to further scope the research and understand what the TSC needed to know to improve teacher allocation. 🔖 **Key output:** *The impact of GIS-supported teacher allocation in Sierra Leone* —Inception Report, unpublished (↑EdTech Hub et al., 2022)
February 2022	Qualitative fieldwork	Undertook semi-structured interviews and focus group discussions with teachers and school leaders in two districts to explore teacher preferences. 🔖 **Key outputs:** *Using technology to improve the equity of teacher allocation in Sierra Leone: the challenge and a way forward—Blog post on qualitative work* (↑McBurnie et al., 2022c) *When teachers are asked to deploy other teachers, we learn a lot about teacher preferences—Blog post on qualitative work* (↑McBurnie et al., 2022a) *What Matters Most for Teacher Deployment? A Case Study on Teacher School Choice Preferences in Sierra Leone*—Report on qualitative fieldwork (↑McBurnie et al., 2022b)
August 2022	Quantitative analysis	Quantitative survey of school leaders' perceptions of what shapes school location preferences and the factors that should be in place to address the imbalanced distribution of qualified teachers in the country. 🔖 **Key output:** *School Leaders' Preferences on School Location in Sierra Leone* Technical Report—(↑Espinoza-Revollo et al., 2022)
March 2023	Quantitative analysis	Quantitative analysis was carried out nationally to analyse the movement and retention of payroll

		teachers from 2015 to 2021. 🔖 **Key outputs:** *Where do teachers go, and where do they stay?*—*Blog post on quantitative analysis* (⬆Lurvink et al., 2023a) *School-to-School Mobility Patterns and Retention Rates of Payroll Teachers in Sierra Leone*—*Working Paper No. 48* (⬆Espinoza-Revollo et al., 2023)
March 2023	Qualitative analysis	We explore whether mobility patterns vary by teachers' gender or qualifications, and whether the teaching workforce is urbanising. 🔖 **Key output:** *School-to-School Mobility Patterns and Retention Rates of Payroll Teachers in Sierra Leone*—*Working Paper No. 48* (⬆Espinoza-Revollo et al., 2023)
November 2023	Qualitative fieldwork	Qualitative study into why teachers in Sierra Leone move schools. 🔖 **Key output:** *Teacher Retention and Mobility in Sierra Leone: What factors contribute to teachers' motivation to stay or leave schools*—Report (⬆Lurvink et al., 2023b)
June 2025	Qualitative fieldwork & Quantitative analysis	A qualitative survey to better understand how changes to teacher deployment processes can facilitate equitable allocation to support improved learning for all, and a quantitative analysis on the practicalities of implementing a matching algorithm amid data challenges and shifting priorities. 🔖 **Key outputs:** From algorithm outputs to classroom impact: A conversation with Marian Abu, director of teacher management at the Teaching Service Commission—Blog post (⬆Frazer, 2024) *Shifting Power Dynamics in Education Decision-Making: Investigating the role of a matching algorithm to improve teacher deployment in Sierra Leone*—Report From Qualitative Survey—(⬆Godwin et al., 2025) Data-Driven Teacher Deployment in Sierra Leone: Practicalities and quantitative analysis of using a matching algorithm in the 2024/25 deployment cycle—Report From Quantitative Analysis (this paper)—(⬆Koutecký et al., 2025)

1. Introduction

Teacher salaries often account for approximately three-quarters of education spending in low- and middle-income countries (LMICs), yet countries face many challenges in ensuring an equitable distribution of teachers across schools and implementing fair policies of recruitment and promotion (⬆Education Commission, 2019). The Teaching Service Commission (TSC) in Sierra Leone is attempting to meet some of these challenges by pursuing ambitious data-driven approaches to teacher management. This has included the recent development of a Teacher Management Information System (TMIS) as well as the introduction of a digitised Teacher Licensing Exam. Building on this, the TSC introduced the use of a matching algorithm into their 2024/25 recruitment process. This paper looks at some of the practicalities and a quantitative analysis of how this was implemented.

Sierra Leone has made education a priority in recent years, allocating more than 20% of the government budget to the sector. The introduction of the Free Quality School Education (FQSE) Policy in 2018 had a significant impact on enrolment, with student numbers across pre-primary to senior secondary schools increasing from 1,982,475 in 2018 (⬆MBSSE, 2018) to 3,461,876 in the 2023/24 school year (⬆Government of Sierra Leone, 2024). However, this increase in enrolment also brings challenges in terms of the teachers and staff needed to provide those children with a quality education. Despite additions to the teacher payroll over recent years, only 40 per cent of teachers are on the government payroll nationally, meaning that volunteer teachers comprise a significant proportion of the education workforce and are overrepresented in remote areas (⬆UNICEF, Forthcoming).

To meet these challenges, the TSC wants to pursue data-driven recruitment of new teachers onto the government payroll and ensure this is done in alignment with its priorities. In particular, the 2024/25 recruitment process was the first time the TSC restricted recruitment only to those teachers who had passed the newly introduced Teacher Licensing Exam, both to ensure the quality of those recruited and to incentivise teachers to register and take the exam.

As a long-term partner to the TSC and the Ministry of Basic and Senior Secondary Education (MBSSE) in data management and data-driven policy development, Fab Inc. supported the TSC in the 2024/25 recruitment process using the flexible matching algorithm previously developed as an open-source public good. The Fab Inc. team worked with the TSC,

particularly the Teacher Management Directorate, to agree on the matching criteria, train TSC staff on the algorithm's use, and refine the tool to support their use. However, there are many steps along the way and many stakeholders involved, from configuring an algorithm to adding teachers to the government payroll. Thus, this report examines the practicalities of implementing a data-driven process and the quantitative analysis of its outputs.

In this context, EdTech Hub, Fab Inc., and the Learning Generation Initiative (LGI) collaborated with the TSC to provide technical support to improve teacher allocation and undertake a series of studies on key elements of the deployment process, including teacher preferences, teacher mobility, and retention nationally. This piece of research builds on the existing studies shown in Table 1, as well as the parallel qualitative research published in the report *Shifting Power Dynamics in Education Decision-Making: Investigating the role of a matching algorithm to improve teacher deployment in Sierra Leone* (⬆Godwin et al., 2025). This paper aims to:

- Discuss some of the practicalities of implementing a matching algorithm amid data challenges and shifting priorities.

- Quantitatively analyse the resulting allocations from the 2024/25 recruitment.

- Assess the future potential of the matching algorithm in a scenario where all teachers are licensed — one of the binding constraints from the 2024/25 process.

2. What is the Teacher Deployment Algorithm?

In 2022, Fab Inc., supported by EdTech Hub funding, designed an open-source Teacher Deployment Algorithm[2] to support governments around the world to strengthen workforce planning processes. The algorithm enables a user to flexibly incorporate their own deployment criteria, including both school and teacher preferences as required, and to clearly visualise the outputs. It was developed for use by any country, but as an illustrative example, the default settings were configured to implement an illustrative deployment in Sierra Leone. The algorithm's flexibility meant these could be easily adapted to new criteria.

2.1. How does the Teacher Deployment Algorithm work?

The Teacher Deployment Algorithm works by matching schools' and teachers' preferences within a set of rules/conditions and is configured to prioritise schools based on their teacher needs. This is governed by the hierarchy of match settings, which enables some aspects to be prioritised over others. The magnitude of school need is defined by the pupil-to-payroll-teacher ratio (PPTR), with schools with no payroll teachers or the fewest payroll teachers relative to pupil enrolment considered the most marginalised and thus prioritised for teacher deployment. When allocating teachers to schools, the algorithm prioritises teachers with the characteristics most desired by schools in need. Simultaneously, teacher preferences for school characteristics are considered in the matching process. The outcome of the deployment algorithm is the suggested allocation of teachers to individual schools, and how this affects children's equitable access to qualified, licensed, payroll teachers.

2.1.1. What is the hierarchy of match settings?

The algorithm uses a hierarchical approach, matching teachers to schools in priority order to meet the set rules, balance priorities, and resolve any tie-breaks.

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[2] See https://github.com/Fab-Inc/FabMatch_SLE. Retrieved 30 October 2025.

1. Schools are prioritised in terms of need

Need is defined as the number of teachers needed to reach the national PPTR (for a given educational level). Teachers are allocated first to schools with the highest need.

2. Rules (and valid pairs) are set

Set rules are the most powerful of the match settings and are followed at all times during the matching process (e.g., share of total teacher cap distributed across school levels, which cannot exceed the set threshold).

The same holds for valid pairs. These include 'match key' which restricts possible matches to 'school and teacher' pairs according to defined joint characteristics (e.g., a teacher with a specific school level preference will only be considered for deployment to the desired school level), and 'radius' which uses latitude and longitude values to enforce a match between schools and teachers within a given radius of each other (e.g., 3 km to minimise travel time).

3. Preferences are set

School preferences are selected from teachers' attributes (e.g., schools prefer teachers with higher teaching qualifications). Teachers' preferences are selected from schools' attributes (e.g., teachers prefer schools which are closer to their current location).

4. Tie breaks are solved

If there are multiple teachers who could be assigned to a school, a tie-break is needed to determine which of them is deployed (e.g., schools would prioritise hiring a female teacher if there was a tie between a male and a female teacher on other characteristics).

2.2. How was the teacher recruitment conducted in 2024?

During the 2024/25 recruitment process, the TSC intended to add a total of 2,000 new teachers to the government payroll. Note that a separate set of 1,000 pre-primary teachers was to be hired using Global Partnership for Education (GPE) funding, and 1,238 additional teachers were to be added onto the government payroll to replace teachers retiring or otherwise leaving the payroll workforce. **This research focuses on the main recruitment of 2,000 new teachers onto the government payroll, although this later increased to 2,341 teachers in total.**

In implementing the 2024/25 recruitment process, a number of changes were introduced to the initially intended criteria of the matching algorithm. In addition, practicalities, such as working with other government ministries to finalise the additions to the government payroll, were also required. The main steps of the 2024/25 recruitment process are set out in the timeline in Section 2.2.1 below.

2.2.1. Timeline

Figure 1 illustrates the process of teachers registering on the TMIS and taking the first digital licensing exam in January 2024, through to the first payment of teacher salaries, with newly deployed teachers starting to receive their salaries for the first time a year later.

Figure 1. *Timeline of the 2024/25 teacher recruitment process*

Jan 24	Apr 24	Jun-Aug 24	Aug 24
• First round of Teacher Licensing Exam conducted	• TSC confirm they want to use the flexible algorithm; extensive working sessions held with Teacher Management Directorate and Senior Management • Original intended criteria agreed	• Second and third rounds of Teacher Licensing Exam held	• First adaptations of criteria to incorporate learning outcomes into the allocation to satisfy GPE payment trigger • 2023/24 ASC data received

Sep 24	Oct-Nov 24	Dec 24	Jan 25
• Algorithm run on 2023/24 data for 2,000 teachers • Limited number of teachers passing the Teacher Licensing Exam required teachers to be allocated across districts in order to meet the original strict district quotas	• Pushback on distance for teachers to move • TSC updates to relax district quotas, while still meeting the GPE payment trigger requirements. Now limit of 5km set for redeployment • Algorithm re-run for 2,000 teachers	• Additional feedback including on religious schools • Proxy data on religion incorporated • Additional 341 teachers added to budget, and algorithm re-run • TSC working with NASSIT and MoF to get teachers their pin codes*	• Teachers newly added to payroll start to receive their salaries

* NASSIT = National Social Security and Insurance Trust; MOF = Ministry of Finance

2.2.2. How did the matching criteria set for teacher deployment change across the 2024/25 recruitment process?

The main updates to the initial matching criteria were made when the data of licensed teachers who had passed the licensing exam was incorporated in August 2024. To allow for the deployment of licensed teachers to nearby schools, the following criteria were updated (these are explained in more detail in Table 2 below):

0. School level quota (raised for junior secondary, lowered for other school levels).

1. Eligible schools (schools need to have Level Two Approval — i.e., be financially supported by the government; however, a requirement for schools to have held Level Two Approval for the past three years was removed).

2. Remote school preference (dropped).

3. Gender preference (downgraded to a tie-break).

4. Teacher experience tie-break (dropped as data is not in the TMIS).

The district-level quota was also updated in September 2024 to be guided by PPTRs and learning outcomes. Finally, based on feedback on the challenges related to deploying Muslim teachers to Christian schools and vice versa, an additional criterion of deploying teachers to schools of the same religion as teachers' preferred schools was created in November 2024, and the radius for teacher deployment from preferred school was raised to a maximum of 42 km to allow for deployment of all teachers, while not over-subscribing eligible schools).

Table 2. *Changes to the matching criteria across the 2024/25 recruitment process*

April 24	Sep 24	Nov 24	Dec 24
2,000 teachers	2,000 teachers	2,000 teachers	2,341 teachers
Rule—District level quota: The teacher quota would be distributed to individual districts as guided by the PPTR across districts in an effort to reduce inequalities between districts	Rule—District level quota: Based on PPTR across districts and learning outcomes (to meet GPE funding criteria)		
Rule—School level quota: Teacher quota would be distributed as follows: pre-primary (5%), primary (60%), JSS (20%), SSS (15%)*	Rule—School level quota: Teacher quota updated to correspond to school levels of teachers who passed the Teacher Licensing Exam as follows: pre-primary (2.09%), primary (45.15%), JSS (38.49%), SSS (14.27%)		
Rule—Prioritised schools: Schools within districts at each school level are prioritised in terms of need, based on the PPTR (for a given education level). The schools with the highest need are allocated teachers first			
Rule—Teachers are licensed: Only teachers who passed the Teacher Licensing Exam would be eligible for deployment on the government payroll			
Rule—Eligible schools: Only non-private schools with a minimum of three years of financial support	Schools need to have Level Two Approval (i.e., be financially supported by the government); however, a requirement to have held Level Two Approval for the past three years was removed		
Rule—Distance from preferred school: constraint of a maximum of 3 km from the current school	Maximum of 5 km from the preferred school		Maximum of 42 km from the preferred school

April 24	Sep 24	Nov 24	Dec 24
Rule — Deployment by school level: Teachers only assigned to the same school level			
Rule — Unqualified teachers: Unqualified teachers will not be recruited			
		Rule — School religion: Religion match between the preferred and the destination school	
Preference — Remote Schools: More remote schools prioritised	Dropped (to maximise the chance of teachers remaining in their school of preference)		
Preference — Gender: Female teachers are prioritised	Dropped from preferences, added as a tie-break (to maximise the chance of teachers remaining in their school of preference)		
	Preference — Teachers' preferred school is prioritised		
Tie-break — Teacher Qualification: Priority based on qualification level (TC < HTC Primary < HTC Secondary < Bachelor in Ed. < Postgraduate Diploma < Masters/PhD)*			
Tie-break — Teacher Experience: Teachers with longer service prioritised	Dropped (data not available in TMIS)		
	Tie-break: Female teachers prioritised		

*JSS = Junior Secondary School; SSS = Senior Secondary School; TC = Teacher's Certificate; HTC = Higher Teaching Certificate.

2.2.3. What were the main reasons for changes to the matching criteria?

The main shift came when the data on teachers who passed the Teacher Licensing Exam was shared. Only 2,341 teachers (not already on payroll) had passed the licensing exam at the time of recruitment.

This had an impact on the algorithm's ability to fully optimise deployment, as the teacher selection was now being made from a much smaller pool of 2,341 non-payroll teachers who had passed the licensing exam, rather than the broader pool of 55,000 non-payroll teachers nationwide. This is illustrated in Figure 2 below, and the effect this has on the selection is explored in more detail in Section 4.

Figure 2. *Illustration of the shift to only selecting from teachers who had passed the Licensing Exam*
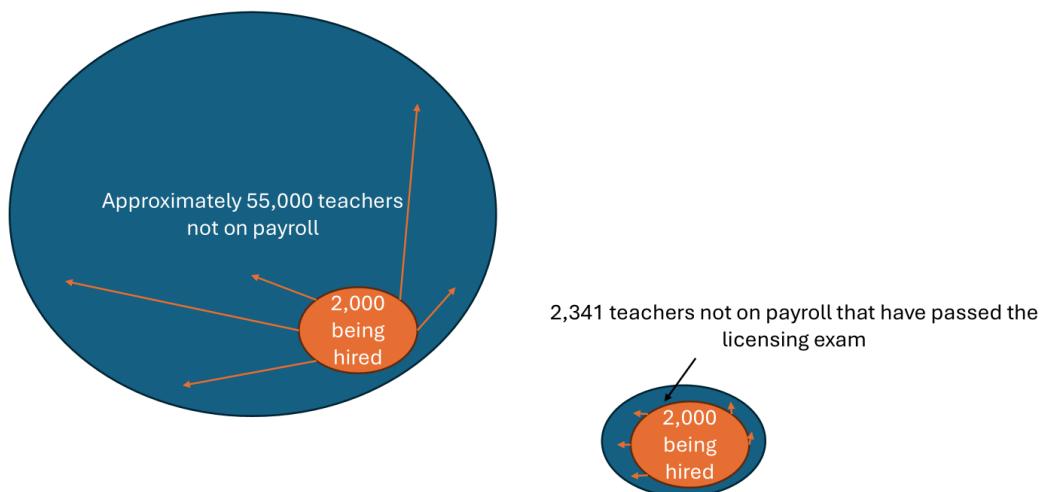
This reduction in the number of eligible teachers also meant that specific rules needed to be relaxed to enable the deployment of all 2,000 teachers while also ensuring that teachers were not deployed too far away from their preferred school, and simultaneously, that a particular school did not receive a high number of new payroll teachers while other schools did not receive any. A balance between these two variables was achieved by setting the maximum distance from a teacher's preferred school to 5 km and capping the number of teachers deployed to a single school at 3.

Moreover, when data on teachers who passed the licensing exam was exported from the TMIS and shared, it was discovered that the variable 'number of service years' was not part of the dataset. The teacher data could not be paired with the Annual School Census (ASC) dataset due to an

issue with unique identifiers in the ASC. Therefore, the tie-break concerning length of service had to be dropped.

More importantly, because the TMIS data lacked information on teachers' current schools and addresses, the teachers' preferred school served as the basis for their location choice. From this location, the algorithm attempted to minimise distances to the teachers' allocated destination school. This is not necessarily problematic, as incorporating teachers' preferences is one of the aims. Still, it differs from other possible methods that aim to minimise teacher movement from their current location (which may differ from their preferred school).

The above-mentioned 'rule relaxation' due to the reduction in the number of available teachers caused by the relatively small pool of teachers who passed the licensing exam, led to an additional feature being developed in the teacher deployment algorithm which allowed for running the deployment in 'batches'—making it possible to run several teacher deployment rounds subsequently, allowing for seamless updates of the input file and the remaining pool of teachers to deploy, and updating the matching criteria.

Additional features were developed throughout the process to ensure that the specific requirements of this flexible deployment algorithm are met as desired in Sierra Leone. Firstly, this included developing an offline version of the tool to ensure it could be used on a local, intermittent internet connection. Secondly, a 'shortest distance' preference was incorporated to allow for setting a higher total distance buffer but aiming to minimise the distance between the school of preference and the placement school. Thirdly, functionality for manually setting a PPTR target for each school level, rather than targeting the default national average, was incorporated. These adaptations supported efforts to make the final suggested 2024 teacher deployment as effective, equitable and optimised as possible.

Changes were also made to the preferences based on TSC priorities. The preference set for 'more remote schools being prioritised', defined by distance from the district HQ, was causing excessive teacher movement from their preferred schools to more remote schools. Therefore, to balance teacher satisfaction with their school allocation choice whenever possible, the 'remote schools' preference was dropped (note that as remote schools often have worse PPTRs, these are still being prioritised overall). This change significantly increased the likelihood that teachers would be placed in the schools they desired. Similarly, the requirement for a school to be Level 2 approved (i.e., eligible for financial subsidy) for a minimum of 3 years was relaxed as long as they were currently approved. This was again

agreed with the TSC to maximise the number of teachers who can be placed in their preferred schools. Similarly, the school preference for female teachers was downgraded to a tie-break, only to maximise the likelihood of teachers being deployed to their preferred school. Therefore, the gender preference only kicked in if there was a tie-break between two teachers of equal education and opposite genders. Later in the process, a rule was introduced whereby teachers with a preference for a school of a particular religion would only be considered for deployment to a school of the same religion, to avoid deploying teachers to schools with different teaching patterns and content.[3]

Another significant modification to the 'between-district' allocation was introduced when the GPE Partnership Compact (⬆MBSSE & MTHE, 2022) was incorporated, which included a payment trigger relating to teacher deployment. The Partnership Compact is a strategic agreement between the Government of Sierra Leone and GPE to transform the 'Foundations of Learning for All'. This necessitated that the distribution of newly qualified teachers to districts should also be guided by learning outcomes, and not the PPTR alone. Consequently, it was agreed in a meeting with the TSC and the MBSSE Minister that seven[4] learning outcomes would be considered, consisting of both national (National Primary School Examination [NPSE], Basic Education Certificate Examination [BECE], West African Senior School Certificate Examination [WASSCE]) and sample-based assessments (Secondary Grade Learning Assessment [SGLA], Sierra Leone Education Innovation Challenge [SLEIC]) to minimise high variance in these scores for a particular assessment between years. These seven learning assessment scores accounted for 25% of the total weight, while PPTRs guided the remaining 75% of district allocation. This specific rule targeting the distribution of teachers to individual districts was used to guide the initial run of the deployment algorithm, but was then dropped for subsequent runs. This is because the district allocation was not achievable without a significant relocation of the teaching workforce from districts with a surplus of teachers who passed the licensing exam to districts with a shortage of the required number of teachers for deployment. While this was originally the TSC's intention, there was pushback from the teachers

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[3] Note that to our knowledge, this data does not exist, so the variable was created from the school's name variable of the ASC, capturing the most common religious words and categorising the schools into three categories: Christian, Muslim, and non-religious.

[4] Including national formal assessments: NPSE, BECE, WASSCE; and sample based learning assessments SGLA English, SGLA Maths, SLEIC Baseline English, SLEIC Baseline Maths.

and the teacher union that represents them. This could have been affected by possible miscommunication, with teachers originally promised allocation to their preferred school if they passed the exam.

The TSC then participated in a press conference, which was broadcast on mainstream country media to sensitise the public to how teachers are being allocated. They explained the benefits, though public pressure continued, and so priority was given to the preferred school's location to minimise teacher movement whenever possible. Note that if teachers were to set their preferred school to one with an oversupply of teachers above a set threshold, they would be placed at the nearest available school rather than at their preferred school to ensure an equitable distribution within districts.2.2.4 Summary of the final process used in the 2024/25 recruitment

Below is a summary of the process followed to deploy the 2,000 teachers:

1. Followed the criteria described above → 1,534 teachers were initially matched.
2. Loosened the criteria by dropping the district-level rule, resulting in 1,954 teachers being matched. This was necessary because certain districts lacked sufficient numbers of licensed teachers, and the only other option would have been to force teachers to travel longer distances from districts with a surplus of licensed teachers.
3. Loosened the criteria by expanding the radius of maximum distance from preferred school to 10km → 1,969 teachers were then matched.
4. Loosened the criteria by dropping the school type constraint → 2,000 teachers were then matched. The TSC then decided to also allocate the remaining 341 teachers who had passed the Teacher Licensing Exam but who were not in the first 2,000. This required an additional step (Step 5)
5. Loosened the criteria by increasing the maximum possible number of teachers to be deployed to a particular school from three to six teachers, and increasing the maximum distance from the preferred school from 5 km to 42km. This way, all 2,341 teachers who passed the Teacher Licensing Exam were allocated to suitable schools for deployment.

3. Quantitative analysis: Methodology

In addition to considering the practicalities of implementing a matching algorithm into the recruitment process, the study for this report conducted three stages of quantitative analysis to investigate the algorithm's outputs from the 2024/25 recruitment process and the future potential of using a matching algorithm for recruitment.

These three stages can be summarised as:

1. **Analysing the characteristics of the 2,341 teachers selected for recruitment and the schools they were selected for.**

   – Here, we took an initial look at the 2,341 teachers selected.

2. **Analysing whether the characteristics of the 2,341 teachers selected for recruitment achieve the priorities of the TSC, relative to the existing payroll workforce.**

   – Here, we compared the 2,341 teachers selected to the 35,899 teachers already on payroll.

3. **Analysing whether the characteristics of 2,341 teachers selected in a hypothetical scenario illustrate the future potential of the matching algorithm in achieving the priorities of the TSC.**

   – Here, we compared the 2,341 teachers selected to a hypothetical allocation of 2,341 teachers who would be selected under similar criteria if all teachers were licensed, given the low number of teachers currently licensed, which was a strong constraint on the process in 2024/25.

In our analysis of each stage, we considered the allocation of teachers across a number of key recruitment priorities identified by the TSC: licence status, qualification, gender, pupil-to-payroll-teacher ratio, school remoteness, and districts defined as disadvantaged under the GPE Partnership Compact.

Where relevant, we also showed how the allocation of teachers is expected to affect the overall distribution after these teachers are added to the payroll workforce. However, with 2,341 teachers being added to the 35,899 payroll teachers currently in the workforce, our intention is to highlight the difficulty and long-term nature of driving sizeable changes in overall payroll characteristics.

These three stages are intended to inform the TSC and other stakeholders about the matching algorithm's output used this year and the future potential of the process. To support this, much of the analysis is presented in a question-and-answer format. The questions are intended to reflect those that the TSC and key stakeholders may have about the recruitment. Clear answers are provided to the questions, and the analysis details are presented to support these answers.

3.1. Data sources

The Government of Sierra Leone has made a number of improvements in education data management in recent years, although challenges remain. The Education Data Working Group has been set up by the MBSSE to convene government institutions and development partners to align on and advance these issues, with many efforts underway. The two main data sources used in this analysis are the Annual School Census (ASC) and the TMIS.

The ASC data collection exercise is carried out each academic year, led by the MBSSE. This includes a school-level and a teacher-level dataset. School-level and teacher-level questionnaires are developed by the MBSSE, with input from other stakeholders, and then distributed to every school in the country.. School leaders are given approximately two weeks to prepare accurate answers using the paper questionnaires, and then enumerators equipped with tablets visit each school to digitally enter all the information using SurveyCTO data collection software. Some checks are in place to monitor for exceptional year-to-year changes in enrolment, teacher, or classroom numbers, and data cleaning is also conducted as needed following the collection. However, time and budget constraints mean that the information is largely self-reported by the school leaders. For example, school leaders enter the teaching qualifications held by teachers, but the enumerators do not verify their actual certificates.

At the time of writing, the most recent ASC was collected in January 2024, before the 2024/25 recruitment process. This means that a comprehensive snapshot of the situation pre-recruitment is available, but it cannot yet be compared with the situation post-recruitment.

The school-level dataset contains information on school location (including district, chiefdom, latitude, longitude, and distance from the district HQ), school level, approval status, student enrolment, and facilities. There are 12,904 schools within the 2023/24 ASC, of which 7,970 have Level Two Approval status, meaning they are eligible for financial support (and payroll

teachers) from the government. The teacher-level dataset contains information on teachers' age, gender, qualifications, years of teaching experience, subject specialism, and payroll status. There are 91,224 teachers in the 2023/24 ASC, of which 35,899 are already on the government payroll and 55,325 are not.

Schools and teachers can be linked using each school's unique Education Management Information System (EMIS) Code, with each teacher therefore attached to a particular school. However, there is no robust unique identifier at the teacher level. Of the teacher-level identifiers in the teacher dataset, the Payroll Identification Number (PIN) is correctly entered for approximately 90% of the teachers on the government payroll, but is not available for teachers who are not on payroll, while the National Identity Number (NIN) is hypothetically available for everyone in the country, but it is currently not well collected in the ASC with many blank entries (or entered as 9999999). Efforts are underway to ensure that everyone in the country does indeed receive a NIN and that this is collected more robustly in the ASC in the future, but this is a current limitation of the data. The 2023/24 ASC was also collected before the introduction of the Teacher Licensing Exam, and so does not include information on teachers' licensing status.

As a broad post-recruitment dataset is not available, we are limited to using the data used for the matching algorithm. Due to the need to include teachers' licensing status, the teacher-level input file was drawn from the TMIS owned by the TSC. This includes information on teachers' age, gender, qualifications, subject specialism, payroll status, licensing status, and their preferred school. Apart from the licensing status, this data is entered by the teacher who registers on the TMIS. Once they take the licensing exam, this information is added to their profile. At the time of recruitment, 2,341 teachers who were not yet on the government payroll had passed the licensing exam. The NIN is robustly collected in the TMIS but not well entered in the ASC, so this cannot be used to merge the two. The preferred school is entered by the teacher using the unique EMIS Code, which can then be linked to the ASC. The school-level dataset used in the matching algorithm was from the 2023/24 ASC.

3.2. Scenarios

The analysis uses two different scenarios. The first scenario is the output from the matching algorithm used in the 2024/25 recruitment. The matching algorithm uses a school-level and a teacher-level input file. The school-level input file was the 2023/24 ASC school dataset. The

teacher-level input file includes the 2,341 teachers from TMIS who were not yet on the government payroll but who had passed the licensing exam.

The second scenario is hypothetical: if all teachers who are not yet on the government payroll had already passed the licensing exam. The school-level input file was again the 2023/24 ASC school dataset. The teacher-level input file for this hypothetical scenario includes the 55,325 teachers not yet on the government payroll from the 2023/24 ASC teacher dataset.

3.3. Limitations

The challenges in the data sources described above limit our analysis. These limitations, and any possible mitigation strategies, are explained below.

Firstly, as mentioned above, at the time of research, an ASC data collection exercise had not been conducted since the recruitment, which means there is a lack of post-recruitment data. This lack of data limits the types of analysis that can be conducted and rules out a permutation testing method initially intended during the research proposal. In considering the outcomes of the 2024/25 recruitment process, it is also assumed that the teachers selected have accepted their placements and are in the schools to which they have been deployed. While discussions with the TSC suggest this is a reasonable assumption, it is nevertheless possible that, in some 'edge' cases, a teacher may not have been finally added to the payroll or may not have taken up the position in the destination school; however, these cases are expected to be minimal. On the other hand, while this lack of post-recruitment data is a limitation for the research, it reflects the timeliness of this research, which aims to provide information on the process very soon after recruitment to inform the TSC and other stakeholders.

Secondly, and relatedly, the inability to robustly merge teacher data using the NINs from the matching algorithm's output into the teacher-level ASC dataset means we cannot manufacture our own post-recruitment dataset. In other words, if we had been able to merge datasets using the NINs, we could have created an updated teacher-level ASC dataset, in which the teachers selected for recruitment who were previously listed as 'not on the payroll' could have been switched to 'on the payroll'. Again, this limits the types of analysis that can be conducted, but it was not a significant barrier to the research.

Thirdly, the low number of teachers who had passed the licensing exam (and the TSC requirement that only licensed teachers could be added to the payroll) had implications for the potential of the matching algorithm in the 2024/25 recruitment. This meant that the matching algorithm had less influence on 'who' was recruited than would be the case if selecting from a larger pool of potential teachers. To mitigate this limitation, we conducted an analysis of a second scenario, described in the section above, in which the hypothetical situation is considered whereby all non-payroll teachers had actually passed the licensing exam. This choice to analyse two separate scenarios has the benefit of showing both what happened in the 2024/25 recruitment and the future potential of the process.

4. Quantitative analysis: Findings

As set out in Section 3, the findings are presented in a question-and-answer format to support the use of this report in informing the TSC and other key stakeholders. The summary of these questions and answers is presented here for reference, but each question is subsequently covered in detail separately.

4.1. Summary of quantitative analysis

The extent to which the characteristics of the 2,341 teachers selected for recruitment achieve the priorities of the TSC, relative to the existing payroll workforce, is set out below, question by question.

1. Have the selected teachers passed the Teacher Licensing Exam?

    – Yes, all the teachers in the 2024/25 recruitment have passed the Teacher Licensing Exam.

2. Were more highly qualified teachers selected?

    – Yes, a higher percentage of highly qualified teachers was selected in the 2024/25 recruitment than in the existing payroll workforce.

3. Were more females selected in the recruitment?

    – No, a slightly lower percentage of females was selected in the 2024/25 recruitment than in the existing payroll workforce.

4. Were more teachers selected for allocation in schools with worse pupil-to-payroll-teacher ratios?

    – Yes, a higher percentage of teachers was selected for allocation in schools with worse pupil-to-payroll-teacher ratios than in areas where the existing workforce is located, including schools that did not yet have any payroll teachers.

5. Were more teachers selected for allocation in remote schools?

    – Yes, a slightly higher percentage of teachers was selected for allocation in more remote schools than in areas where the existing payroll workforce is located.

6. Were more teachers selected for allocation in districts defined as disadvantaged under the GPE Compact?

- Yes, a higher percentage of teachers was selected for allocation in disadvantaged districts relative to the existing payroll workforce.

The extent to which the characteristics of 2,341 teachers selected in a hypothetical scenario, whereby all teachers are licensed, and similar matching criteria are applied, which would achieve the priorities of the TSC, is set out below.

1. Would more highly qualified teachers be selected?

   - No, while the selected teachers in the hypothetical scenario would still have a higher percentage of highly qualified teachers than the existing payroll workforce, their qualifications would be similar to those of teachers selected in the 2024/25 recruitment.

2. Would more females be selected?

   - No, a similarly low percentage of females would be selected in the hypothetical scenario as in the 2024/25 recruitment, and again, this would be a slightly lower percentage than the existing payroll workforce.

3. Would more teachers be selected for allocation in schools with worse pupil-to-payroll-teacher ratios?

   - Yes, in the hypothetical scenario, an even higher percentage of teachers would be selected for allocation in schools with worse pupil-to-payroll teacher ratios, including an even higher percentage in schools that did not yet have any payroll teachers.

4. Would more teachers be selected for allocation in remote schools?

   - Yes, in the hypothetical scenario, an even higher percentage of teachers would be selected for allocation in schools further from district HQ towns.

5. Would more teachers be selected for allocation in districts defined as disadvantaged under the GPE Compact?

   - Yes, in the hypothetical scenario, an even higher percentage of teachers would be selected for allocation in disadvantaged districts.

4.2. What were the characteristics of the 2,341 teachers selected for recruitment and the schools they were selected for?

As an initial introduction, a headline breakdown of the key characteristics for the 2024/25 recruitment is shown in Table 3 below.

Table 3. *Headline characteristics of teachers selected for recruitment*

Headline characteristic	Percentage Value
% of selected teachers who have passed the Teacher Licensing Exam	100%
% of selected teachers who have a teaching qualification	100%
% of selected teachers who have a higher teaching certificate or above	66%
% of selected teachers who are female	27%
% of selected teachers who are allocated in a school with a PPTR above 100 (prior to their addition to the payroll)	64%
% of selected teachers who are allocated to a school more than 5 km away from a district headquarters town	43%
% of selected teachers who are allocated in a district defined as disadvantaged	57%
% of teachers who are allocated to their preferred school	54%
% of selected teachers who are allocated to a school more than 5 km from their preferred school	7%

A visual, geographic view of where these teachers were recruited and the schools they were selected for is shown in Figure 3 below.

Figure 3. *Map of the school locations where teachers were deployed, and the number of teachers deployed to each school*
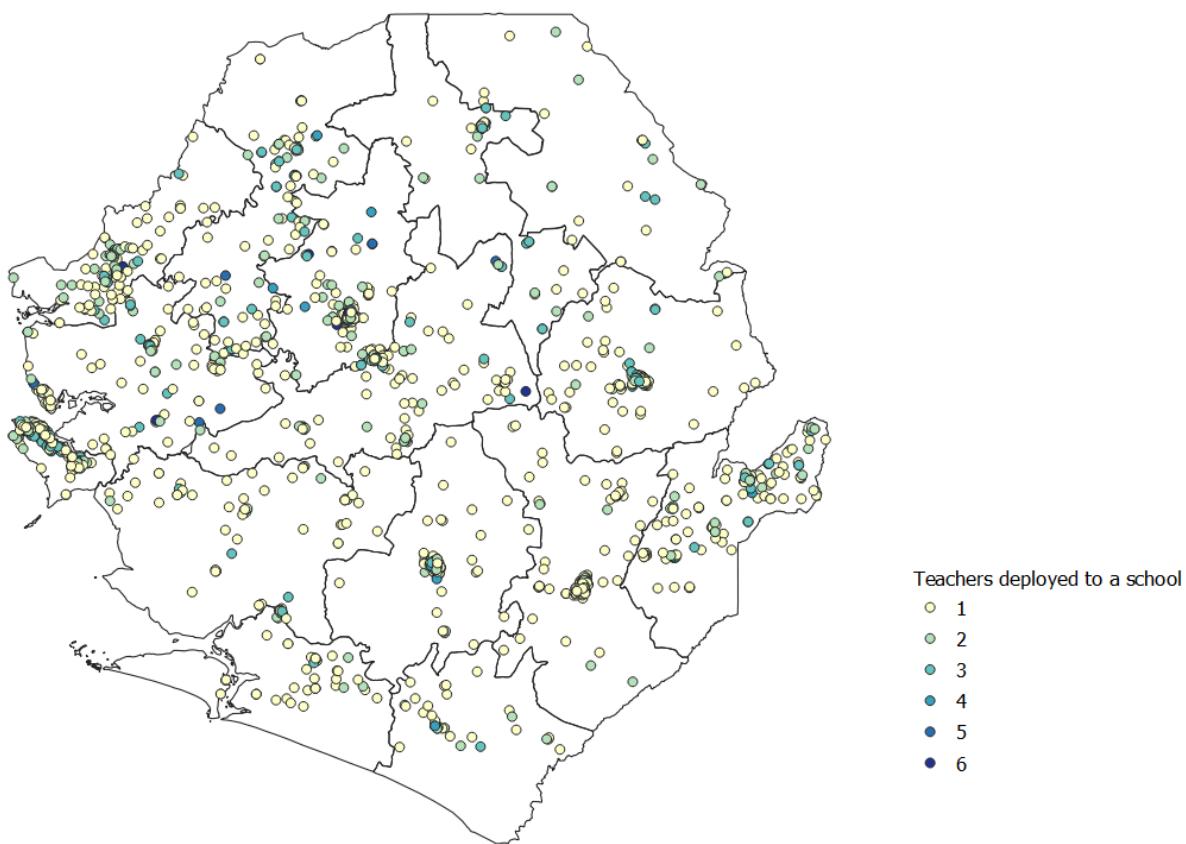
A more detailed comparison of the characteristics of the 2,341 teachers with those of the existing payroll teacher workforce, as a comparable reference for some of these values, is included in Section 4.3.

4.3. Do the characteristics of the 2,341 teachers selected for recruitment achieve the priorities of the TSC, relative to the existing payroll workforce?

In this section, we compare the 2,341 teachers selected with the 35,899 teachers already on the payroll to analyse the extent to which the 2024/25 recruitment achieved the TSC's priorities.

4.3.1. Have the selected teachers passed the Teacher Licensing Exam?

Yes, all the teachers in the 2024/25 recruitment passed the Teacher Licensing Exam.

This is a notable milestone for the TSC. Ensuring that all teachers recruited onto the payroll had passed the new Teacher Licensing Exam was a key priority for the TSC. This also supports a number of areas for the institution.

1. Ensures the recruited teachers meet the required standard set by the TSC.

2. Promotes the importance of the Teacher Licensing Exam to encourage more teachers who are not yet on the payroll to register on the TMIS and take and pass the exam.

3. Strengthens the link between the Teacher Management and the Registration and Licensing directorates, aligning the TSC's goals.

Table 4 presents the percentages of teachers who have passed the licensing exams.

Table 4. *Percentages of teachers among existing payroll teachers, newly recruited candidates, and the total payroll workforce following the recruitment round, who have passed the Teacher Licensing Exam*

Passed Teacher Licensing Exam	Payroll workforce before recruitment (licensing exam results after the third round in August 2024)	Recruitment of people selected to be added to the payroll	Payroll workforce after recruitment
%	8	100	13
_N	35,899	2,341	38,240

The benefits of recruiting only licensed teachers, as well as the challenges of ensuring enough teachers pass the exams, are also discussed in more detail in the companion paper on the qualitative aspects of this research (↑Godwin et al., 2025).

4.3.2. Were more highly qualified teachers selected?

Yes, a higher percentage of highly qualified teachers was selected in the 2024/25 recruitment than in the existing payroll workforce.

In Sierra Leone, there are a number of different levels of teaching qualifications, ranging from the more basic Teaching Certificate to the

more advanced Higher Teaching Certificates, Bachelor's in Education, Master's and other post-graduate qualifications in education.

As a first step, the 2024/25 recruitment ensured that all recruited teachers had a teaching qualification and that no unqualified teachers were recruited. Moreover, a significantly[5] higher percentage of the teachers selected in the 2024/25 recruitment held Higher Teaching Certificates and above than the existing payroll workforce. Table 5 presents data on teaching qualification levels.

Table 5. *Teaching qualification levels (HTC and higher) among existing payroll teachers, newly recruited candidates, and the total payroll workforce following the recruitment round*

HTC or Higher	Payroll workforce before recruitment	Teachers selected for addition to the payroll	Payroll workforce after recruitment
%	56	66	57
_N	35,899	2,341	38,240

The full breakdown of qualifications is shown in Figure 4 below, illustrating that the main driver behind the increase in the higher qualifications was an increase in teachers with Higher Teaching Certificate (Secondary) qualifications, with the percentage of teachers with a Bachelor's in Education or higher qualification relatively similar between the groups.

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[5] Chi-square test of independence confirmed a statistically significant difference in HTC or higher qualification distributions between Census and Recruitment groups (χ^2 = 65.36, p < 0.01).

Figure 4. *Teaching qualifications of teachers already on the payroll (left) and newly selected teachers in the 2024/25 recruitment (right)[6]*

Teaching Qualification Distribution (Recruitment Data)

☐ Untrained	☐ HTC (Primary)	☐ Bachelor in Education	☐ Masters/PhD in Education
☐ TC	☐ HTC (Secondary)	☐ Post graduate Diploma in Education	
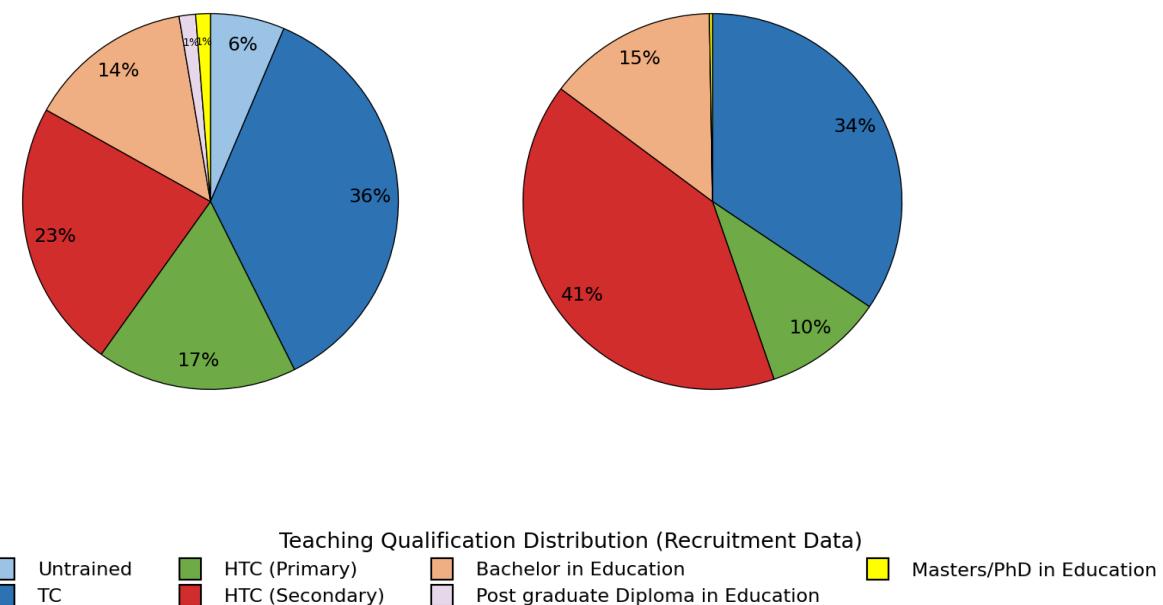
4.3.3. Were more females selected in the recruitment?

No, a slightly lower percentage of females was selected in the 2024/25 recruitment than in the existing payroll workforce.

Sierra Leone has one of the lowest percentages of female teachers in the world. This is evident among payroll teachers and for all teachers regardless of payroll status. This is also reflected in those who have passed the licensing exam, with previous internal research into the first two rounds of the licensing exam results for the TSC also finding a disparity in pass rates between genders.

Currently, 3,694 female teachers have sat the Teacher Licensing Exam, with a pass rate of 43%, compared with 5,936 male teachers, with a pass rate of 59%. These numbers include those already on the government payroll. This disparity persists when other characteristics are held constant, including qualification, age, payroll status, stream of specialisation, and district. The reason for this disparity is not yet clear. However, with the low number of females currently on the payroll, and Sierra Leone's Gender Empowerment

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[6] TSC policies intend that there should be no unqualified teachers on the payroll, and the TSC has been undertaking initiatives to avoid this. The small percentage of untrained teachers shown in the existing payroll (left) may either reflect a few legacy cases, or could also be from incorrect or outdated data — i.e. the teachers in question may have gained a qualification since the 2023/24 ASC data was collected.

Act requiring large public and private institutions to maintain a gender balance above 30%, supporting female teachers to register and pass the licensing exam should be an important area of focus for the TSC. Table 6 presents data on the distribution of female teachers.

Table 6. *Distribution of female teachers among existing payroll teachers, newly recruited candidates, and the total payroll workforce following the recruitment round*

% Female	Payroll workforce before recruitment	Teachers selected for addition to the payroll	Payroll workforce after recruitment
%	29.8	27.0	29.6
_N	35,899	2,341	38,240

While increasing the share of female teachers on the payroll is a stated priority for the TSC and is included as a tie-break in the matching model, the more strict requirement for all teachers to have passed the licensing exam, and the lower percentage of females in doing so, means this priority was not achieved in the 2024/25 recruitment.[7]

4.3.4. Were more teachers selected for allocation in schools with worse pupil-to-payroll-teacher ratios?

Yes, a higher percentage of teachers were selected for allocation in schools with worse pupil-to-payroll-teacher ratios than where the existing workforce is located, including schools that did not have any payroll teachers.

One of the main aims of TSC recruitment is to produce a more equitable distribution of payroll teachers. In the 2024/25 recruitment, a significantly[8] higher percentage of teachers were added to schools with worse pupil-to-payroll-teacher ratios (PPTRs) than the existing allocation of payroll teachers.

Figure 5 visualises grouping schools into 'PPTR pots'. It is important to note that this is presented as a static representation; i.e., the teachers selected in the 2024/25 recruitment are not included in the PPTR calculations,

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[7] Chi-square test of independence confirmed a statistically significant difference in gender distribution between Census and Recruitment groups (χ^2 = 7.96, $p < 0.01$), denoting a 1% significance level.

[8] Chi-square test of independence confirmed a statistically significant difference in PPTR distributions between those selected in the 2024/25 recruitment and those currently on payroll (χ^2 = 2576.51, $p < 0.01$), denoting a 1% significance level.

enabling us to see the extent to which teachers were selected for schools that did not yet have any payroll teachers.

Figure 5. *Comparative distribution (%) of existing payroll teachers and newly recruited teachers (2024/25) by school PPTR categories*
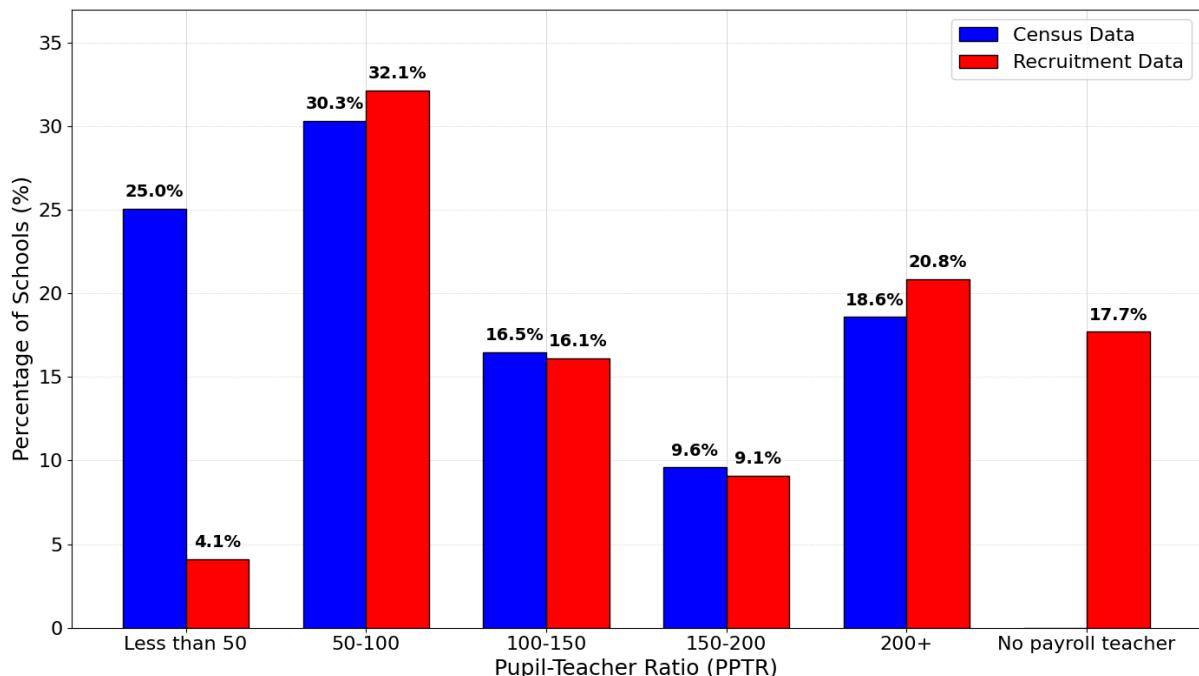
It is noticeable that while the percentage of teachers is relatively similar between the newly selected and the existing teachers in the middle (i.e., for schools with PPTRs between 50–200), there is a slightly higher percentage of teachers selected for deployment in schools with PPTRs of over 200, and a sizeable percentage of teachers selected for schools that do not yet have any payroll teachers — a particularly valued target for the TSC.

4.3.5. Were more teachers selected for allocation in remote schools?

Yes, a slightly higher percentage of teachers was selected for allocation in more remote schools than where the existing payroll workforce is located.

Previous research (↑Mackintosh et al., 2020; ↑UNICEF, Forthcoming) has highlighted that the largest disparities in workforce distribution in Sierra Leone are typically found within districts — i.e., the greatest challenges are in the remote areas of each district — rather than across districts. This research found a noticeable drop-off in workforce characteristics more than 5 km away from urban centres. A proxy for this aspect of remoteness has been introduced in recent ASC data, an indicator of the distance to the

district headquarters town,[9] grouped into: in town, less than 5 km, 5–10 km, 11–20 km, 21–50 km, and 50+ km.

Compared to the existing payroll workforce, the 2024/25 recruitment selection showed a small but statistically significant[10] difference in the distance to the district HQ of the schools where they are allocated. This is shown for the 5 km cut-off in Table 7 and visualised in the full breakdown in Figure 6 below.

Table 7. *Share of teachers in schools more than 5 km away from district HQ among existing payroll teachers, newly recruited candidates, and the total payroll workforce following the recruitment round*

Percentage of teachers more than 5 km away from the district HQ	Payroll workforce before recruitment	Teachers selected for addition to the payroll	Payroll workforce after recruitment
%	37	43	37
Total (_N)	35,899	2,341	38,240

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[9] Each of the 16 districts has a designated district headquarters town, where the main government buildings are located.

[10] Chi-square test of independence confirmed a statistically significant difference in the overall distribution of distance categories between Census and Recruitment groups ($\chi^2 = 33.52$, $p < 0.01$), denoting a 1% significance level.

Figure 6. *Comparative distribution (%) of existing payroll teachers and newly recruited teachers (2024/25) by distance from district headquarters*
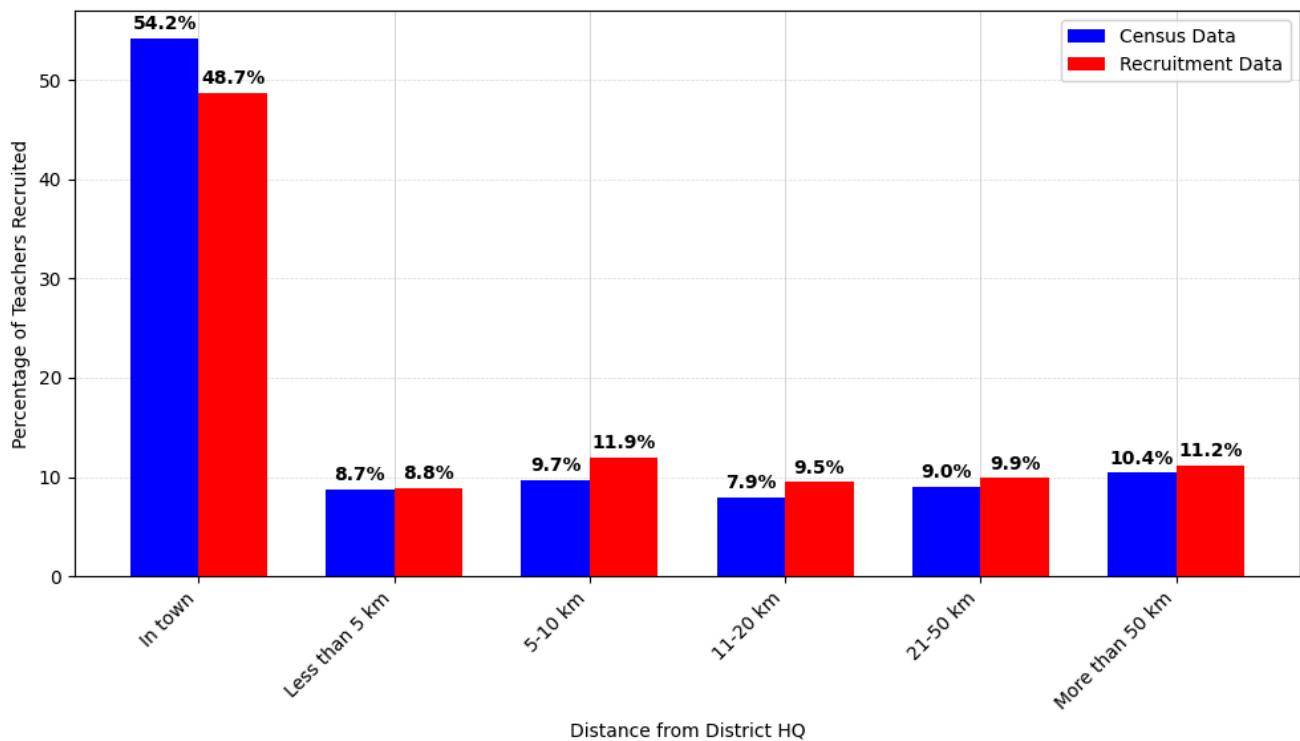
Note that while ensuring an equitable distribution of teachers for remote areas remains a priority for the TSC, the 'distance to district HQ' indicator was not included in the final criteria used in the matching algorithm for the 2024/25 recruitment. It is likely that the results found here demonstrate the existing correlation between PPTRs (which remained in the final criteria) and distance to district HQ. This likely also explains why the difference is not as strong for this indicator as for PPTRs.

4.3.6. Were more teachers selected in districts defined as disadvantaged under the GPE Compact?

Yes, a higher percentage of teachers was selected for allocation in disadvantaged districts relative to the existing payroll workforce.

Improving the equitable distribution of payroll teachers across Sierra Leone is recognised as a policy target by the TSC, the wider Sierra Leone Government and education sector stakeholders. As part of this, the current GPE Compact specifies that the proportion of newly qualified teachers allocated to targeted districts (disadvantaged districts) must be measurably higher compared with the proportion of newly qualified teachers allocated to non-targeted districts. The selection of districts

defined as disadvantaged included those with learning outcomes below the country average.[11]

A significantly[12] higher percentage of teachers in the 2024/25 recruitment were allocated in districts defined as disadvantaged under the GPE Compact, relative to the existing payroll workforce. This is shown in Table 8 below.

Table 8. *Distribution of teachers in disadvantaged districts among existing payroll teachers, newly recruited candidates, and the total payroll workforce following the recruitment round*

Disadvantaged districts	Payroll workforce before recruitment	Teachers selected for addition to the payroll	Payroll workforce after recruitment
%	43	57	44
Total (_N)	35,899	2,341	38,240

Meeting the GPE Compact target was an important priority for the TSC during the 2024/25 recruitment process, and this was achieved.

4.4. How do the characteristics of 2,341 teachers selected in a hypothetical scenario illustrate the future potential of the matching algorithm in achieving the priorities of the TSC?

In this section, we use a hypothetical scenario where 2,341 teachers would have been selected in a similar run of the matching algorithm if all teachers were licensed. This is intended to highlight the future potential of the matching algorithm once the current strong constraint of only a few teachers having passed the licensing exam is alleviated.

Here, we compare the selection in the hypothetical scenario to both the selection used in the 2024/25 deployment and to the existing payroll workforce.

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[11] See page 26 of the Partnership Compact (↑MBSSE & MTHE, 2022).

[12] Chi-square test of independence confirmed a statistically significant difference in the distribution of disadvantaged status between Census and Recruitment groups (χ^2 = 153.79, $p < 0.01$), denoting a 1% significance level.

4.4.1. Would more highly qualified teachers be selected?

No, while the selected teachers in the hypothetical scenario would still have a higher percentage of highly qualified teachers than the existing payroll workforce, their qualifications would be similar to those selected in the 2024/25 recruitment.

Table 9 highlights the comparison of qualifications.

Table 9. *Comparison of 'HTC or higher' qualification between the current workforce, 2024/25 recruitment, and the hypothetical scenario*

HTC or higher	Payroll workforce before recruitment	Teachers selected for addition to the payroll in the 2024/25 recruitment	Teachers selected for addition to the payroll in the hypothetical scenario
%	56	66	64
_N	35,899	2,341	2341

There would be no significant[13] difference in the teachers selected in the hypothetical scenario, but as before, this cohort of 2,341 teachers would have a significantly[14] higher percentage of higher qualifications than those on the existing payroll workforce. Minor differences can be observed in Figure 7 below, in terms of a slightly higher percentage of teachers with the very highest levels of qualifications (Bachelor's, Post Graduate Diplomas, and Master's or PhDs in Education).

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[13] Chi-square test of independence found no statistically significant difference in HTC or higher qualification distributions between those selected in the hypothetical scenario and in the 2024/25 recruitment (χ^2 = 2.06, p > 0.05).

[14] Chi-square test of independence found a statistically significant difference in HTC or higher qualification distributions between those selected in the hypothetical scenario and in the existing payroll workforce (χ^2 = 57.22, p < 0.01.)

Figure 7. *Teaching qualifications of selected teachers in the 2024/25 recruitment (left) and newly selected teachers in the hypothetical scenario (right)*
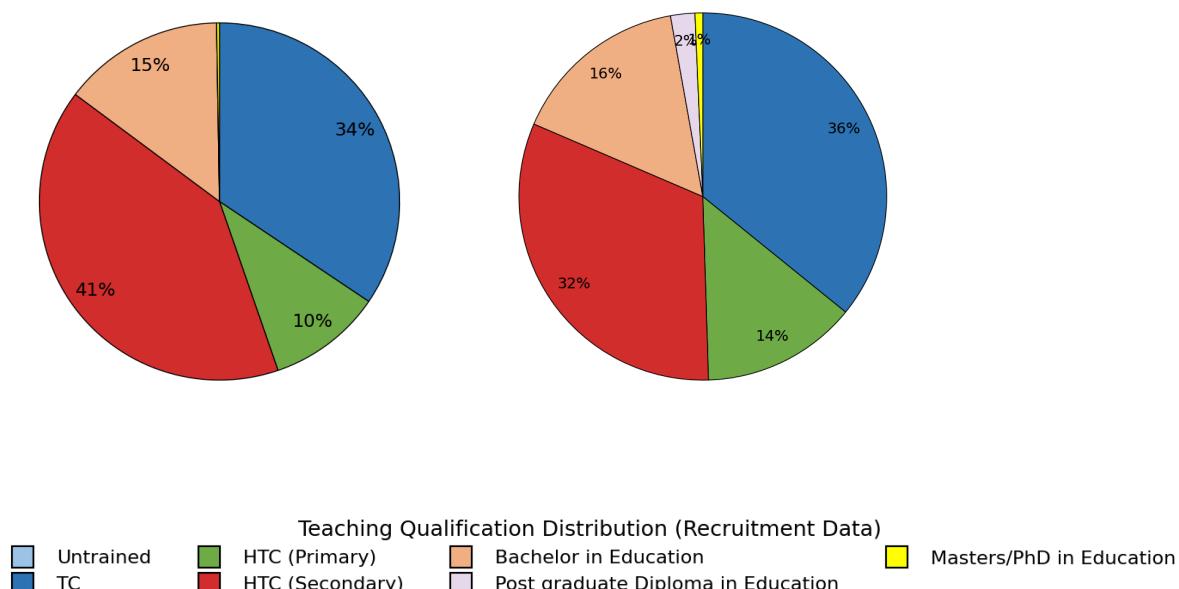
The similarity between the level of qualifications of teachers in the hypothetical scenario and the 2024/25 recruitment reflects that:

a. Including qualification level at the tie-break level within the model settings does not have a strong influence on the results of the matching algorithm.

b. The TSC has had some success so far in ensuring that teachers with a range of qualifications, including higher qualifications, have taken and passed the licensing exam.

4.4.2. Would more females be selected?

No, a similarly low percentage of females would be selected in the hypothetical scenario as in the 2024/25 recruitment, and again, this would be a slightly lower percentage than in the existing payroll workforce.

Even though gender was included in the matching algorithm as a tie-breaker, this setting does not have a strong enough influence on the results to increase the recruitment of females onto the payroll. There is no significant[15] difference between the percentages of females in the

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[15] Chi-square test of independence found no statistically significant difference in percentages of females between those selected in the hypothetical scenario and in the 2024/25 recruitment ($\chi^2 = 0.73$, $p > 0.05$).

hypothetical scenario and the 2024/25 recruitment, but the percentage in the hypothetical scenario is again significantly[16] lower than in the existing payroll workforce, as seen in Table 10.

Table 10. *Comparison of the distribution of female teachers between the current workforce, 2024/25 recruitment, and the hypothetical scenario*

% Female	Payroll workforce before recruitment	Teachers selected for addition to the payroll in the 2024/25 recruitment	Teachers selected for addition to the payroll in the hypothetical scenario
%	29.8	27.0	25.9
_N	35,899	2,341	2341

An important consideration regarding this, which is discussed further in Section 4.4.3, is that there are particularly lower percentages of female teachers in remote schools and in schools with the worst pupil-to-payroll-teacher ratios, which effectively creates a conflict between these two criteria. This makes the choice of algorithm settings particularly important in this area.

4.4.3. Would more teachers be selected for allocation in schools with worse pupil-to-payroll-teacher ratios?

Yes, in the hypothetical scenario, an even higher percentage of teachers would be selected for allocation in schools with worse pupil-to-payroll-teacher ratios, including an even higher percentage in schools that did not yet have any payroll teachers.

The recruitment in the hypothetical scenario would have an even greater influence on the equitable distribution of payroll teachers. A significantly[17] higher percentage of teachers would be added to schools with worse pupil-to-payroll-teacher ratios, relative to the existing payroll workforce and even the 2024/25 recruitment.

Figure 8 below visualises grouping schools into 'PPTR pots'. It is important to note that this is presented as a static representation, i.e., the teachers

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[16] Chi-square test of independence found a statistically significant difference in shares of females between those selected in the hypothetical scenario and in the existing payroll workforce (χ^2 = 17.68, p < 0.01).

[17] Chi-square test of independence confirmed a statistically significant difference in PPTR distributions between those selected in the hypothetical scenario and the existing payroll workforce (χ^2 = 3828.81, p < 0.01), denoting a 1% significance level; as well as between those selected in the hypothetical scenario and those selected in the 2024/25 recruitment (χ^2 = 137.94, p < 0.01).

selected in the hypothetical scenario and the 2024/25 recruitment are not included in the PPTR calculations, enabling us to see the percentages of teachers selected for schools that did not yet have any payroll teachers.

Figure 8. *Distribution of selected teachers by PPTR grouping, comparing the current workforce (blue), 2024/25 recruitment (red), and the hypothetical scenario (green)*
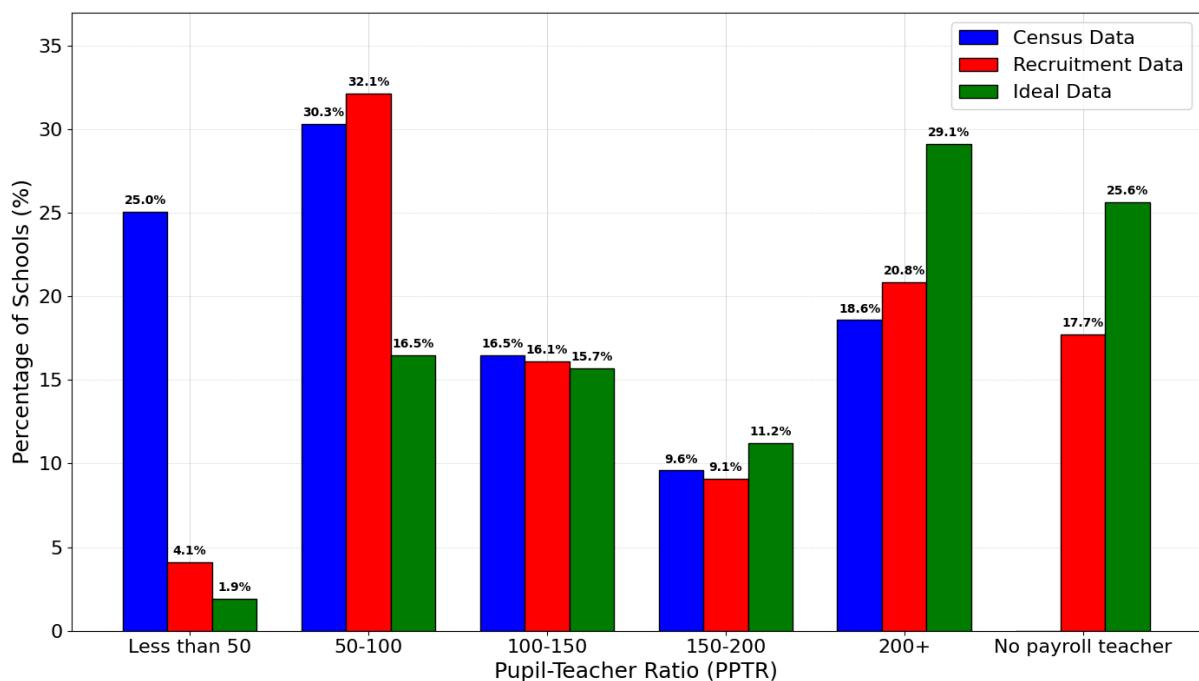
Comparing the teachers selected in the hypothetical scenario with those selected in the 2024/25 recruitment, we can see much lower percentages of teachers allocated in schools with PPTRs lower than 100, and far higher percentages of teachers allocated in worse-off schools with PPTRs higher than 200 and as yet without any payroll teacher. This reflects the primacy of the pupil-to-payroll-teacher ratio within the matching algorithm settings.

4.4.4. Would more teachers be selected for allocation in remote schools?

Yes, in the hypothetical scenario, an even higher percentage of teachers would be selected for allocation in schools further from district HQ towns.

A significantly[18] higher percentage of teachers would be selected for allocation in more remote schools in the hypothetical scenario, compared to both the 2024/25 recruitment selection and the existing payroll workforce. This is shown for the 5 km cut-off (the reason for 5 km being chosen is discussed in Section 4.3.5) in Table 11, and then visualised in the full breakdown in Figure 9 below.

Again, it is worth noting that while ensuring an equitable distribution of teachers to remote areas remains a priority for the TSC, the distance-to-district-HQ indicator was not included in the final criteria used in the matching algorithm for the 2024/25 recruitment. It is likely that the results found here demonstrate the existing correlation between PPTRs (which remained in the final criteria) and distance to district HQ. This appears to have a stronger relationship in the hypothetical scenario where all teachers are considered.

Table 11. *Comparison of teacher distribution in remote locations (5+ Km from HQ) between the current workforce, 2024/25 recruitment, and the hypothetical scenario*

Percentage more than 5 km away from district HQ	Payroll workforce before recruitment	Teachers selected for addition to the payroll in 2024/25 recruitment	Teachers selected for addition to the payroll in the hypothetical scenario
%	37	42	60
_N	35,899	2,341	2341

[18] Chi-square test of independence confirmed a statistically significant difference in the shares in schools more than 5 km away from the district HQ between those selected in the hypothetical scenario and the existing payroll workforce (χ^2 = 478.80, $p < 0.01$), denoting a 1% significance level; as well as between those selected in the hypothetical scenario and those selected in the 2024/25 recruitment (χ^2 = 146.72, $p < 0.01$).

Figure 9. *Distribution of selected teachers by distance from district HQ, comparing the current workforce and newly recruited teachers (2024/25) to the hypothetical scenario*
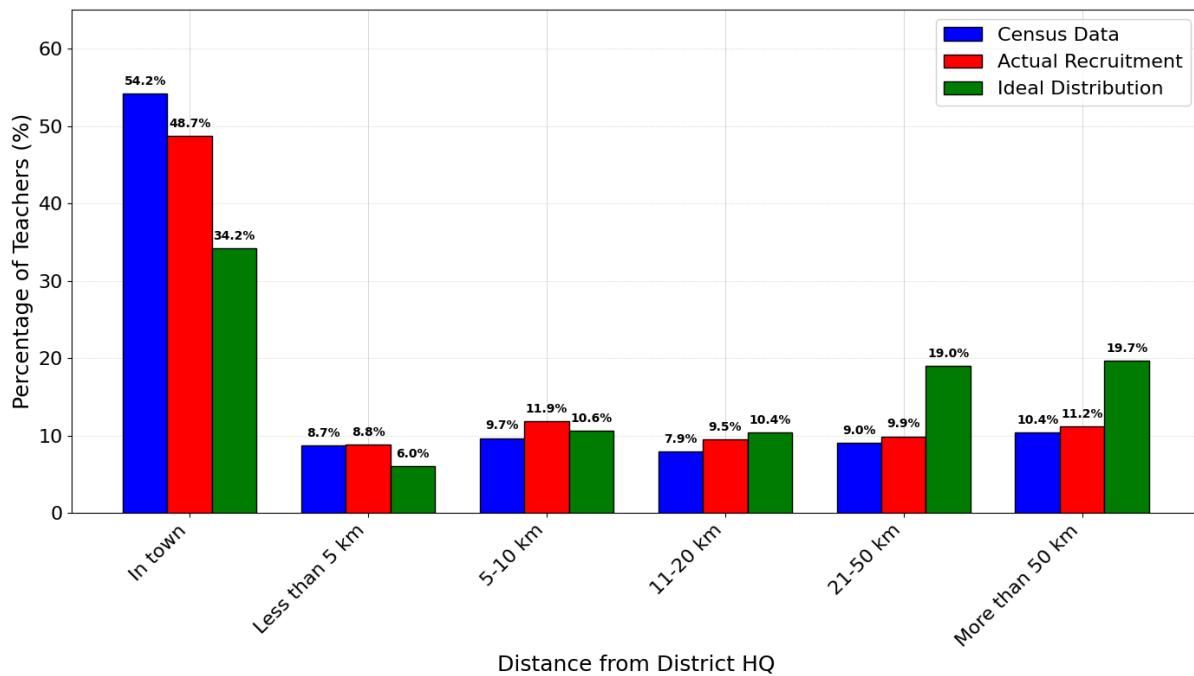
This shows a similar effect as the PPTR, with the increase particularly noticeable in the most remote areas, more than 20km away from the district HQ.

4.4.5. Would more teachers be selected for allocation in districts defined as disadvantaged under the GPE Compact?

Yes, in the hypothetical scenario, an even higher percentage of teachers would be selected for allocation in disadvantaged districts.

A significantly[19] higher percentage of teachers would be selected for allocation in disadvantaged districts in the hypothetical scenario (68%), compared to both the 2024/25 recruitment selection (57%) and the existing payroll workforce (43%).

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[19] Chi-square test of independence confirmed a statistically significant difference in the shares in schools more than 5 km away from the district HQ between those selected in the hypothetical scenario and the existing payroll workforce (χ^2 = 554.20, p < 0.01), denoting a 1% significance level; as well as between those selected in the hypothetical scenario and those selected in the 2024/25 recruitment (χ^2 = 70.00, p < 0.01).

Table 12. *Comparison of the distribution of teachers in disadvantaged districts between the current workforce, 2024/25 recruitment, and the hypothetical scenario*

Disadvantaged districts	Payroll Workforce before Recruitment	Teachers selected for addition to payroll in 2024/25 recruitment	Teachers selected for addition to payroll in the hypothetical scenario
%	43	57	68
Total (_N)	35,899	2,341	2341

This is notable, as it reflects the challenge of not having enough licensed teachers in the disadvantaged districts, which led to loosening some of the other criteria during the recruitment process.

5. Conclusions and recommendations

Drawing on how the teacher recruitment was conducted in 2024 (see Section 2), the quantitative findings of the 2024/25 recruitment and the hypothetical scenario in which all teachers are licensed (Section 4), four main conclusions are identified in this research.

1. The use of a matching algorithm can promote data-driven recruitment in Sierra Leone and better meet the TSC's priorities.

2. Implementing a data-driven recruitment process is not a one-off task; it is likely to require stakeholder engagement and adaptation to new priorities and data challenges.

3. Balancing conflicting priorities requires trade-offs, such as determining whether to prioritise female teachers over remote schools with worse PPTRs, or vice versa.

4. It is important to connect recruitment processes with other TSC functions, such as the implementation of the Teacher Licensing Exam.

5.1 The use of a matching algorithm can promote data-driven recruitment in Sierra Leone and better meet the TSC's priorities

The TSC aims to achieve a number of priorities within its recruitment, and these priorities can shift as political, financial, and technical circumstances change. Having a flexible matching algorithm that can be adapted to meet changing needs is beneficial for the TSC in achieving those priorities. The associated qualitative research highlights several benefits of doing so within a data-driven process, such as providing some protection for the TSC from the influence of external stakeholders and political interference (↑Godwin et al., 2025).

During the 2024/25 recruitment, many of the TSC's key priorities were met in the selection, as shown in the scorecard in Table 13.

Table 13. *Scorecard for the 2024/25 recruitment selection.*

Score	Category
✓✓	Teachers had passed the licensing exam
✓	Higher-qualified teachers
✓	Teachers allocated in schools with worse pupil-to-payroll-teacher ratios
✓	Teachers allocated in more remote schools
✓	Teachers allocated in districts defined as disadvantaged under the GPE Compact
✗	More female teachers

All teachers selected had passed the licensing exam, providing the TSC with increased control over the quality of teachers being added to the payroll for the first time. More qualified teachers were selected relative to those teachers already on the government payroll. In terms of the schools for which those teachers were selected, these were typically schools with worse pupil-to-payroll-teacher ratios (including schools without any existing payroll teachers), in more remote schools further from district HQ towns, and more in districts defined as disadvantaged under the GPE Compact. Table 14 presents a scorecard for the hypothetical situation.

Table 14. *Scorecard for the hypothetical scenario selection.*

Score	Category
✓	Higher-qualified teachers
✓✓	Teachers allocated in schools with worse pupil-to-payroll-teacher ratios
✓✓	Teachers allocated in more remote schools
✓✓	Teachers allocated in districts defined as disadvantaged under the GPE Compact
✗	More female teachers

Considering the hypothetical situation where all teachers are licensed, we see that there would be significantly larger improvements in schools with worse pupil-to-payroll-teacher ratios, in more remote schools, and in districts defined as disadvantaged under the GPE Compact.

5.2. Implementing a data-driven recruitment process is not a one-off task; it is likely to require engagement with stakeholders and adapting to new priorities and data challenges

It can be tempting to think of data-driven recruitment using a matching algorithm as a one-off task: a few clicks to set up the algorithm criteria, where you click 'go,' and a list of teacher allocations is produced.

However, in reality, it is not as simple as that. Setting the algorithm criteria to be used requires an initial plan from central TSC, followed by engagement with stakeholders such as funders, teachers' unions, and district TSC staff. As has also been highlighted in the qualitative research (↑Godwin et al., 2025), explaining and involving stakeholders in the process earlier can help minimise confusion or changes in the process down the line.

It is also important to simulate the algorithm criteria to test if this is achieving the intended aims. Some priorities may be conflicting (as discussed in Section 5.3 below), so even as new developments are incorporated, it is worth experimenting with the different levels at which criteria can be set and how this affects the simulation.

Once the final criteria are confirmed and the list of teachers is generated, this still requires engagement with school leaders, district staff, the Ministry of Finance, and others to implement the changes within the payroll and ensure the timely deployment of teachers, particularly when this involves teachers being moved from their current schools.

5.3. Balancing conflicts in priorities requires tradeoffs, such as determining whether to prioritise female teachers over remote schools with worse PPTRs, and vice versa

Despite a 'gender tie-breaker', where, in the case of any ties across the matching criteria, a female teacher would be prioritised, neither the selection for the 2024/25 recruitment, nor the selection for the hypothetical

scenario resulted in an increased allocation of female teachers relative to the current (already low) percentage of female teachers within the existing payroll workforce. In the case of the 2024/25 recruitment, this was particularly limited by the need to select teachers who had passed the licensing exam, and so was not due to the matching algorithm settings. However, the fact that this was also the case in the hypothetical scenario of all teachers passing the licensing exam illustrates a broader conflict in priorities.

Figures 10 and 11 below highlight how the percentage of female teachers is much lower than that of males in schools that are more remote and with worse PPTRs. There are, therefore, fewer female teachers who can be added to the payroll in those schools. This makes it harder to select teachers who boost both these criteria. The more we prioritise remote schools with worse PPTRs, the less we can prioritise the allocation of female teachers.

Figure 10. *Distribution of teachers by gender and distance from the district HQ of their school*
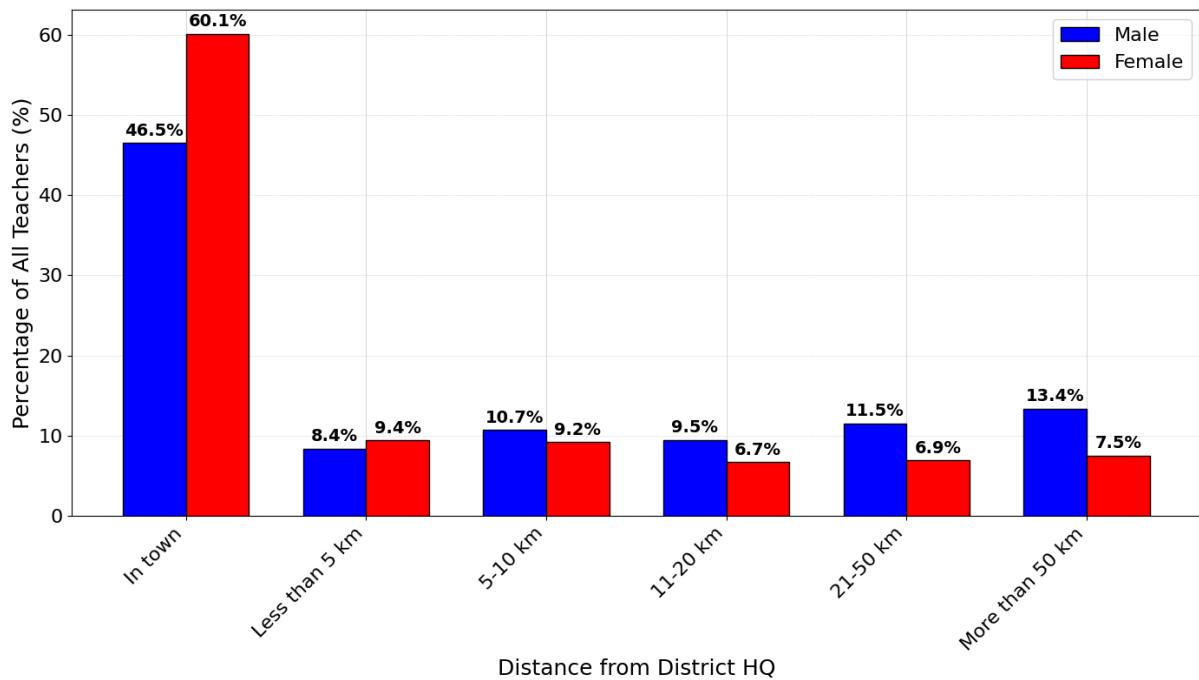
Figure 11. *Gender distribution by PPTR categories for all teachers*
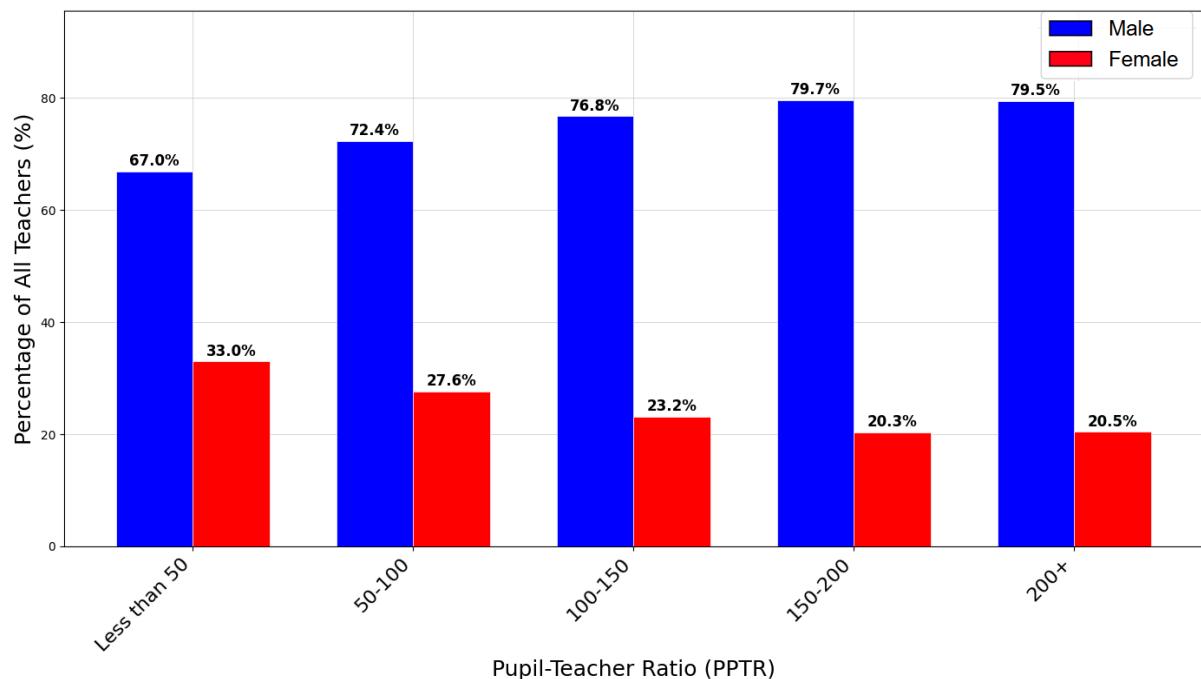
Such conflicts in priorities require careful simulation and the setting of matching criteria to visualise the potential outputs of the matching algorithm, followed by discussion within the TSC and, perhaps, with other stakeholders, to ensure the right balance is reached. Given the need to increase female teachers on the payroll, both as a priority in and of itself, as well as to meet the Gender Empowerment Act, potential solutions in future recruitment rounds could include moving the prioritisation of female teachers up from a tie-breaker to more influential criteria, such as the rules or preferences. For example, gender could be weighted more strongly in preferences, or introduced more directly as a quota (e.g., setting a minimum requirement that 50% of the teachers recruited are female).

5.4. It is important to connect recruitment processes with other functions of the TSC, such as the implementation of the licensing exam

Given the TSC's prioritisation that teachers must have passed the licensing exam to be added to the government payroll, one of the most influential ways in which the other priorities can be met is to ensure that those other priorities are also targeted in the rollout of the licensing exam.

The more that teachers with higher qualifications, female teachers, teachers in schools with worse PPTRs, teachers in schools in more remote areas, and teachers in schools in disadvantaged districts can be

encouraged and supported to take and pass the licensing exam, the greater the potential for these priorities to be met during teacher recruitment.

Similarly, as highlighted in the qualitative research (↑Godwin et al., 2025), the more the TSC central and district staff can be included in understanding the priorities for recruitment and the use of the matching algorithm, the more they can support teachers to be registered, licensed, recruited, and deployed.

References

These references are available digitally in our evidence library at
https://docs.edtechhub.org/lib/ICRSXHTV

EdTech Hub, Education Commission, & Fab Inc. (2022). *The Impact of GIS-Supported Teacher Allocation in Sierra Leone* (No. 1). EdTech Hub. https://doi.org/10.53832/edtechhub.0055. Available from https://docs.edtechhub.org/lib/QAH4K4D6. Available under Creative Commons Attribution 4.0 International. (details)

Education Commission. (2019). *Transforming the Education Workforce: Learning teams for a learning generation.* Education Commission. https://educationcommission.org/wp-content/uploads/2019/09/Transforming-the-Education-Workforce-Full-Report.pdf. (details)

Espinoza-Revollo, P., Ali, Y., Garrod, O., Atherton, P., Mackintosh, A., Ramirez, A., Beoku-Betts, I., & Haßler, B. (2023). *School-to-School Mobility Patterns and Retention Rates of Payroll Teachers in Sierra Leone* (Working Paper No. 48). EdTech Hub. https://doi.org/10.53832/edtechhub.0143. Available from https://docs.edtechhub.org/lib/DE7XUSMJ. Available under Creative Commons Attribution 4.0 International. (details)

Espinoza-Revollo, P., Ramirez, A., Atherton, P., & Mackintosh, A. (2022). *School Leaders' Preferences on School Location in Sierra Leone: An individual and school-level study* [Technical Report]. EdTech Hub. https://doi.org/10.53832/edtechhub.0106. Available from https://docs.edtechhub.org/lib/MFH269TU. Available under Creative Commons Attribution 4.0 International. (details)

Frazer, M. M. (2024, December 4). From algorithm outputs to classroom impact: A conversation with Marian Abu, director of teacher management at the Teaching Service Commission [Blog post]. *EdTech Hub.* https://doi.org/10.53832/edtechhub.1080. Available from https://edtechhub.org/2024/12/04/strengthening-the-use-of-data-for-decisions-on-teacher-deployment-in-sierra-leone/. Available under Creative Commons Attribution 4.0 International. (details)

Godwin, K., Cameron, E., Frazer, M. M., Dube, G., Mackintosh, A., Koutecký, T., Adam, T., & Haßler, B. (2025). *Shifting Power Dynamics in Education Decision-Making: Investigating the role of a matching algorithm to improve teacher deployment in Sierra Leone* [Technical Report]. EdTech Hub. https://doi.org/10.53832/edtechhub.1103. Available from

https://docs.edtechhub.org/lib/IRFH43RX. Available under Creative Commons Attribution 4.0 International. (details)

Government of Sierra Leone. (2024). *2023 and 2024 Annual Schools Censuses Draft Report*. https://mbsseknowledgeplatform.gov.sl/wp-content/uploads/2024/11/Annual-School-Censuses-2023-and-2024-Draft-Report.pdf. (details)

Lurvink, A.-F., Espinoza-Revollo, P., Ali, Y., Garrod, O., Atherton, P., Mackintosh, A., Ramirez, A., Beoku-Betts, I., Haßler, B., Godwin, K., & Godwin, A.-F. L., Patricia Espinoza-Revollo, Yusuf Ali, Oliver Garrod, Paul Atherton, Alasdair Mackintosh, Ana Ramirez, Iman Beoku-Betts, Björn Haßler and Katie. (2023a, March 22). Where do teachers go, and where do they stay? *EdTech Hub*. https://edtechhub.org/2023/03/22/where-do-teachers-go-and-where-do-they-stay/. (details)

Lurvink, A.-F., Mansaray, K., Kamara, J., Khanu, A. J., Cameron, E., Godwin, K., & Haßler, B. (2023b). *Teacher Retention and Mobility in Sierra Leone: What factors motivate teachers to stay at or leave schools?* EdTech Hub. https://doi.org/10.53832/edtechhub.0168. Available from https://docs.edtechhub.org/lib/CQ8JNCH8. Available under Creative Commons Attribution 4.0 International. (details)

Mackintosh, A., Ramirez, A., Atherton, P., Collis, V., Mason-Sesay, M., & Bart-Williams, C. (2020a). *Education Workforce Spatial Analysis in Sierra Leone* (p. 31) [Research and Policy Paper]. Education Commission. https://educationcommission.org/wp-content/uploads/2020/12/2-EW-Spatial-Analysis-Paper.pdf. (details)

McBurnie, C., Godwin, K., & Bernard-Jones, L. (2022a, May 1). When teachers are asked to deploy other teachers, we learn a lot about teacher preferences. *EdTechHub*. https://edtechhub.org/2022/05/13/when-teachers-are-asked-to-deploy-other-teachers-we-learn-a-lot-about-teacher-preferences/. Available under Creative Commons Attribution 4.0 International. (details)

McBurnie, C., Godwin, K., Beoku-Betts, I., Bernard-Jones, L., & Haßler, B. (2022b). *What Matters Most for Teacher Deployment? A case study of teacher preferences in Sierra Leone*. EdTech Hub. https://doi.org/10.53832/edtechhub.0095. Available from https://docs.edtechhub.org/lib/8GN4RWMR. Available under Creative Commons Attribution 4.0 International. (details)

McBurnie, C., Vijil, A., & Haßler, B. (2022c, May 8). Using technology to improve the equity of teacher allocation in Sierra Leone: the challenge and a way forward. *EdTech Hub*. https://edtechhub.org/2022/05/06/using-technology-to-improve-the-equity-of-teacher-allocation-in-sierra-leone-the-challenge-and-a-way-forward/. Available under Creative Commons Attribution 4.0 International. (details)

Ministry of Basic and Senior Secondary Education. (2018). *2018 Annual School Census Report and Statistical Abstract*. Government of Sierra Leone. https://www.statistics.sl/images/StatisticsSL/Documents/Publications/Other_Publications/2018-Annual-Schools-Census-Report.pdf. (details)

Ministry of Basic and Senior Secondary Education, & Ministry of Technical and Higher Education. (2022). *Sierra Leone 2022-2026 Partnership Compact Foundations of Learning for All*. Government of Sierra Leone. Available from https://assets.globalpartnership.org/s3fs-public/document/file/2022-10-SierraLeone-partnership-compact.pdf?VersionId=Gdp1Xe2QFrHqM0XHgfzsuBo83rsVA4Vr. (details)

UNICEF. (Forthcoming). *Right Teachers, Right Places: Improving foundational learning through stronger teacher deployment*. (details)

Vijil, A., McBurnie, C., Bellinger, A., Godwin, K., & Haßler, B. (2023). *Factors Related to Teacher Absenteeism in Sierra Leone: Literature review*. EdTech Hub. https://doi.org/10.53832/edtechhub.0170. Available from https://docs.edtechhub.org/lib/MS3CKE8G. Available under Creative Commons Attribution 4.0 International. (details)