

Teachers for All

Improving primary school
teacher deployment in Zambia



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Correspondence should be addressed to:

UNICEF Innocenti – Global Office of Research and Foresight

Via degli Alfani, 58

50121 Florence, Italy

Tel: (+39) 055 20 330

Fax: (+39) 055 2033 220

researchpublications@unicef.org

www.unicef-irc.org

@UNICEFInnocenti on Twitter, LinkedIn, Facebook, Instagram and YouTube

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Mabruk Kabir

April 2023

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Acronyms

CTT	Core technical team
DEBS	District Education Boards
DHRMCs	District Human Resource Management Committees
ECZ	Examination Council Zambia
EGRA	Early Grade Reading Assessment
EMIS	Education Management Information System
ESSP	Education and Skills Sector Plan
MoE	Ministry of Education
NAS	National Assessment Survey
NSC	National Selection Committee
OECD	Organisation for Economic Co-operation and Development
PTR	Pupil-to-teacher ratio
SACMEC	The Southern and Eastern Africa Consortium for Monitoring Educational Quality
TCZ	Teaching Council of Zambia
TSC	Teaching Service Commission
T4A	Teachers for All
8NDP	Eighth National Development Plan

Executive summary

The equitable and effective deployment of teachers is critical to achieving quality education for all. While Zambia has achieved remarkable progress in expanding its education system, improvements to education quality have not kept pace. Teachers are key to improving student learning. However, teacher shortages are a key challenge and are compounded by inequities in teacher allocation, both across and within districts. Recognizing teachers as key to improving learning, strengthening the recruitment and placement of teachers are priorities for the Ministry of Education (MoE). Reflecting this commitment, the Government of Zambia deployed 30,496 new teachers in 2022 and expects to recruit an additional 4,500 teachers in 2023.

Teachers for All (T4A) is a mixed-methods and multi-phase research programme that generates evidence on primary school teacher allocation. **This report presents findings from Zambia to support policymakers in understanding the magnitude and distribution of teacher shortages, and to inform ongoing efforts to improve teacher deployment.**



KEY FINDINGS



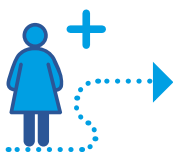
The inequitable distribution of teachers across and within schools contributes to significant disparities in class sizes and learning conditions.

Data from Zambia reveal that larger class sizes are negatively associated with learner performance at the Grade 7 level. Reducing class sizes may not improve learning on its own, but it represents a key enabling condition.



While data show a teacher shortage at national level, headline statistics conceal important sub-national variations.

Teachers are not only distributed inequitably across provinces, but also across districts within in those provinces. Around 24 per cent of districts (28 of 116 districts) are experiencing acute teacher shortages, with an average pupil-to-teacher ratio (PTR) of more than 80:1 – double the MoE's PTR target.



Rural and remote schools experience greater teacher shortages than urban schools, and the shortage of female teachers is particularly acute in rural areas.

The lack of female teachers in rural areas has important implications for gender equitable education access and learning outcomes. Global evidence, including analysis from Zambia, suggests that female teachers play an important role in promoting enrolment, retention and learning for girls.



The inequity in teacher distribution is mainly concentrated inside districts.

Most districts in Zambia have a high variation of PTRs, which means there is a large spread of PTRs between schools in that area. Many districts also experience low coherence, which is when teacher allocation does not correlate with learner enrolment numbers.



Inequities within schools – i.e., across grades – remain a key policy challenge. Average PTRs tend to be higher in the lower grades of the primary cycle (Grades 1-4) compared to the upper grades (Grades 5-7).

This implies that learning conditions tend to be worse in earlier grades, when children acquire critical foundational skills. Students who fail to acquire basic learning and numeracy may fall further behind as they progress through primary education. This disproportionately affects disadvantaged learners.



The Government of Zambia recognizes the critical role that teachers play in improving learning outcomes and has made addressing teacher shortages a key policy priority.

The government recruited and allocated 30,496 teachers in 2022 and has committed to recruiting an additional 4,500 teachers in 2023.

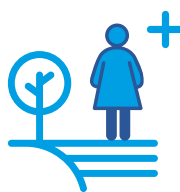
RECOMMENDATIONS FOR POLICYMAKERS



Despite increases in teacher supply, teachers continue to be distributed unevenly across Zambia, and various regions are still experiencing shortages and surpluses. Using localized data in decision making can improve the targeting of resources. District-level data can identify areas that face the sharpest and most persistent teacher shortages, despite the mass recruitment exercise in 2022. Prioritizing additional teacher deployment in these districts will have the highest returns in terms of improving learning conditions.



Prioritize teacher recruitment and retention measures for rural areas to improve equity in the system. There are two broad sets of interventions that can mitigate the challenges of serving in rural areas: (i) strengthening incentives for teachers (both financial and non-financial) and, (ii) addressing the physical constraints of living in rural/remote areas.



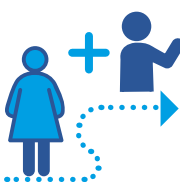
Address the additional barriers that female teachers face in rural areas. Female teachers experience additional constraints when serving in rural and remote areas, including concerns around safety and security, difficulties in mobility and access to hygiene and sanitation needs. This compounds teacher shortages in these areas. Measures to address these additional barriers may include investing in school infrastructure, such as electricity access and sanitation facilities, and providing targeted support for female teachers, including incentive packages specifically tailored to their needs.



Prioritize teacher deployment to earlier grades to address poor learning. Enacting policy measures and targeting resources at Grades 1-4 can improve learning conditions at this critical juncture of the education cycle. Measures include providing policy guidance for school leaders, deploying additional teachers to earlier grades and incentivizing teachers to serve longer in these classes. The cost of poor learning in early grades is particularly high, as a deficit in foundational learning is difficult to address once learners move beyond the early grades. This deficit will continue to grow as learners progress through the education system.



Within-district teacher transfers can be the fastest way to equalize learning conditions across schools, especially for disadvantaged schools in rural schools. Deploying teachers locally also reduces the risk of uprooting or displacing teachers, or requiring them to travel longer distances. This increases the likelihood that teachers will stay at their assigned schools.



Strengthen decentralization efforts by empowering and building the capacity of local authorities, including members of District Human Resource Management Committees (DHRMCs) and District Education Boards (DEBS), to oversee and coordinate local transfers. Local actors and community members have better information on both school needs and teacher preferences. They are also better positioned to coordinate decisions around transfers, monitor compliance and ensure the deployment of replacement teachers.

1. Country context

Zambia has achieved remarkable progress in expanding its education system and improving access at the primary-school level. The gross enrolment rate has increased from 79 per cent in 2000 to 97.1 per cent in 2017.¹ In parallel, the pool of primary school teachers has expanded from 31,900 in 2000 to 78,100 in 2017.² Zambia's commitment to education is also reflected in its budget allocation. The education sector receives the largest single share of the government budget, projected to be around 17.2 per cent in 2018-2022.³ In 2021, the sector received 11.5 per cent of the total national budget, representing 3.8 per cent of GDP.⁴

However, despite substantial investments in the education sector, improvements to the quality of education have not kept pace. International and national learning assessments consistently find that Zambian children are not learning basic competencies in school. The National Assessment Survey (NAS) has reported low test scores in English and mathematics for Grade 5 learners for the past 15 years. Results from the 2007 Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ), a regional learning assessment for Grade 6 learners, show that Zambia performed at the bottom on mathematics among 15 participating African countries.⁵ More recently, a 2021 USAID early grade reading assessment (EGRA) found that only four per cent of Grade 2 learners met the MoE-stipulated minimum level for reading proficiency.⁶ Data from the Organisation for Economic Co-operation and Development's (OECD)

Programme for International Student Assessment (PISA) identified large class sizes, teacher capacity and teacher absenteeism as factors contributing to learning challenges.⁷

Raising learning outcomes is a key priority for the MoE. Recognizing teachers as a critical input to learning, the MoE's 2017-2021 Education and Skills Sector Plan (ESSP 2017-21) prioritized teachers as a key focus area. The plan aims to 'improve quality by ensuring that qualified teachers are equitably available in sufficient numbers across all regions'.⁸ Building on this, the government's Eighth National Development Plan (8NDP) 2022-2026 reiterated the need to improve education quality 'through the recruitment and placement of more teachers in needy areas'.⁹

Despite expanding the teaching workforce in recent decades, Zambia is still experiencing an acute teacher shortage. While the MoE had set a target PTR of 40:1,¹⁰ national statistics estimate the PTR for primary schools was 57:1 in 2020, significantly larger than the secondary-level PTR of 26:1.¹¹ This headline figure not only underestimates the extent of teacher shortages but conceals large variation between schools. The government recently calculated that more than 115,000 teachers are needed across Zambia to fill vacant posts at the primary level.¹² High PTRs imply large class sizes at the primary level, and this reduces pupils' access to teachers. Teachers are less able to engage in pedagogical practices that promote foundational

1. See the latest available data from the UNESCO Institute for Statistics at <https://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS?locations=ZM>, accessed January 2023 and the Zambian Ministry of General Education, *Education Statistics Bulletin 2020*, Government of Zambia, Lusaka, Zambia, 2020.
2. Latest available data from the UNESCO Institute for Statistics, see <http://data.uis.unesco.org/#>>, data extracted 24 October 2022.
3. Zambian Ministry of General Education and Ministry of Higher Education, *Education and Skills Sector Plan 2017-2021*, Government of Zambia, Lusaka, Zambia, 2017.
4. Data from UNICEF Zambia, 2021.
5. World Bank, 'Education Enhancement Project Appraisal Document', World Bank Group, Washington, D.C., USA, 2017.
6. United States Agency for International Development, *Education Data Activity: 2021 Midline Grade Reading Assessment Report*, USAID Education Office and Zambia US Embassy, Lusaka, Zambia, 2022.
7. PISA measures the competencies of 15 year old learners
8. Zambian Ministry of General Education and Ministry of Higher Education, *Education and Skills Sector Plan 2017-2021*, Government of Zambia, Lusaka, Zambia, 2017, p.16.
9. Zambian Ministry of Finance and National Development, *Eighth National Development Plan 2022-2026*, Government of Zambia, Lusaka, Zambia, 2022, p.48.
10. See Walter, T.F., *Teaching staff imbalances across public primary schools in Zambia*, Innovation for Poverty Action, Washington, D.C., USA, 2018 (IPA). The Global Partnership for Education suggests achieving a learner-to-teacher ratio below 40:1. Above this threshold, it is considered that there is a lack of teachers to ensure quality education.
11. Data from the Ministry of General Education's *2020 Education Statistical Bulletin* shows a PTR of 56.5:1. This figure covers all school types, including private, grant aided and community schools, and varies as a result.
12. Data cited from a Zambian Cabinet study in the MoE presentation given at T4A inception workshop held between 1 and 2 June 2022. In the first half of 2022, the Government of Zambia recruited over 30,000 teachers as an effort to address teacher shortages.

learning, including giving individualized attention to learners, adapting material to a learner's level of development, providing formative feedback and building supportive relationships.¹³

Overall teacher shortages are compounded by inequities in teacher allocation both across and within districts. This is partly driven by challenges in deploying teachers to rural areas, something that is particularly pronounced for female teachers. There are overlapping constraints related to placing and retaining teachers in difficult-to-staff schools. Consultations with the project's core technical team (CTT) members revealed that teachers tend to work in urban schools, even when explicitly assigned to serve (and are paid) in rural schools.¹⁴ In addition, MoE officials report that over 95 per cent of formal transfer requests are to move to urban areas, often to already well-staffed schools. The lack of physical accessibility and access to basic services were the most frequently cited factors driving low retention rates in rural schools. In addition, several social and cultural issues were flagged as critical barriers that are stopping teachers stay in rural areas, including healthcare needs, the need to reunify with spouses and the lack of water, sanitation, and hygiene (WASH) facilities (especially in relation to menstrual health).¹⁵

In the Zambian education system, there is room to improve teacher attendance and classroom contact time. It is estimated that unauthorized teacher absenteeism was at 18 per cent in 2015, while authorized absenteeism was estimated at 5 per cent (e.g., absenteeism for training, field trips or maternity leave).¹⁶ In school, studies have found that teachers are frequently occupied with administrative tasks and non-teaching activities, reducing time on task in the classroom.¹⁷ Early primary school learners

experience the lowest contact hours in school, averaging 4 hours for Grade 1-4 learners, 5.2 hours for Grade 5-7 learners and 6.4 hours for Grade 8-12 learners.¹⁸ These hours are further reduced for double-shift schools, as overall learning hours (and access to teachers) are divided into morning and afternoon streams.¹⁹

Existing administrative data may underestimate both the scope and magnitude of the teacher allocation challenge. Recent analysis from Zambia identified significant discrepancies between Education Management Information System (EMIS) data and payroll data, which estimate that up to 60 per cent of teachers may not be working for the school they are registered at within the payroll system.²⁰ Anecdotal evidence suggests that this is partly due to teachers transferring from undesirable rural facilities to those closer to town without the knowledge of the MoE and the Teaching Service Commission (TSC). As teachers technically remain registered in rural schools on payroll, it is not possible to deploy additional or replacement teachers due to the lack of payroll vacancies, and this further amplifies disparities.

To address these challenges, the Government of Zambia has increased investment in the education sector and implemented a number of administrative reforms. In order to address teacher shortages, the MoE has made teacher recruitment and allocation a cornerstone of its education strategy. This commitment is reflected in the 8NDP 2022-26, which aims for a PTR of 45:1 in primary schools by 2026.²¹ This political commitment has translated to large-scale teacher recruitment, with the Government of Zambia deploying 30,496 new teachers in 2022.²² An additional 4,500 teachers are expected to be recruited in 2023.²³

13. See Solheim, O.J. and Opheim, V., 'Beyond class size reduction: Towards more flexible ways of implementing a reduced pupil-teacher ratio', *International Journal of Educational Research*, vol. 96, 2019, pp.146-153.

14. Analysis using data from payroll and establishment registers. See Walter, T.J., *Reducing school staffing imbalances and wasteful government spending in Zambia*, Innovations for Poverty Action and International Growth Center, London, UK, 2019.

15. Statistics and anecdotes cited during consultations at the T4A inception workshop held between 1 and 2 June 2022.

16. The World Bank, *Education public expenditure review in Zambia*, The World Bank Group, Washington, D.C., USA, 2016.

17. Mulenga, I. M. and Lubasi, I. M., 'Teachers present in school but absent in class: Utilization and 'silent erosion' of learning time in the implementation of the curriculum in Mongu district of Zambia', *European Journal of Education Studies*, vol. 6, no. 2, 2019, pp.61 - 79.

18. Zambian Ministry of General Education and Ministry of Higher Education, *Education and Skills Sector Plan 2017-2021*, Government of Zambia, Lusaka, Zambia, 2017.

19. Ministry of General Education Zambia, 'Education Sector Analysis 2018', Government of Zambia, Lusaka, Zambia, 2018.

20. See Walter, T.J., *Reducing school staffing imbalances and wasteful government spending in Zambia*, Innovations for Poverty Action and International Growth Center, London, UK, 2019 and Ashraf, N. et al., *Missing links and mismatches: Data challenges with policy implications*, International Growth Center, London, UK, 2019.

21. Zambian Ministry of Finance and National Development, *Eighth National Development Plan 2022-2026*, Government of Zambia, Lusaka, Zambia, 2022, p.48.

22. Names of newly recruited teachers were released on the Teaching Council Zambia website in August 2022, see www.tsc.gov.zm/teachers-list/, accessed January 2023.

23. Figure cited during budget presentation in the Zambian Parliament in October 2022.

Zambia is also implementing a comprehensive decentralization strategy to improve public service delivery, as enshrined in Article 151 of the Zambian constitution in 2016.²⁴ The policy framework for the devolution of human resource management is outlined in the Service Commissions Act No. 10 of 2016 and the Service Commission (Civil Service Commission) Regulations of 2020. These reforms aim to empower local stakeholders by establishing District Human Resource Management Committees (DHRMCs) in all 116 districts, overseen by District Education Boards (DEBS). Consisting of both local civil servants and community members, DHRMCs oversee teacher selection and played a key role during the 2022 recruitment process. To improve accountability and transparency, teaching positions were advertised nationally, then Zambia Postal Services (Zampost) collected the applications

and forwarded them to the DHRMCs for review and selection. Selected candidates were cross-checked with the Zampost database when appointments were made, and an online tracking system was built for applicants to track their applications.

Despite political commitment and proactive policy measures, teacher shortages continue to drive challenges in equity and learning in Zambia.

Given the scope of the challenge, there is a need to leverage data and evidence to better support policy decisions around teacher recruitment, deployment and retention. To assist policymakers in deploying teachers where they are needed most, there is a need to identify the areas that are experiencing the most acute teacher shortages and understand what is causing these shortages.



24. Zambia's National Decentralization Policy 2009 was formulated to enhance the participation of citizens in governance at all levels. The revised National Decentralization Policy (2013) and the Decentralization Implementation Plan (2014-2017) provide a policy and procedural framework for the implementation of the government's decentralization agenda. In 2016, decentralization was enshrined in Article 151 of the Zambian Constitution, which provides for the establishment of a system of local government where functions, responsibilities and resources from the national government and provincial administration are transferred to local actors. The human resource management aspects of decentralization policy, including for the Teaching Service Commission, is outlined in the Service Commission Act No. 10 of 2016. For further background, see Chisala, C., 'Decentralisation and Local Economic Development in Zambia [conference paper for the 6th Annual International Conference on Public Administration and Development Alternatives]', University of South Africa, Pretoria, South Africa, 2021.

2. Teachers for All

2.1 Design and objectives

The **Teachers for All project** aims to better understand the magnitude and distribution of public teacher shortages and inequities in Zambia to support the MoE's agenda on teacher deployment.²⁵ It seeks to address these questions:

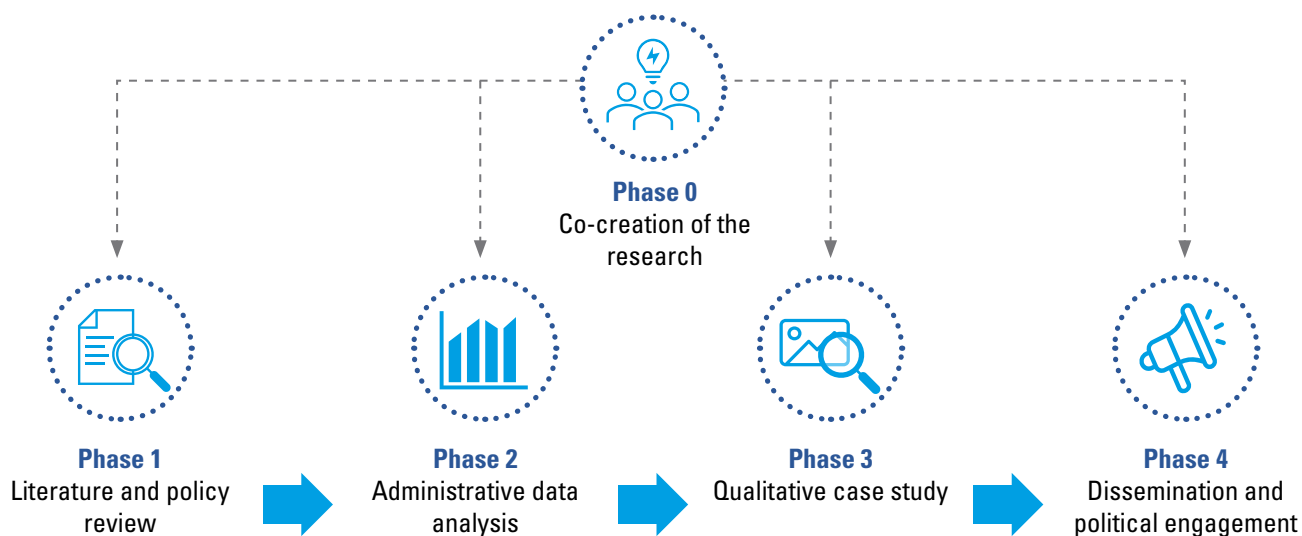
1. What are the **differences in teacher allocation across schools** (between and within districts), considering teacher experience, qualifications, training and gender?
2. What are the **differences in teacher allocation within schools** (between grades)?
3. Is there a **relationship between teacher allocation and learner performance**? Does learner performance vary based on teacher characteristics (experience, qualifications, training and gender)?
4. What **instruments, mechanisms and procedures** are in place to ensure the rational management of teachers, including their recruitment, placement, transfer and retention? What are the **successes and challenges** that accompany them? What are the main characteristics of **successful strategies**?

To ensure the relevance of its scope and direction, T4A relies on a **co-creation process**. In Zambia, a broad multi-stakeholder workshop was held between 1 and 2 June 2022 with MoE officials, civil society organizations, researchers and development partners. This consultation aimed to collaboratively shape the project's objectives and research questions to ensure the project directly responds to immediate challenges in Zambia and supports the MoE's strategy, policy priorities and ongoing reform agenda. In addition, the project works with MoE officials (organized through the CTT) to understand, generate and utilize data and is strengthening the MoE's capacity to use evidence to inform decision making.

The project uses a **mixed methodology and a sequential, multi-phase research design** (see *Figure 1*). This report presents the findings of the first two phases of the analysis (Phase 1 and Phase 2). It also provides policy recommendations and directions for the next, qualitative phase of the investigation (Phase 3).

The following sections outline the data and research approach, provide an overview of the teacher workforce in public primary schools and teacher policies, and present findings and policy implications.

Figure 1. Teachers for All's research design



25. T4A is currently active in 12 sub-Saharan African countries

2.2 Data sources and key metrics

The analysis primarily draws upon administrative data from the 2020 EMIS (the latest year available). School-level data are used to calculate metrics related to teacher allocation, including PTRs at various administrative levels, in addition to measures of variation and coherence (see Box 1). In Zambia, PTR estimates refer to teachers that are qualified and trained. Teachers eligible to teach in the public system must go through teacher training colleges and be registered with the Teaching Council of Zambia (TCZ) to hold a teaching license.²⁶

The analysis also utilizes learning assessment data from the Examination Council Zambia (ECZ) relating to the examination given at Grade 7 level. This examination is administered at the end of seven years of the primary cycle and is used for both placement (i.e., selection into Grade 8) and certification purposes. This dataset is used to calculate a composite learning score for each learner, based on an average of subjects; namely, English, mathematics and the Zambian language.

The EMIS and ECZ datasets were merged by matching unique school identification codes in the EMIS database with their associated unique examination centre codes in the examinations database.²⁷ It is important to note that, on average, each examination centre serves learners from two schools. In other words, the specific characteristics of the school from which learners come to take the exam are not known. As such, the correlation between school-level PTR and exam-level test scores may be biased and should be interpreted with caution. However, given that neighbouring schools tend to serve similar populations (and therefore learners from similar socio-economic backgrounds), the analysis still provides useful insight for policymakers.

Box 1. Key concepts

Teacher allocation, the distribution of teachers throughout a territory and their assignment to schools is measured through two key concepts.

Pupil-teacher ratio (PTR), or the average number of pupils per teacher, assesses the number of enrolled pupils to the number of teachers. In addition to measuring this at the national level, calculating this at regional and district levels enables policymakers to identify shortages, compare allocation between geographical areas and identify areas of unequal allocation, which helps to inform policy actions. In addition to identifying discrepancies using absolute PTR, policymakers can also consider variation in PTRs, measured through standard deviation of PTRs. This captures the spread or dispersion of PTRs and can be used to assess imbalances between schools within a district.

Degree of coherence and randomness (measured through R^2) measures the relationship, or lack of relationship, between the number of teachers and the number of pupil enrolments per school. It is based on the principle that the number of teachers in a school should be proportional to the number of pupils; so the more pupils in a school, the more teachers. Consequently, schools with the same number of pupils should have roughly the same number of teachers. Inequitable allocation of teachers means the number of teachers is not consistent with the number of pupils enrolled, and teacher allocation is driven by other factors.

26. The UNESCO Institute for Statistics estimates that 94.4 percent of teachers are classified as qualified at the primary level in 2017. Zambia's EMIS is derived from the annual school census, which is distributed in the form of a questionnaire sent to all schools and is completed by each school headteacher. The responses are then consolidated and entered electronically at the district education offices before being transmitted to the central ministry.

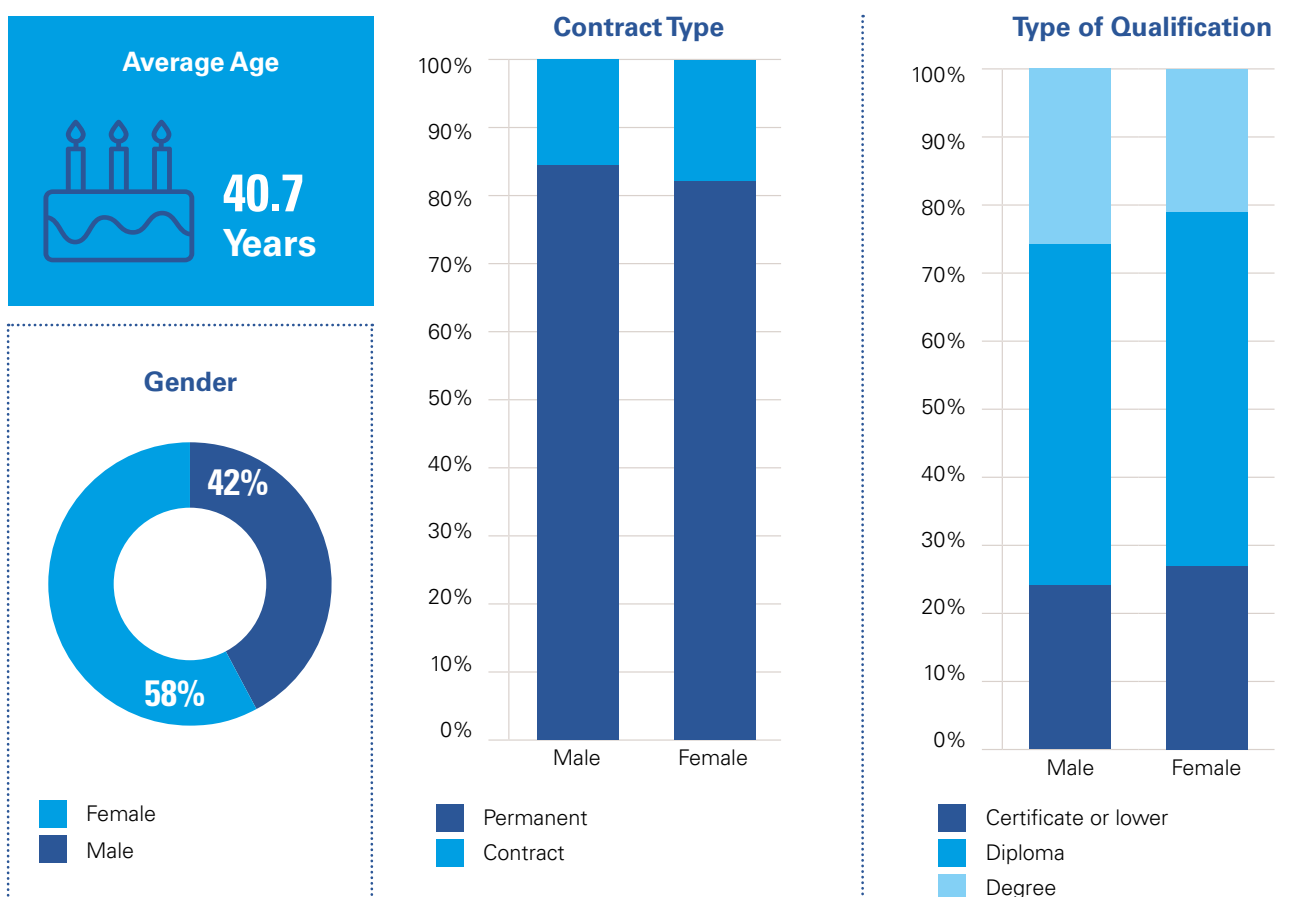
27. For a discussion of merging ECZ examination centre data with school data, see UNICEF Innocenti, MoE Zambia and UNICEF Zambia, *Data Must Speak: Unpacking Factors Influencing Primary School Performance in Zambia*, UNICEF Innocenti, Florence, Italy, 2022.

3. Teacher profiles and teacher policies in Zambia

Descriptive statistics on primary school teachers provide a number of key insights (see Figure 2A).²⁸ Teachers in public primary schools are aged 41 on average, and 58 per cent are male. A higher proportion of male teachers are on permanent contracts (85 per cent) than female teachers (82 per cent). The majority of teachers have a teaching diploma as opposed to certificates or degrees.

When broken down by gender, 52 per cent of male teachers have a diploma, 24 per cent have a degree, and 24 per cent have a teaching certificate (or below). For female teachers, 52 per cent have a diploma, 20 per cent have a degree and 27 per cent have a teaching certificate or lower (see Figure 2B for the distribution of teacher qualifications across districts).

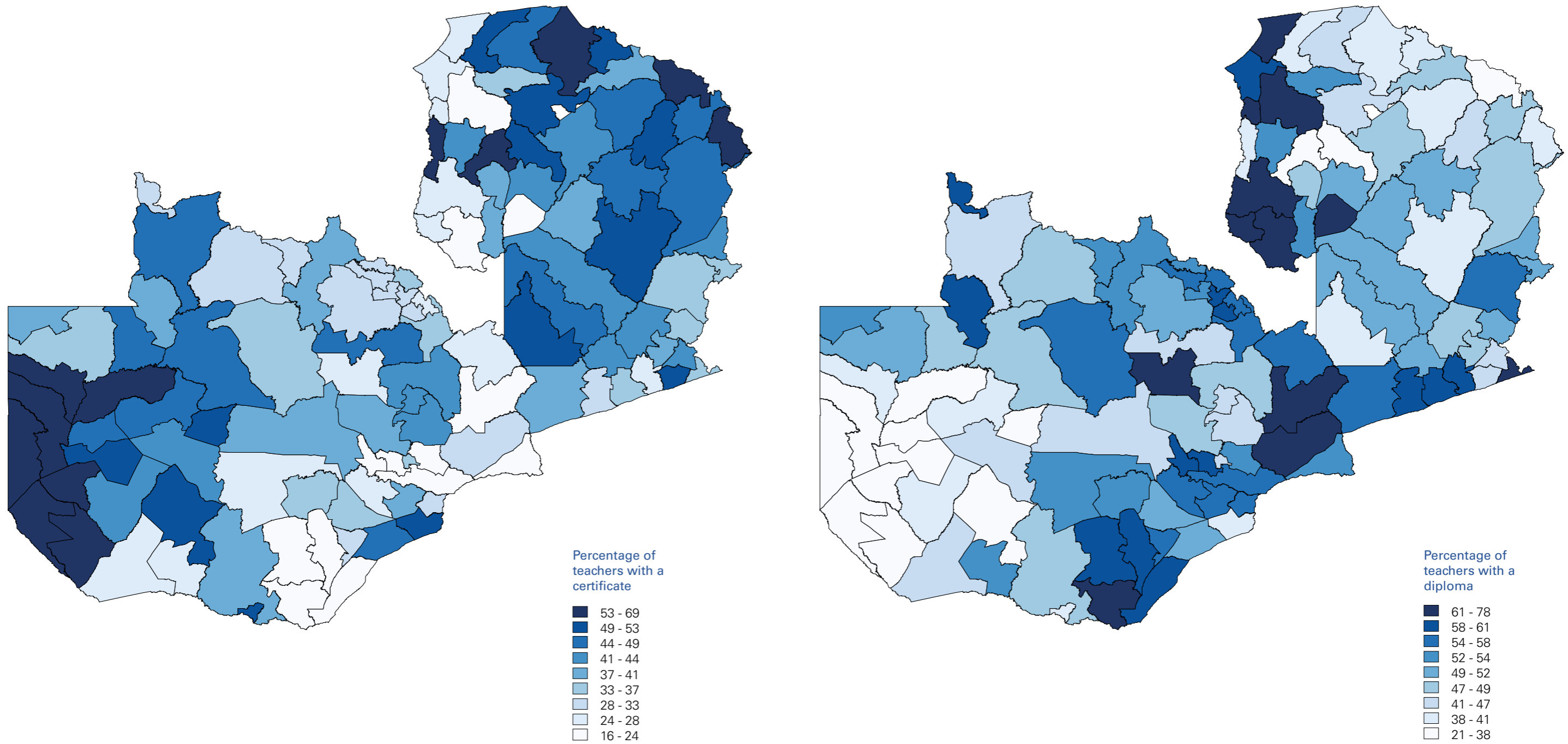
Figure 2A. Profile of primary school teachers in public schools in Zambia



Source: EMIS 2020

28. Descriptive statistics calculated at the school level from EMIS 2020. Sample is constructed based on two criteria: (i) public schools that are exclusively primary schools and (2) public schools that have primary grades. Slight deviations from Data Must Speak Zambia findings are due to variation in sample and level of analysis.

Figure 2B. Distribution of teachers with a teaching certificate (or below) and teachers with a diploma



Note: Darker colors represent higher proportions.

Data Source: EMIS 2020

The designations employed in the maps contained in this report do not imply on the part of UNICEF the expression of any opinion whatsoever concerning the legal status of any country or territory, or of its authorities or the delimitations of its frontiers.

In the education sector, the provision of early childhood and primary education is devolved to local authorities, while the mandate for national policy and legislation remains at the central level.

Teacher management, including teacher recruitment, allocation, transfer and retention, is governed by a policy framework consisting of the Teaching Profession Act 2013, the Service Commission Act No. 10 of 2016, and the Teaching Service Commission Statutory Instrument No. 102 of 2020.²⁹

Following recent decentralization reforms, teacher recruitment follows a localized process that engages all tiers of the MoE (see Figure 3). On an annual basis schools identify vacancies through the school census, and send the number of vacancies to central MoE level. At the central level, the MoE estimates the recruitment envelope based on budget, acquires treasury authority from the Public Service Management Division and establishes payroll positions through the Payroll Support Service Department. The MoE then advertises vacant posts nationally, but local DHRMCs select teacher candidates. These candidates are screened and verified by both the DEBS at the district level and the Human Resource Management Committees at the Provincial Education Offices. The National Selection Committee (NSC) approves and announces the list of selected candidates (the committee consists of staff from the MoE and the TSC). Teachers are officially employed by the TSC and overseen by the MoE. The key stages and roles of various actors are summarized in the infographic below.³⁰

Public school teachers must be qualified and registered at the TCZ. There are several criteria that need to be met to apply for teaching positions, including a list of general criteria and additional criteria for each education level (see Annex 1). Currently, the minimum entry-level criterion to teach at the primary level is a teaching diploma, which was upgraded from a teaching certificate in 2016. In addition, teaching personnel must be 'registered' and hold a Practicing Certificate (License) conferred by the TCZ. The license authorizes a teacher to teach at a school or college of education or perform the duties of an education administrator.

Teachers in Zambia are entitled to access continuing professional development (CPD) programmes offered by government-run teacher resource centres.

These programmes are part of the SPRINT framework (which stands for School Programme of In-service for the Term). The framework aims to strengthen teacher capacity and orient and train teachers to implement new teaching methods, such as the introduction of a revised curriculum.³¹ There are two forms of CPD: (1) short term, in the form of capacity strengthening programmes provided through workshops at teacher resource centres, and (2) long term, in the form of professional courses for schoolteachers provided by colleges and universities. At the primary level, training is largely provided in schools, district resource centres and through distance learning.³² The revised 2013 curriculum included in-service training to familiarize teachers with the new requirements, which was delivered through Teacher Education and Specialized Services.

Teaching salaries aim to compensate teachers serving in rural areas and consist of two components:

(1) a basic package, including salary, housing allowance and transport allowance for all teachers, and (2) additional allowances based on context, such as remote allowance for teachers deployed in rural and remote schools. Rural and remote allowance corresponds to 20 and 25 per cent of base salary, respectively. Schools qualify for the rural hardship allowance based on the distance to the nearest district centre. Districts are divided into four categories according to their degree of remoteness, and a cut-off is established for each of these categories. For instance, the most remote districts have a cut-off of zero (so all schools are eligible for an allowance), moderately remote districts have a cut-off of between 20 and 25 km, and the most urbanized districts have a cut-off of 30 km.³³ Additional allowances are given based on qualifications, including a responsibility allowance for teachers with diplomas teaching in secondary schools and a double-class allowance for primary school teachers who teach two lower grades.

29. MoE Zambia presentation on teacher allocation studies, 2022.

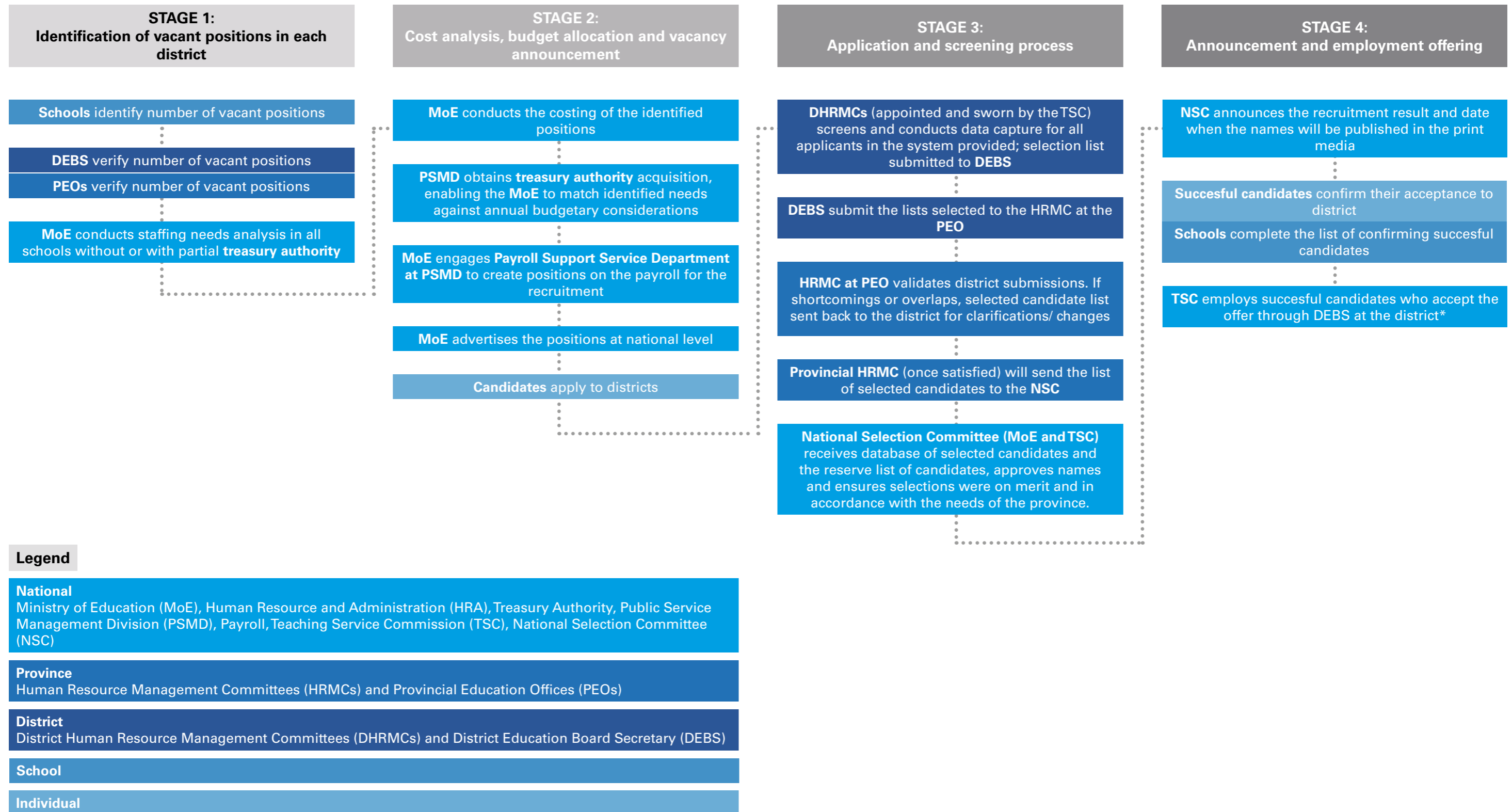
30. The stages outlined in the infographic reflect inputs from the Zambian MoE.

31. MoE Zambia, 'Sector Analysis, 2018', Government of Zambia, Lusaka, Zambia, 2018.

32. MoE Zambia, 'Sector Analysis, 2018', Government of Zambia, Lusaka, Zambia, 2018.

33. Chelwa, G. et al., 'Teacher Pay and Educational Outcomes: Evidence from the Rural Hardship Allowance in Zambia', South African Journal of Economics, vol. 87, no. 3, 2019, pp.255-282.

Figure 3. Teacher recruitment process: Key steps and actors



*When successful candidates don't report to a school, the school informs the district, the district informs the province and the province consults the reserve list and offers the post to another candidate.

4. Key findings

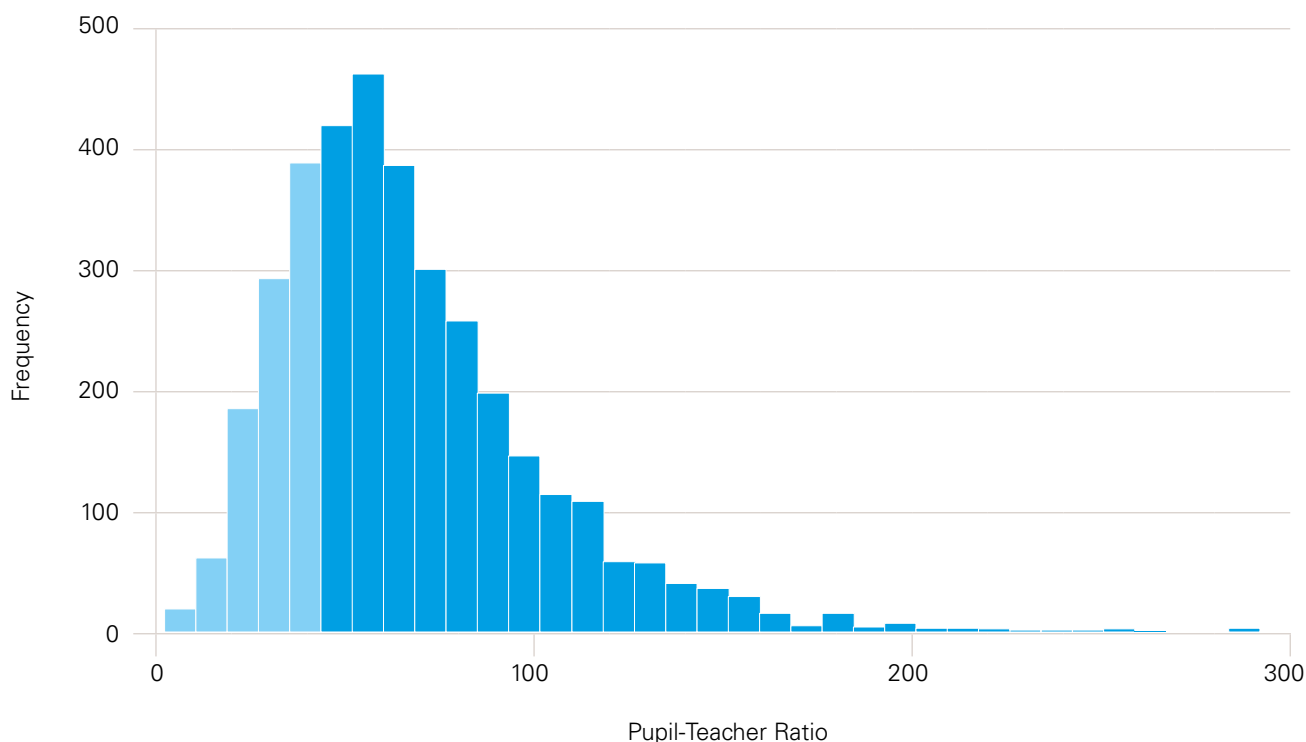
How are teachers distributed across Zambia?

4.1 Teacher shortages are acute at the national level and concentrated primarily in rural areas

The national average PTR in public primary schools was 66.7 in 2020.³⁴ Not only is this figure above Zambia’s national policy target of 40:1, it is above global norms and best practices on class sizes and learning conditions.³⁵

The national PTR figure conceals large variation across schools.³⁶ Figure 4 illustrates the distribution of PTRs across schools in Zambia, and provides two key insights. Firstly, about two-thirds of schools are above the target PTR threshold of 40:1. The share of this distribution is highlighted in dark blue in Figure 4.

Figure 4. Teacher distribution in Zambia: Share of schools above target PTR



Note: The darker shade of blue reflects the share of public primary schools above the 40:1 PTR target

34. This PTR calculation varies from national statistics displayed in the country context section, as it was calculated on a sub-sample of public (Government of Zambia or GRZ) schools either classified as primary schools or schools that have primary grades. Schools with long-term multigrade classrooms were dropped from the sample along with outliers that skew the sample. Total sample for this analysis is 3,650 primary public schools. The median PTR is 59.5.

35. The Global Partnership for Education suggests achieving a PTR below 40:1.

36. For the purposes of this analysis, PTR is equivalent to the Qualified and/or Trained Teacher Ratios. In Zambia, teachers serving in the public system are considered qualified and trained if they are registered and licensed by the TCZ/TSC.

Secondly, a quarter of schools are experiencing acute teacher shortages, defined as schools where primary class sizes are over double the PTR target. Roughly 25 per cent of schools in Zambia have a PTR above 80:1, and 10 per cent of schools have a PTR above 112:1.³⁷ In short, there is a large variation in PTRs across Zambian schools, and a significant share of schools are experiencing acute shortages.

Teacher shortages are particularly pronounced in rural schools. Figure 5 illustrates differences between urban and rural schools, highlighting disparities in both the median PTR as well as the range of PTRs across Zambian primary schools.

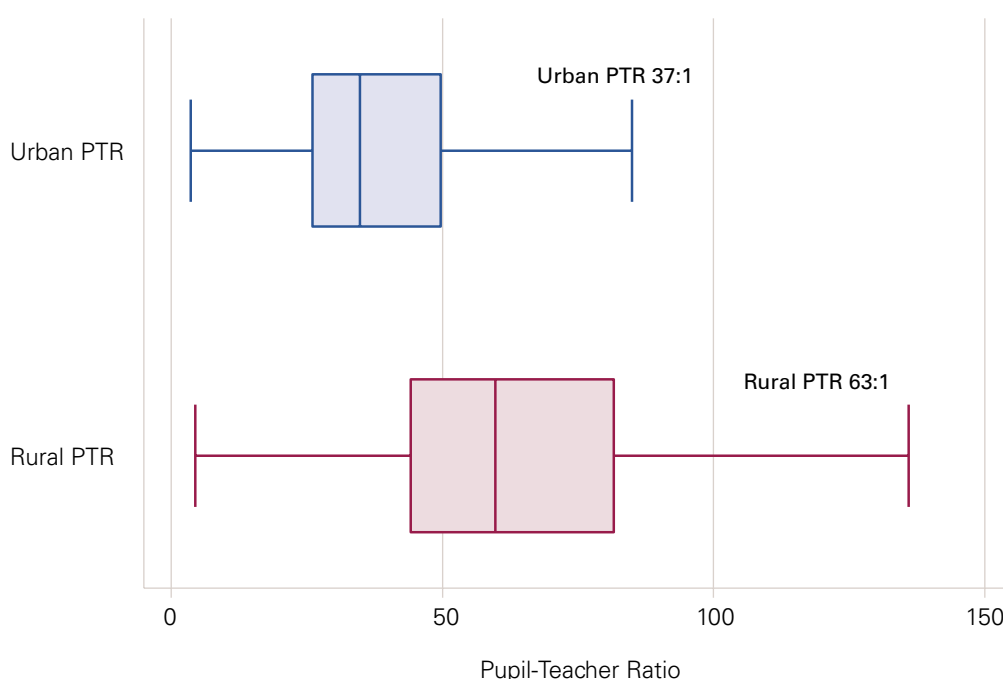
On average, rural schools experience significantly larger class sizes. The median PTR of rural schools (63:1) is almost double the median PTR of urban schools (37:1). In addition, a larger share of rural schools experience teacher shortages compared to urban schools. While only 10 per cent of urban schools have a PTR of over 65:1, almost half of rural schools have a PTR above 65:1. Furthermore, 10 per cent of rural schools have a PTR above

114:1, implying very large class sizes and extremely challenging learning conditions.³⁸

In contrast, the majority of urban schools are experiencing a teacher surplus, defined as schools with class sizes below the PTR target of 40:1. Over half of urban schools have a PTR under 37:1, indicating that even the most crowded urban schools have smaller class sizes than their rural counterparts (see Figure 5).³⁹

While rural schools across Zambia experience teacher shortages, specific provinces experience wider imbalances between rural and urban areas. These regions require urgent attention from policymakers. When assessing differences in average PTR at the provincial level (see Figure 6), inequity is most acute in the Southern, Central, Western provinces where the PTR in rural schools is more than double that of urban schools.

Figure 5. Teacher distribution between urban and rural schools



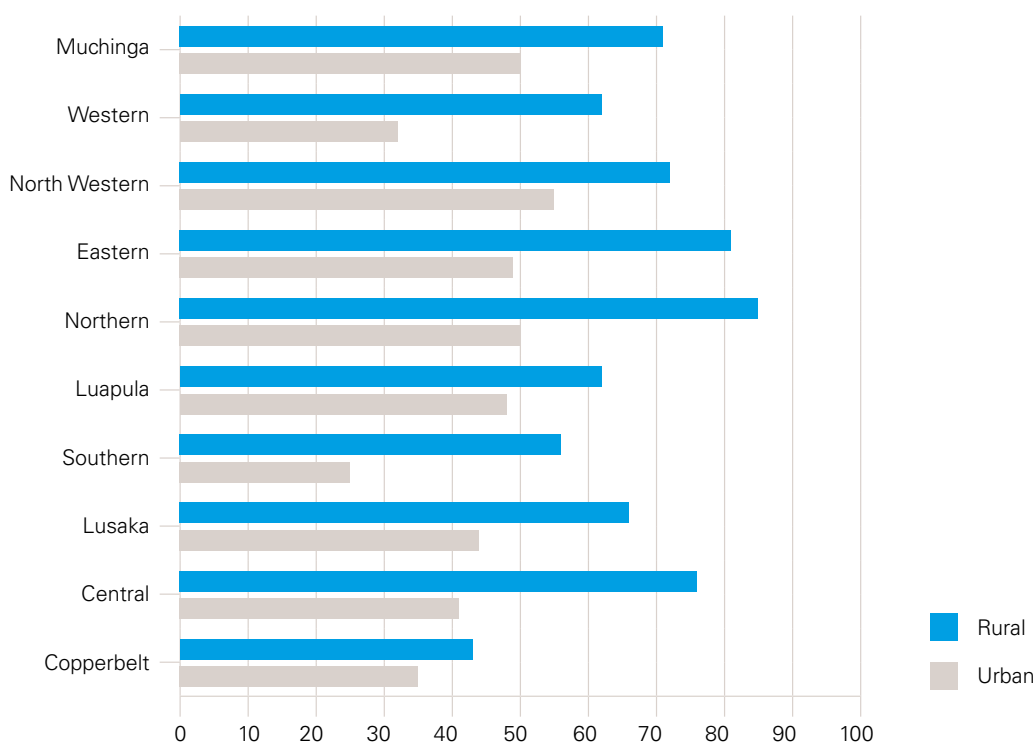
Note: The boxplot illustrates the differences in 'median PTR' between Urban and Rural, as well as the range of PTRs in schools

37. The 75th percentile is the value at which 25 per cent of the observations lie above, and 75 per cent of the observations lie below.

38. The variation in PTRs is also significantly higher for rural schools. Rural schools have a standard deviation of 35, compared to 22 for urban schools.

39. The share of urban schools relative to the total population of schools is 10 per cent of schools in this sample.

Figure 6. Differences in PTR between urban and rural schools, by province



4.2 Teacher shortages are concentrated geographically

The most acute teacher shortages are concentrated sub-nationally. At the province level, Northern (84:1), Eastern (79:1), Central (73:1), North-Western (71:1) and Muchinga (70:1) provinces experience the highest average PTR.

Teacher shortages are further concentrated in individual districts within provinces.

Disaggregating PTRs at the district level provides a more granular understanding of teacher shortages. Figure 7 maps average PTR at the district level and underscores two key insights.

Firstly, at the national level, about 25 per cent of districts (28 of 116 districts) are experiencing acute teacher shortages. These districts have an average PTR greater than 80:1 – double the MoE’s PTR target. In addition, the top decile of districts – interpreted as the top 10 per cent of the distribution – experience average PTRs above 88:1. These districts are represented by the darkest blues in Figure 7 and signal areas where policy actions should be prioritized to address poor learning conditions.

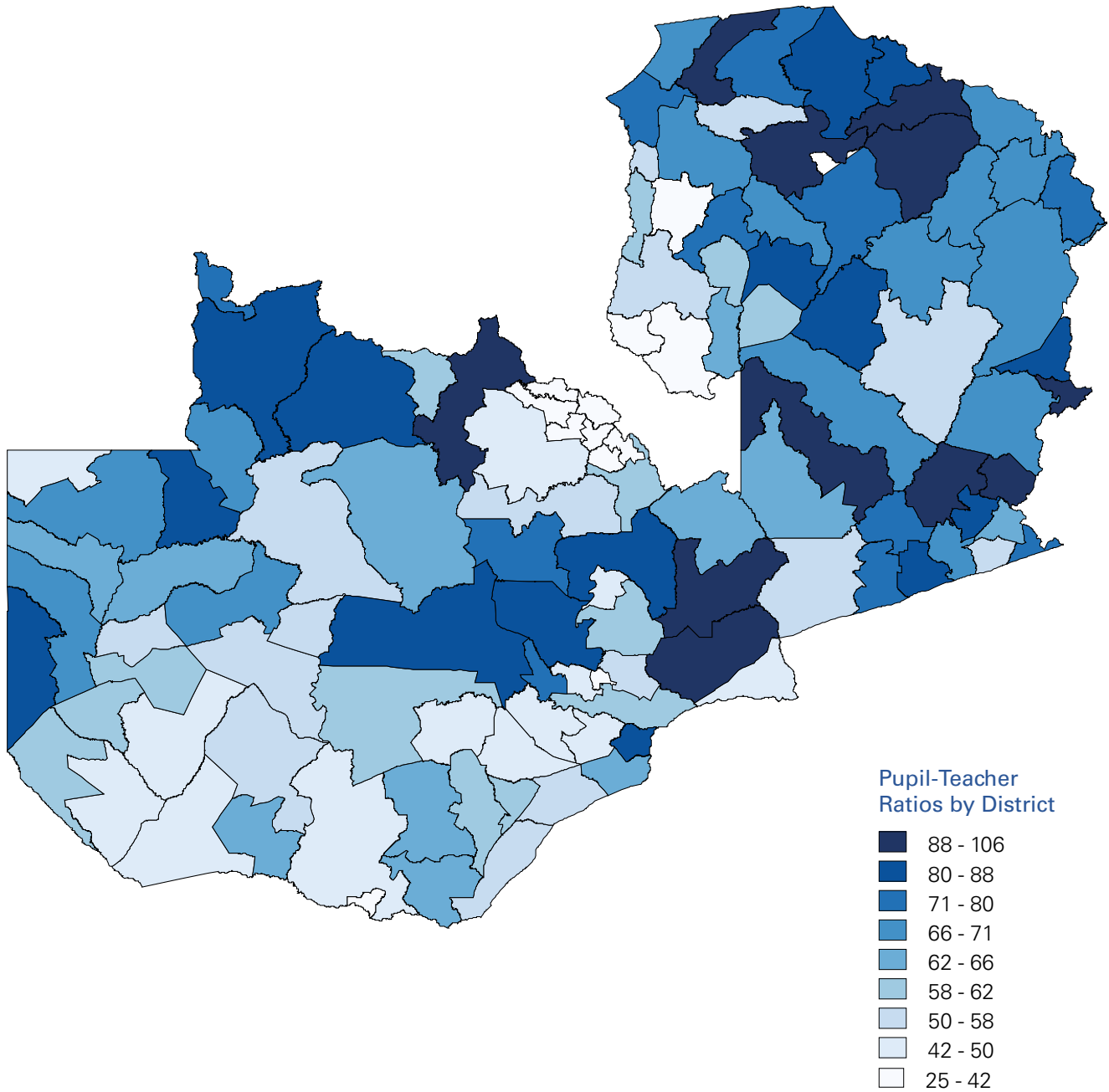
At the other end of the distribution, only 8 per cent of districts in Zambia (10 out of 116 districts) meet the target PTR of 40:1 or below. These districts are concentrated mostly in the western regions of the country.

Secondly, within provinces, some districts experience greater shortages than other districts. For instance, the districts of Kaputa, Lunte, Mbala, Mungwi and Senga Hill in Northern Province; Chitambo and Luano in Central Province; Mushindano and Solwezi in North-Western Province; Chipangali, Lumezi, Lundazi and Mambwe in Eastern Province and Rufansa in Lusaka Province have the highest PTRs compared to the other districts in each province. A number of these districts have challenging characteristics that will require policy adaptations. Some districts are newly formed or very remote, such as Luano in Central Province or Kaputa in Northern Province, the latter of which is often accessed through Luapula via Kasama. Others are very large districts with remote areas, such as Rufansa, or are part of game parks, such as Mambwe in Eastern Province.

In short, teachers are distributed inequitably within provinces, and aggregate statistics may conceal important within-province variation.

Despite the broader limitations of administrative data, utilizing more localized analysis can improve decision making as it can identify areas that have greater relative needs, and this can result in better targeting of public resources.

Figure 7. Inequitable teacher distribution in Zambia: Variation in PTR across districts



Note: Darker colors represent higher PTRs. Only includes public primary schools.

Data Source: EMIS 2020.

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4.3 Female teachers are overwhelmingly concentrated in urban areas

Teacher shortages are compounded by the underrepresentation of female teachers in classrooms. The distribution of female teachers is uneven across provinces and districts. Figure 8 illustrates the share of female teachers at the district level; the lightest colours represent the lowest percentage of teachers.

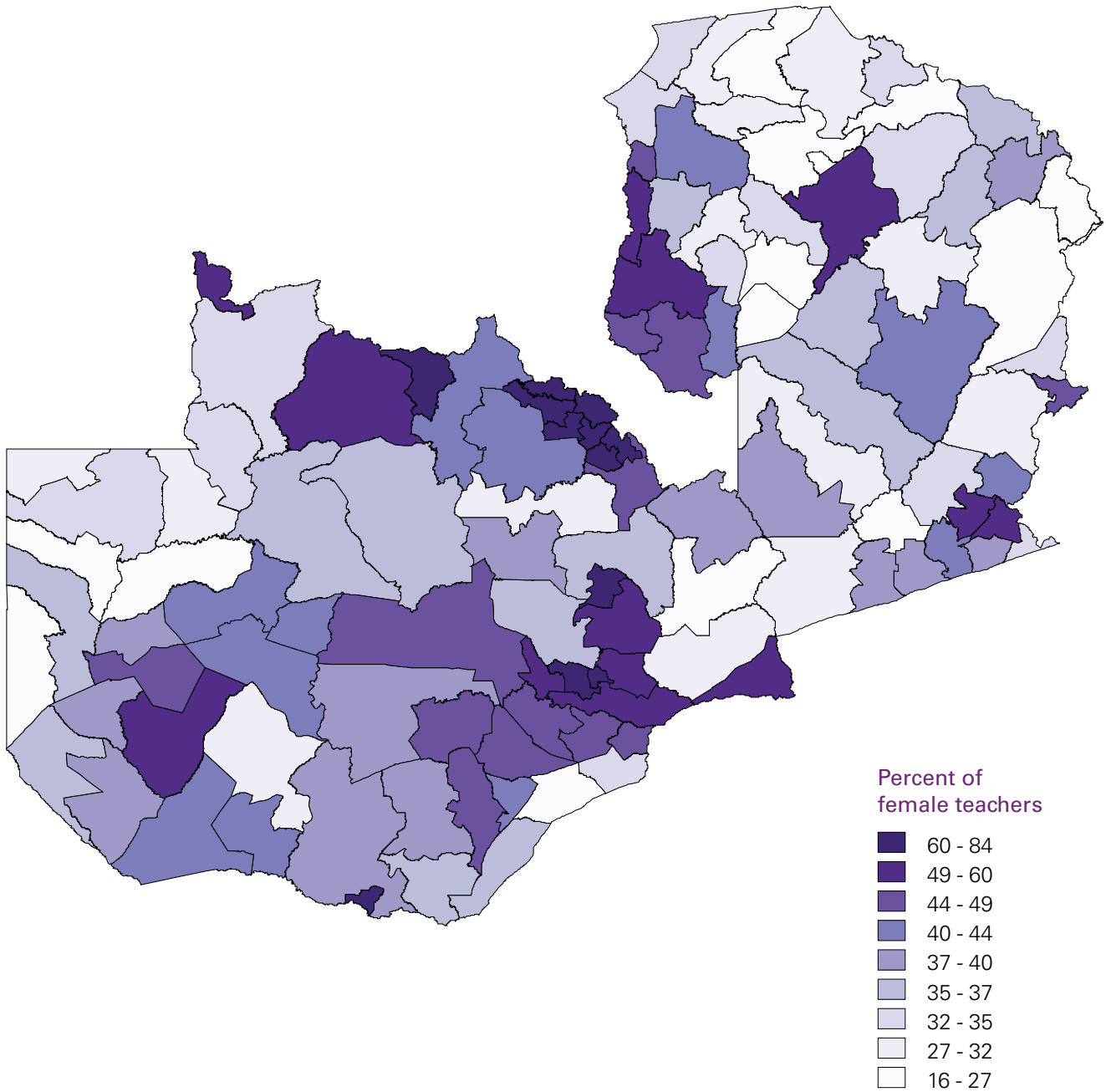
Schools in Zambia's eastern districts have the lowest share of female teachers.⁴⁰ Many of these districts experience challenging conditions, including limited accessibility due to difficult terrain in districts such as Mitete, Lukulu and Sikongo, inconsistent

water transport in places like Chilubi Island and Lunga, or security challenges in Luano Valley. Poor housing infrastructure in parts of Western Province also disproportionately affects female teachers.

Female teachers are disproportionately concentrated in urban schools. At the national level, the average share of female teachers in urban schools is 78 per cent. This is significantly higher than in rural schools, where the share is 37 per cent.

40. The most acute shortages of female teachers are concentrated in the districts of Mitete, Lukulu, Sikongo and Mulobezi in Western Province; Chirundu and Luano districts in Central Province; Kasenengwa, Chama and Mafinga districts in Eastern Province; Mafinga district in Muchinga Province; Senga Hill, Lunte and Nsama Chilubi Island in Northern Province and Lunga in Luapula Province.

Figure 8. Differences in the proportion of female teachers across districts



Note: Darker colors represent higher female teacher proportions.

Data Source: EMIS 2020

The designations employed in the maps contained in this report do not imply on the part of UNICEF the expression of any opinion whatsoever concerning the legal status of any country or territory, or of its authorities or the delimitations of its frontiers.

The urban-rural discrepancy is sharper in more disadvantaged provinces (see Figure 9). In most provinces, urban schools have more than double the share of female teachers (with exceptions, such as Copperbelt Province). In particular, rural areas in Northern, Eastern and Muchinga provinces have the most acute shortage of female teachers.

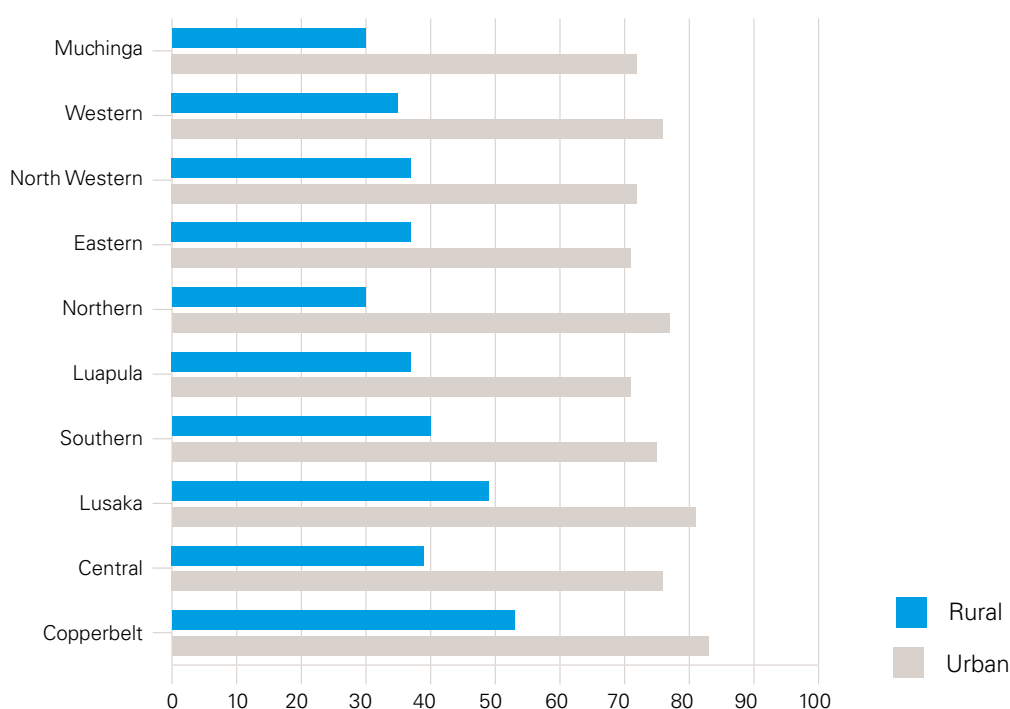
The discrepancy is further amplified as only 10 per cent of schools are classified as urban.⁴¹ This implies that, while female teachers are scarce overall, the vast majority of female teachers are concentrated in a few urban schools.

The lack of female teachers in rural areas has important implications for gender equitable education access and learning outcomes. Female learners in rural and remote areas are often the most disadvantaged and are at higher risk of dropping out. Global evidence suggests that female teachers play an

important role in promoting enrolment and retention for girls.⁴² Recent analysis from Zambia shows that increasing the number of female teachers in a school is strongly correlated with positive learning outcomes for girls, particularly in English and the Zambian language, and this correlation is stronger in rural schools.⁴³

Policy measures to increase the share of female teachers, with a targeted focus on rural schools, are a critical lever for improving both equity and learning outcomes. Consultations with national partners and CTT members revealed a number of gender-specific barriers facing female teachers, including access constraints and physical mobility issues in remote areas, safety and security, access to health and sanitation facilities and socio-cultural barriers. These factors are broadly consistent with global evidence.⁴⁴ Developing interventions to specifically address these barriers will be key to increasing the share of female teachers in rural schools.

Figure 9. Differences in the proportion of female teachers between provinces



41. This figure is based on the sample of public primary schools used in this analysis.

42. Evans and Le Nestour reviewed on the impact of female teachers’ presence on girls’ learning in Ecuador, China, Korea and a number of West and Central African countries. Although their review finds broad variation, female teachers are at least as effective in delivering learning outcomes for girls, in addition to having a positive impact on non-learning outcomes such as motivation to stay in school. See: Evans and Le Nestour, *Are Female Teachers Better for Girls’ Education?*, Center for Global Development, 2022 <https://www.cgdev.org/blog/are-female-teachers-better-girls-education>

43. This relationship holds for English and Zambian language but not for mathematics. See UNICEF Innocenti, Zambia MoE and UNICEF Zambia, *Data Must Speak: Unpacking Factors Influencing Primary School Performance in Zambia*, UNICEF Innocenti, Florence, Italy, 2022.

44. For reviews on challenges of staffing rural schools, see Adedjei, Segun Olugbenga, and Olanrewaju Olaniyan. *Improving the conditions of teachers and teaching in rural schools across African countries*. Addis Ababa: UNESCO-IICBA, 2011; Bertoni, Eleonora, et al. *Teachers’ preferences for proximity and the implications for staffing schools: Evidence from Peru*. Education Finance and Policy (2019): 1-32.; Mulkeen, A., and D. Chen. *Teachers for rural schools: Experiences in Lesotho*. Malawi, Mozambique, Tanzania, and Uganda. The World Bank (2008). Adedjei and Olaniyan 2011; Bertoni et al. 2019; Monaco 2016; Mulkeen and Chen 2008; Yeboah and Adom 2016.

How are teachers distributed across schools?

4.4 Learner enrolment and teacher allocation are weakly aligned

At the national level, there is a relatively strong coherence between learner enrolment and the assignment of teachers.⁴⁵ Figure 10 illustrates the relationship between the number of learners and teachers at each primary school and captures a correlation of 0.82.⁴⁶

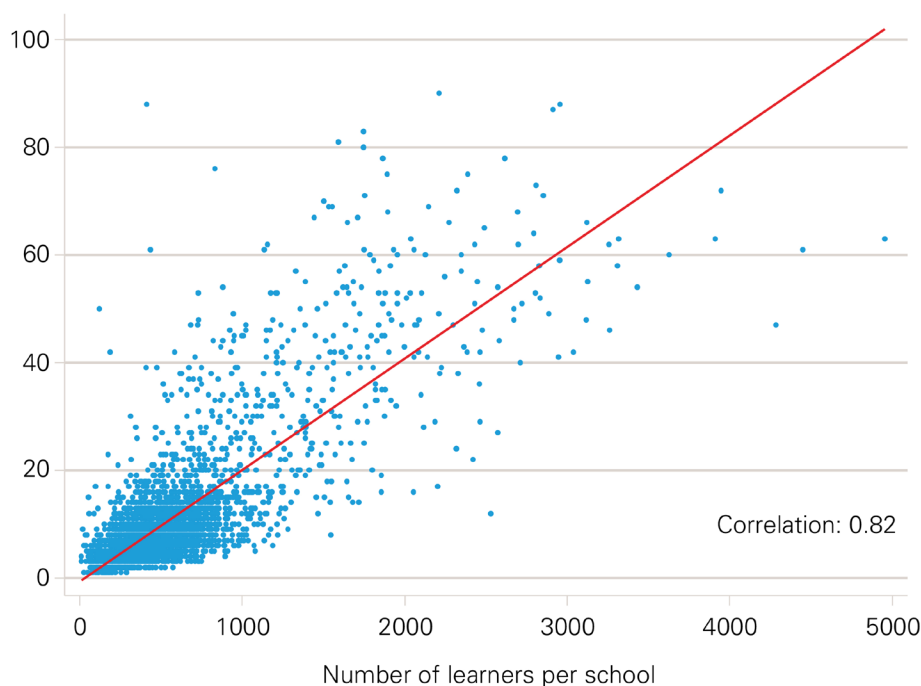
However, this figure masks substantial variation at lower levels. Figure 11 plots the average degree of randomness (i.e., lack of coherence) in each district and provides two key takeaways.

Firstly, schools in districts in the eastern provinces tend to have higher randomness in teacher allocation. Central Province has the largest number of districts where allocation randomness is high. Districts in Central such as Kapiri Mposhi, Kabwe, Ngabwe, Serenje and Chitambo contain the highest share of schools where teacher allocation

is not consistent with pupil enrolment. Similarly, in Northern Province, Mungwi, Lupososhi and Nsama districts experience high randomness, and in Eastern Province, Lumezi and Chasefu districts have the highest randomness. There are also some outliers, such as Mufumbwe and Solwezi districts in North-Western Province.

Secondly, at the national level, about a quarter of districts experience high randomness in teacher allocation (22 percent). In these cases (represented by the darkest shades of red in Figure 11) less than half of the variation in teacher allocation is explained by learner enrolment. This implies that factors outside of learner enrolment influence how teachers are allocated. Identifying these external factors is an area for additional research, which will be particularly suited to the qualitative methods deployed in Phase 3 of the T4A project.

Figure 10. Relationship between number of learners and teachers

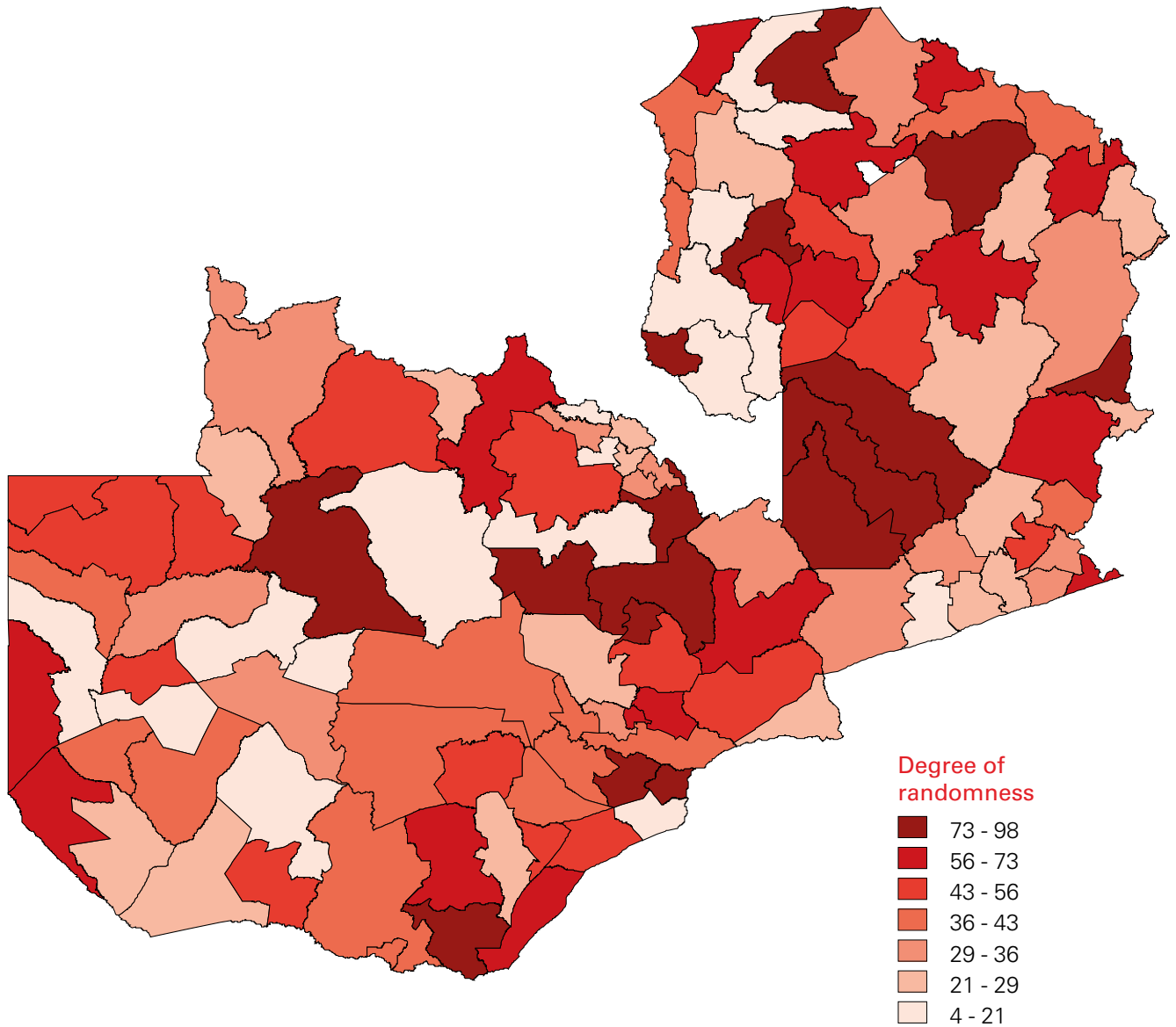


Note: Figure 10 plots the relationship between the number of learners and teachers at each primary school and represents a correlation of 0.82.

45. Equitable allocation of teachers means the number of teachers in a school is proportional to the number of pupils enrolled, i.e., the degree of coherence (measured in terms of R^2) is closer to 1. Conversely, the higher the degree of randomness, the higher the share of allocation linked to other factors.

46. Correlation is significant at the $P < .001$ level. This is a simple correlation without any control variables.

Figure 11. Differences in coherence of teacher allocation across districts



Note: Darker colors represent higher randomness in teacher allocation

Source: 2020 EMIS

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In addition to differences between districts, exploring the geographical variation inside districts shows the extent of imbalance between schools. Unpacking this imbalance highlights two main takeaways.

Firstly, the within-district variation in PTR is significantly larger than the between-district variation.⁴⁷ The within-district variation (31.3 standard deviations) is almost double the between-district variation (17.8 standard deviations). This implies that inequities in teacher distribution are more significant inside the districts themselves than between districts.

Secondly, the majority of districts in Zambia experience an unbalanced distribution of teachers across schools (see Figure 12). Districts with large variation – measured in terms of the standard deviation of PTRs – have a significant share of schools with very high or low PTRs (relative to the mean), signalling high inequity. In Zambia, half of the districts have a standard deviation in PTR of over 28, and two-thirds of the districts have a standard deviation of over 23.

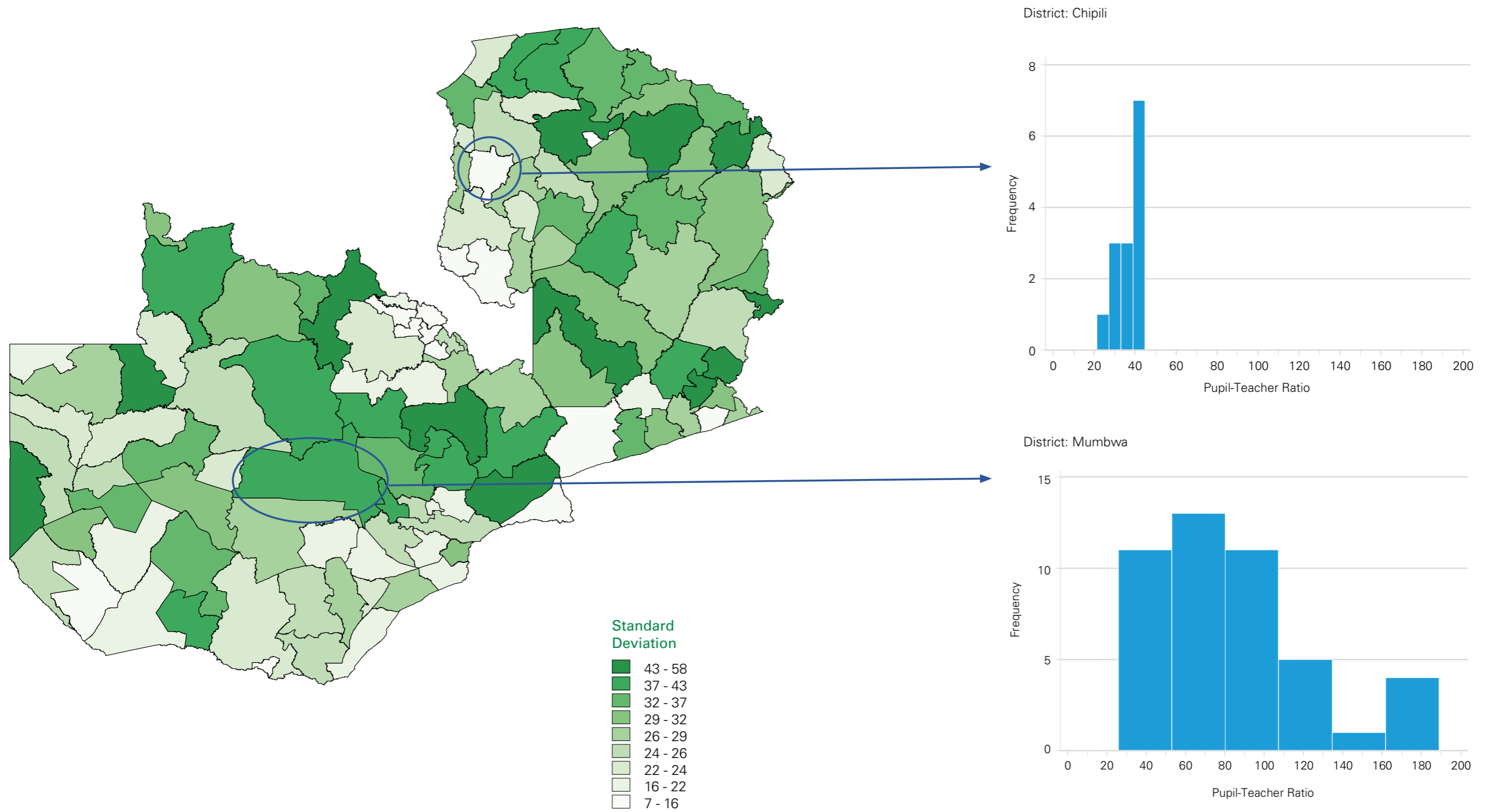
Figure 12 illustrates the standard deviations of the PTR at the district level. For the district of Chiplili, for instance, the PTR for schools is clustered tightly around the mean with little dispersion. This implies that the majority of schools have similar PTRs, meaning that the teacher distribution is relatively equitable regardless of location. In contrast, in the district of Mumbwa, the range is broader and there are many schools with PTRs further from the mean. This signals that many schools have either teacher shortages or surpluses. It is also important to note that both these districts are outliers in their provinces (i.e., they deviate significantly from neighbouring districts).

In short, the inequity in teacher distribution is primarily concentrated within districts, and a large share of districts have unbalanced teacher allocation between schools. This means there is an important role for local actors, such as the DEBS and DHRMCs, in redistributing teachers within individual districts to improve teacher allocation.



47. This implies that most of the variation in PTRs is inside districts.

Figure 12. Variation in pupil-teacher ratios inside districts



Note: Darker colors indicate greater variation. Calculated based on the Standard Deviation within each district
Source: 2020 EMIS

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How are teachers distributed within schools?

4.5 Lower grades have larger class sizes

While teachers are unevenly distributed across schools, inequities within schools – i.e., across grades inside a school – are also a critical barrier to learning.

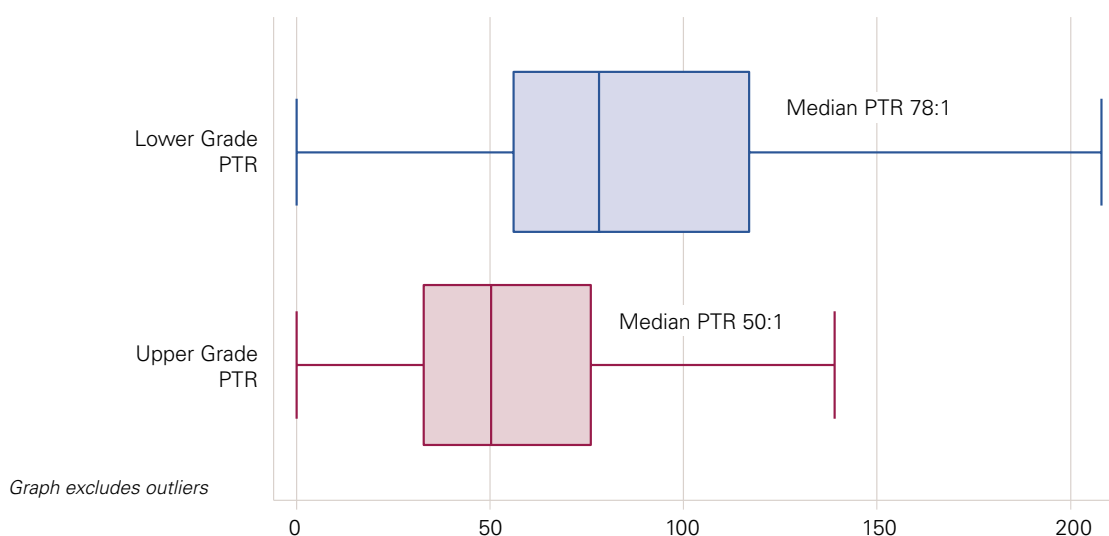
In Zambia, lower primary grades have larger class sizes.⁴⁸ For the limited sample for which data are available, the median PTR is 78:1 in the lower grades (Grades 1-4), compared to 50:1 for upper grades (Grades 5-7).⁴⁹ In addition, lower primary grades also have greater variation, indicating greater dispersion of PTRs in earlier grades (see Figure 13).

The discrepancy between lower and upper grades is more pronounced in rural schools. In rural schools, the median PTR for lower primary grades is 94:1, compared to 60:1 for upper grades. In contrast, in urban schools the lower primary grade PTR is 50:1, compared to 37:1 for upper grades.⁵⁰ In short, rural schools experience larger inequity between grades, and this is disadvantaging rural learners in early grades.

These findings suggest that learners in lower grades are experiencing more challenging learning conditions. Learners who fail to acquire basic literacy and numeracy skills in the early grades will not only fall behind in terms of grade-level competencies but will also be unable to engage with more advanced curricula as they progress through the education cycle. The performance gap between learners increases over time – a phenomenon known as the ‘Matthew Effect’.⁵¹ The most disadvantaged learners may never be able to catch up, deepening social inequities.

It is important to note that grade-specific PTRs are not directly comparable to PTRs in the full sample of public primary schools, as the majority of schools did not report teachers’ specific grade assignments. Despite this limitation, the analysis of the smaller sample provides early evidence, and points to the importance of prioritizing teacher deployment in earlier grades.

Figure 13. Differences in median PTR between lower and upper primary grades



Note: The boxplot illustrates the ‘median PTR’ as well as the range of PTRs between Lower Primary (Grades 1-4) and Upper Primary (Grades 5-7)

48. Calculated as a ratio of total learners in Grades 1-4 and Grades 5-7, relative to the number teachers with those grade ranges assigned to them. Due to missing data on teacher grade assignments, the sample for grade-level PTR calculation only includes schools that have reported data on all teacher grade assignments. This sub-sample is 395 schools (or 11 per cent of the full sample for public primary schools). Furthermore, a large share of the schools that have reported all teacher grade assignments are from Northern Province (161/395 schools). As a result, these findings are not generalizable across Zambia.

49. The mean PTR for lower grades is 93:1, and 60:1 for upper grades.

50. The sample for rural schools is 377 schools, while the urban sample is 21 schools.

51. The Matthew Effect refers to a pattern where individuals that begin with advantage accumulate more advantage over time, and those who begin with disadvantage become more disadvantaged over time. For a review of the literature, see Walberg, H. & Tsai S.-L., Matthew Effects in Education. American Educational Research Journal, 1983; Stanovich, K, Progress in Understanding Reading. New York 2000; Pfof, M., Hattie, J., Dörfler, T. & Artelt C., Individual Differences in Reading Development: A Review of 25 Years of Empirical Research on Matthew Effects in Reading. Review of Educational Research, 2014; Martin, J. Skills for the 21st century: Findings and policy lessons from the OECD survey of adult skills. OECD Education Working Papers, No. 166, 2018 OECD Publishing, Paris..

4.6 What factors play a role in the distribution of teachers?

The ‘attractiveness’ of a school for teachers can be represented through two metrics: the number of teachers in a school (for a given number of learners) and the average number of months teachers tend to serve in a school. Regression analysis, while not causal, allows us to identify which school, teacher and learner-level characteristics are most strongly associated with teacher allocation (see *Annex III for regression output*).⁵²

Three factors predict the number of teachers in a school: classroom numbers, the presence of infrastructure and the number of learners. Controlling for all other factors, including the number of learners in a school, the number of teachers is positively and significantly related to the number of classrooms, with 0.4 teachers per additional classroom in a school. In terms of infrastructure, the number of teachers is positively associated with electricity access, with 1.1 additional teachers per school if there is electricity, 2.4 additional teachers if there is a computer lab and 0.3 additional teachers per toilet, controlling for all other factors. The number of teachers is also positively related to student enrolment, with 1.1 teachers for 100 additional learners in a school. Schools with more teachers tend to have a higher share of female teachers, with 3 per cent more female teachers per additional teacher in a school.

Geography is negatively related to teacher numbers, captured through school location and distance from the nearest DEBS office. Controlling for all other factors, rural schools have an average

of 8.6 fewer teachers than urban schools. Increased distance from the nearest DEBS office is associated with fewer teachers, estimated at an average of 1 fewer teacher per additional 100 km.

In terms of teacher retention, school location, infrastructure, teacher age and qualifications are important predictors. Urban school teachers serve about 14 months more on average than rural school teachers, all else held constant. Teachers serve an additional 4.3 months if there is electricity, and 0.7 months or 17 additional days per additional toilet, on average. In terms of teacher characteristics, older teachers tend to stay longer in a school; each additional year of teacher age increases retention by an average of 4.8 days. Schools with a higher proportion of teachers with a teaching certification tend to stay 18 months longer (relative to diploma holders). In short, patterns in retention are broadly consistent with teacher numbers - suggesting that similar factors influence the attractiveness of a school.

Moreover, location and electricity access affect inequities within schools (i.e., the difference in average class size between the upper and lower grades).⁵³ Schools that are further from the DEBS office are associated with a larger gap in class sizes between upper grades (Grades 5-7) and lower grades (Grades 1-4), as are schools without electricity. This means schools that are closer to an urban centre, or with better infrastructure, are better at addressing within-school inequities.

The **attractiveness of a school** is related to school **size**, its **location** and the **quality of infrastructure**.



52. Regression analysis run at the school level, with fixed effects at the district level and robust standard errors. Separate regressions run for number of teachers in a school, years teacher has served in the school and difference between PTR between upper and lower grades of primary as dependent variables. Final sample size for the regressions was 1,485 schools.

53. Regression run on sub-sample of 359 schools that reported grade assignments for all teachers.

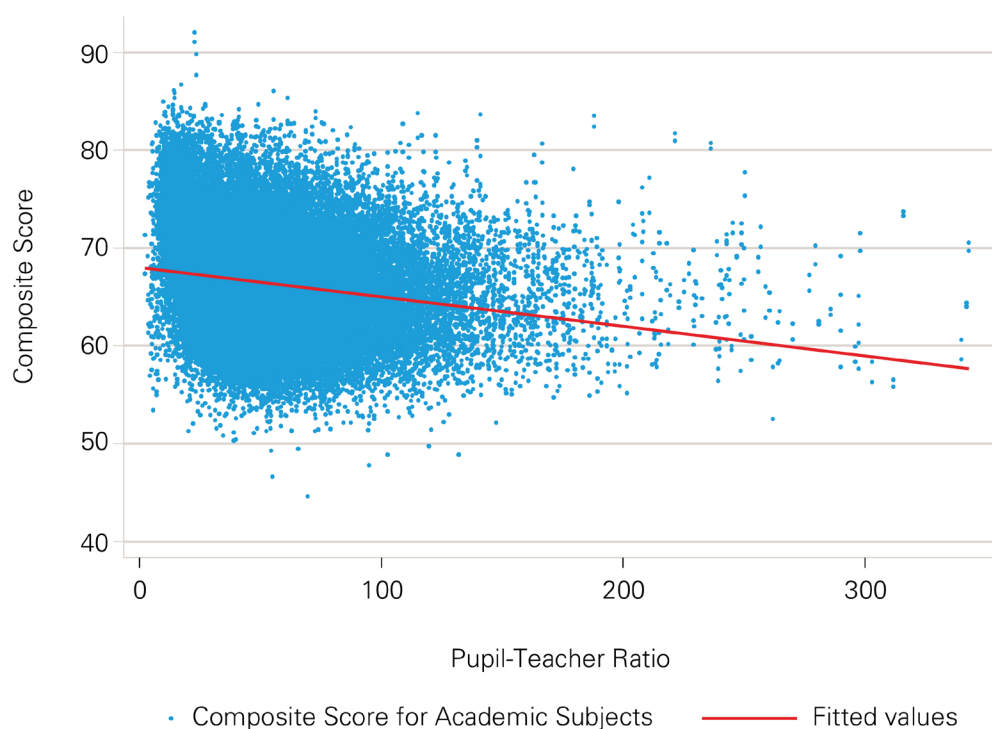
How is teacher allocation linked to learning outcomes?

4.7 Higher PTR is negatively related to overall learning

Pupil-teacher ratios are negatively associated with learning outcomes. Figure 14 plots the relationship between PTR (on the x-axis) and composite learner test results (on the y-axis). The learner composite score index is an average of academic subject scores for mathematics, English and the Zambian language, drawn from standardized assessments which learners take in Grade 7 at the end of the primary cycle. Scores are standardized on a scale of 0-100 per cent.

Overall, a one-pupil increase in PTR in a school is associated with a 2.2 per cent drop in average learner test scores at Grade 7 level.⁵⁴ However, once accounting for various school and teacher characteristics, this relationship falls to a 1 per cent drop (equivalent to 0.05 standard deviations), but remains negative and statistically significant.⁵⁵ The regression also reveals a number of relevant factors that explain the PTR-learning relationship (*see Annex III for full regression table*).

Figure 14. Relationship between composite learner test score (Grade 7) and pupil-teacher ratio



Note: Figure plots the relationship between PTR (on the x-axis) and composite learner test results (on the y-axis). The learner composite score index is an average of academic subject scores for mathematics, English and the Zambian language, drawn from standardized assessments which learners take in Grade 7 at the end of the primary cycle.

54. Represents a 'naïve' correlation without any controls. Significant at the $p < .001$ level; sample excludes multigrade schools. Exam results drawn from ECZ exam centre results. For a detailed discussion on learning outcomes in Zambia, as well as details on the merging protocol between schools and ECZ exam centers, see UNICEF Innocenti, MoE Zambia and UNICEF Zambia, *Data Must Speak: Unpacking Factors Influencing Primary School Performance in Zambia*, UNICEF Innocenti, Florence, Italy, 2022..

55. Regression run at the learner level with district fixed effect and robust standard errors. It is important to note that regression results cannot be interpreted causally, as unobserved factors may still be biasing these results. Despite this limitation, these findings provide directions that can be explored through future research.

Teacher characteristics are able to explain a large share of the variation in learner performance. Two factors are of particular interest:

1. **The share of ‘permanent’ teachers in a school is negatively associated with learner performance (5 percentage points or 0.2 standard deviations); all other factors held constant.** In other words, temporary or contractual teachers, despite being a very small share of the total teaching force, are associated with better learning outcomes. This relationship is the strongest for mathematics (-9 percentage points) and English (-8.7 percentage points), but less for Zambian language (-1 percentage point). Global education literature broadly reaffirms this finding. Growing evidence suggests that contract teachers experience different accountability structures, and exert more effort than civil service teachers, given they are more likely to lose their jobs if they perform poorly.⁵⁶ However, this should not be interpreted as a call to recruit more temporary teachers, rather it implies a need for stronger teacher management and teacher accountability in the education sector.
2. **The role female teachers play in learning outcomes for girls is particularly strong.** An increase in the proportion of female teachers in a school increases the average learning score for girls by 1.9 percentage points (or 0.14 standard deviations); all other factors held constant. The relationship is strongest for Zambian language (2.5 percentage points), followed by English (1.9 percentage points) and mathematics (1.2 percentage points). This finding is aligned with global evidence as well as earlier research from Zambia, and suggests that recruiting more female teachers is likely to improve learning outcomes for female learners, who lag behind their male peers.⁵⁷

In terms of school characteristics, rural schools perform lower on average compared to urban schools; all other factors held constant (1.6 percentage points or 0.12 standard deviations). School infrastructure also plays a key role in learning. The number of toilets (per 100 learners) is strongly and positively associated with learner performance

(7.3 percentage points or 0.14 standard deviations), along with the presence of a school library (7.7 percentage points or 0.07 standard deviations). In terms of learner characteristics, female learners (-7.5 percentage points or 0.08 standard deviations) and older learners (-3.2 percentage points or 0.07 standard deviations per year) tend to perform worse, all other factors held constant.

Schools with female heads achieved higher maths scores (but this did not apply to other subjects). This relationship is particularly strong (3.6 percentage points or 0.1 standard deviations) and statistically significant. School leaders play a key role in fostering high quality teaching and learning environments within their schools. Earlier research shows that women-led schools often perform better than schools led by men, but women remain largely underrepresented in school leadership roles.⁵⁸ In Zambia’s primary education system, while 41 per cent of teachers are female, this share is only 20 per cent for headteachers.⁵⁹ The impact of female leaders on learning represents an area for future research.

The relationship between learning and PTR can be further broken down by province and by individual academic subject. While this relationship is negative in all provinces, it is sharpest in Copperbelt and Lusaka provinces (see Annex II for scatterplots by subject). In terms of individual subjects, all subjects have a negative relationship with PTR (see Annex III for a summary of regression output). In particular, English has the strongest negative association (-1.3 percentage points per unit increase in PTR) followed by Zambian language (-0.8 percentage points) and mathematics (-0.7 percentage points). This means language scores have the strongest negative relationship with PTR.

These findings are broadly consistent with global evidence on learning outcomes. While reducing class size is not a silver bullet, teachers in large classrooms are unable to cater to individual learner needs. Implementing teaching best practices, such as providing frequent feedback, monitoring progress or adapting material to learner level, becomes more challenging beyond a certain number of learners. In other words, improving teacher allocation is a necessary (albeit insufficient) step to improving learning outcomes.

56. For reviews of global evidence around the efficacy of contract teachers, see Aslam, Monazza, et al. *Reforms to Increase Teacher Effectiveness in Developing Countries: Systematic Review*, 2016 ; Glewwe, Paul, and Eugenie WH Maïga. The impacts of school management reforms in Madagascar: do the impacts vary by teacher type?. *Journal of development effectiveness* 2011: 435-469..

57. For additional analysis on learning outcomes, see UNICEF Innocenti , MoE Zambia and UNICEF Zambia, *Data Must Speak: Unpacking Factors Influencing Primary School Performance in Zambia*, UNICEF Innocenti, Florence, Italy, 2022.

58. For additional background on the role of female leadership in schools, see: Bergmann, J., Alban Conto, C. and Brossard, M., *Increasing Women’s Representation in School Leadership: A promising path towards improving learning*, UNICEF Innocenti, Florence, Italy, 2022.

59. Figures only capture public schools.

5. Looking ahead: Teacher allocation following 2022 and 2023 deployments

Recognizing the critical role of teachers in improving learning, the newly elected government of Zambia committed to addressing widespread teacher shortages. In 2022, the MoE undertook a large-scale recruitment exercise and deployed 30,496 new teachers across Zambia. An additional 4,500 teachers are slated to be deployed in 2023.

Despite increases in teacher supply, teachers continue to be distributed unevenly across Zambia. Two figures illustrate the projected impact of the mass deployment, and highlight key takeaways:

- **First, additional teachers recruited in 2022/23 reduce overall PTRs across the country, illustrated in Figure 15.⁶⁰** Following the teacher deployment, the sharpest teacher shortages are mitigated in districts in the Northern, North-Western, and Eastern provinces.
- **Second, despite improvements, the geographic pattern of teacher shortages remains persistent.** In other words, most districts facing teacher shortages prior to the mass allocation continue to experience shortages. PTRs in these districts remain substantially above the target 40:1 ratio.
- **Third, many districts are experiencing teacher surpluses, underscoring the unbalanced nature of teacher distribution in Zambia.** Figure 16 maps the share (percent) of teacher needs that have been addressed by the 2022/23 recruitment exercise. Districts in **red** represent districts where fewer than half the teacher need has been met. In other words, a significant number of additional teachers will be required to bring the district-level PTR to 40:1. Conversely, districts in **blue** are those which have received more teachers than they need – or have a surplus – and see supply-demand ratios near 100 per cent or more.

In short, about one-third of districts (39 of 116 districts) require additional teachers despite the 2022 mass recruitment. At the same time about one-third (37 of 116) of districts have more teachers than they require to meet target PTRs. Geographically, districts in the west are experiencing surpluses (with a few exceptions). In contrast, districts in the South and East tend to see ongoing shortages, despite an additional deployment of teachers.

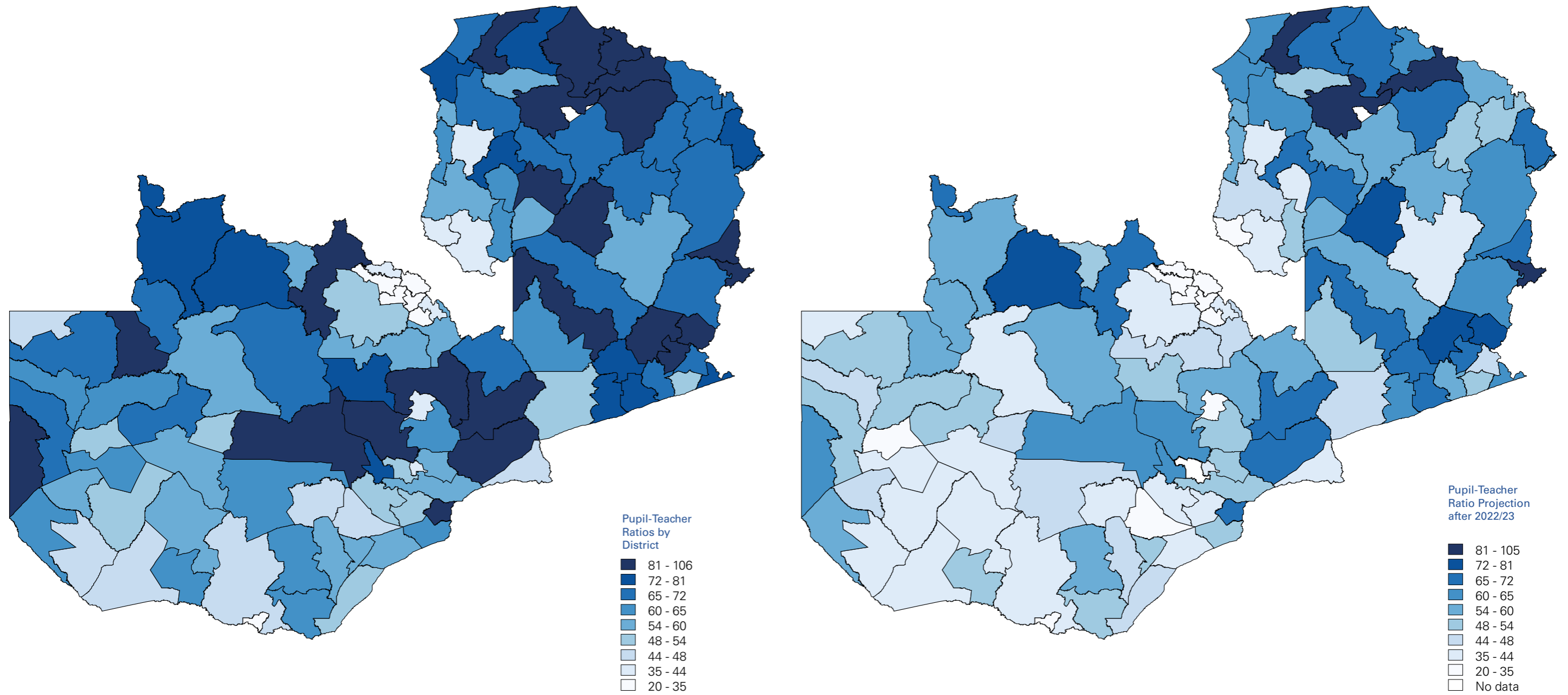
These estimates should be interpreted with caution, however, as they are limited by the lack of updated learner data at the district level (i.e., learner data is from 2020). Despite this limitation, these findings raise important questions around why certain provinces and districts continue to experience teacher shortages and point to directions of further inquiry under the qualitative component of the T4A project (see Figure 1 - Phase 3).

Despite recent increases in teacher supply, teachers continue to be distributed unevenly across Zambia. **Teacher shortages remain persistent in some districts, while other experience a surplus.**



60. District level learner totals drawn from 2020 EMIS. Projected district-level teacher total estimated from existing stock of teachers in 2020, as well as the projected flow of teachers, including: (i) district-level data from 2022 mass recruitment of 30,500 teachers, and (ii) the projected 4,500 teachers in 2023. The 4,500 teachers have been distributed evenly across 116 districts, as district-level data was not available during time of analysis.

Figure 15: Comparing District-level Pupil-Teacher Ratios in 2020 (left) and 2022/23 (right)

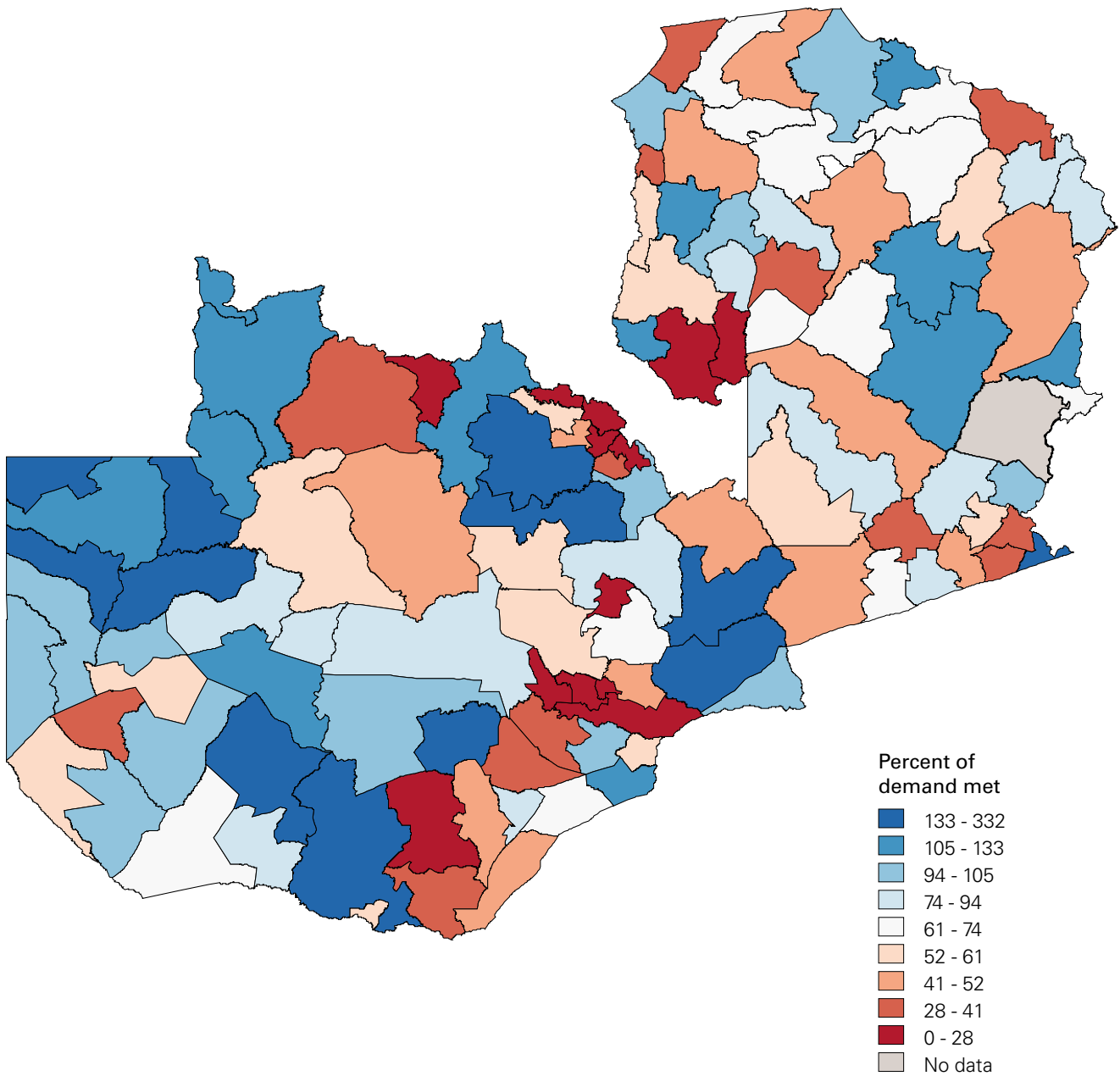


Note: Figure compares the distribution of teacher shortages (left) before the 2022/23 mass deployment, and after (right). PTRs are calculated at the district level, and only includes public schools. Darker colors represent higher average PTRs.

Data Source: EMIS 2020 and Teaching Service Commission

The designations employed in the maps contained in this report do not imply on the part of UNICEF the expression of any opinion whatsoever concerning the legal status of any country or territory, or of its authorities or the delimitations of its frontiers.

Figure 16: Share (percentage) of teacher demand met following 2022 deployment



Note: Districts in red represent districts where fewer than half the teacher need has been met. In other words, a significant number of additional teachers will be required to bring the district level PTR to 40:1. Districts in blue are those which have received more teachers than they need – or have a surplus – and see supply-demand ratios near 100 per cent or more.

Data Source: EMIS 2020/Teaching Service Commission

The designations employed in the maps contained in this report do not imply on the part of UNICEF the expression of any opinion whatsoever concerning the legal status of any country or territory, or of its authorities or the delimitations of its frontiers.

6. Key findings and policy implications

Key findings

Teachers are key to improving student learning. But the inequitable distribution of teachers across and within schools contributes to significant disparities in class sizes and learning conditions. Reducing class sizes is a key enabling factor in improving learning. In Zambia, larger PTRs are negatively associated with learner performance at Grade 7 level. Teachers in smaller classrooms can provide individualized attention to learners to improve their teaching practices, including monitoring progress, providing frequent and formative feedback and adapting the curriculum to learner level.

While there is a teacher shortage at the national level, headline statistics conceal important sub-national variation. Teachers are distributed inequitably across provinces but also within districts in those provinces. In particular:

- **Northern, Eastern and Central provinces experience the most critical teacher shortages; these provinces have the highest average PTR at the primary level.** Looking beyond aggregated statistics, about 25 per cent of districts (28 of 116 districts) have acute teacher shortages, where the average PTR is more than double the MoE's target PTR of 40:1.
- **Rural and remote schools have more acute teacher shortages and lower teacher retention than urban schools.** The shortage of female teachers is particularly acute in rural areas. Female teachers experience additional constraints when deployed to rural areas, including concerns around safety and security, difficulties in mobility and issues meeting hygiene and sanitation needs. The lack of female teachers in rural areas has important implications for gender equitable education access and learning outcomes for girls.

In Zambia, inequity in teacher distribution is primarily concentrated inside districts. Many districts also experience low coherence in teacher allocation, where teacher allocation is not consistent with learner enrolment. Rebalancing teachers within districts represents one way to improve teacher allocation.

Teachers are distributed inequitably within schools. In primary schools, class sizes tend to be larger in the lower grades (Grades 1-4) than the upper grades (Grades 5-7). While this disparity exists across Zambia, the gap between grades is more acute in rural schools. Higher PTR in earlier grades implies that learning conditions are worse in earlier grades, but this is when children acquire critical foundational skills. It is difficult to address this deficit in foundational learning beyond the early grades, as students who fail to acquire basic learning and numeracy may fall further behind as they progress through primary education.

Policy recommendations

Utilize localized data more and prioritize districts with the most acute and persistent shortages. Despite sharp increases in teacher supply in 2022, teachers continue to be distributed unevenly across Zambia. Policymakers tasked with teacher recruitment decisions (i.e., the NSC) are encouraged to target resources toward the districts most in need. This will have the highest return in terms of reducing overall class sizes and improving learning conditions.

Prioritize teacher recruitment and retention in rural areas to improve equity in the system. There are two sets of interventions that can mitigate the challenges of serving in rural areas:

Calibrating financial incentives to compensate teachers for the difficulties of living in remote areas.⁶¹

61. Evidence is strongest for fiscal incentives when it comes to recruiting teachers to disadvantaged schools. See Evans, D.K., and Acosta, A.M., *How to Recruit Teachers for Hard-to-Staff Schools: A Systematic Review of Evidence from Low- and Middle-Income Countries.* CGD Working Paper 595, Center for Global Development, Washington, D.C., USA, 2021; For evidence from Zambia see Evans, David K., and Fei Yuan. *The working conditions of teachers in low-and middle-income countries.* World Bank 2018 World Report, 2018.

Three key principles underpin effective incentive regimes:

1. **Supplemental income should represent a substantial share of the teacher's total income.**⁶² While Zambia's existing salary scheme provides teachers with additional top-ups to serve in rural and remote schools, it does not serve as a meaningful incentive. Incentives should not only offset the logistical costs of serving in remote areas, they should also provide a premium to compensate for the physical and socio-emotional difficulties of relocation.
2. **Ensure timely and reliable incentive payments.** Implementation challenges that lead to payment delays may blunt the impact of incentives.⁶³ Easing payment mechanisms, such as through electronic or mobile payments, can reduce the logistical burden on rural teachers who may have to travel long distances to withdraw salaries.
3. **Communicate incentive structures and bonus payments clearly and frequently to teachers.** Existing and new teachers should be aware of the bonus structure, including understanding which schools qualify and the size of the wage premium.

Strengthening non-financial incentives for teachers:

1. **Consider an accelerated teacher career and progression framework for rural teachers.** While the early evidence remains mixed, non-financial incentives, such as rapid promotion pathways in return for working in remote areas, may reinforce financial rewards. Drawing on emerging evidence around behavioural interventions, including promoting service in rural schools as a public duty to boost morale, may also improve retention in challenging schools.⁶⁴
2. **Invest in socio-economic development in rural areas, including in physical infrastructure near schools.** While these investments have broader fiscal implications for the government, policymakers should consider them where they are feasible.
3. **Mitigate additional barriers that female teachers face in rural areas,** including providing high-quality housing as well as electricity access and sanitation facilities in schools.
4. **Provide targeted support for female teachers, including incentive packages tailored to meet their needs.** Evidence from South Asia and Africa suggests that offering a mix of financial and non-financial incentives improves the retention of female teachers.⁶⁵

62. Earlier evidence from Zambia suggests that financial incentives increases the stock of teachers, see Chewla et al 2019. For a broader discussion of teacher incentives, see Evans, David K., Fei Yuan, and Deon Filmer. *Teacher pay in Africa: Evidence from 15 countries*. World Development 155, 2022.

63. Evans, David K., and Fei Yuan. *The working conditions of teachers in low-and middle-income countries*. World Bank 2018 World Report, 2018.

64. Evidence from Ecuador and Peru. See Ajzenman, N. et al., *Order Effects and Employment Decisions: Experimental Evidence from a Nationwide Program*, IDB Working Paper 1266, Inter-American Development Bank, Washington, D.C., USA, 2021..Findings are driven by male teachers, who may be more mobile and willing to work in remote areas. See Ajzenman, N. et al., *Altruism or Money? Reducing Teacher Sorting Using Behavioral Strategies in Peru*, IZA Discussion Paper 14111, IZA Institute of Labor Economics, Bonn, Germany, 2021.

65. Experiments from India suggest a salary premium between 24 to 73 per cent can incentivize female teachers to move to a remote school, while studies from Ghana and Kenya suggest the provision of housing and other incentives, such as study leave with pay and expedited promotion play a role in attracting teachers to rural areas. For a global review and discussion on teacher incentives, see Evans, David K., and Amina Mendez Acosta. *How to Recruit Teachers for Hard-to-staff Schools: A Systematic Review of Evidence from Low-and Middle-income Countries*. Center for Global Development, 2021. For country based analysis, see Fagernäs, Sonja, and Panu Pelkonen. "Preferences and skills of Indian public sector teachers." *IZA Journal of Labor & Development* 1.1 (2012): 1-31; Gad, B. *Recruitment and Retention of Public Sector Teachers in Ghana: A Discrete Choice Experiment*. Diss. University of Ghana, 2015; Kamere, Isabela M., M. I. Makatiani, and Arthur Kalanza Nzau. "Policy interventions for attraction and retention of female teachers in rural secondary schools." *Msingi Journal* 1, 2019: 50-59.

Prioritize teacher deployment in earlier primary grades. Targeting resources toward earlier grades can improve learning conditions at this critical juncture of the education cycle. Strategies to achieve this include:

- **Developing a policy framework on teacher allocation within schools**, including outlining grade-level PTR norms, to guide school leaders.
- **Prioritizing additional teacher allocations for Grades 1-4** and strengthening incentive regimes for teachers to serve longer in lower classes.

Deepen decentralization reforms and localize a broader range of decisions around teacher management. Policymakers can bring decision making closer to communities in the following ways:

- **Strengthen policy around within-district teacher transfers.** Rebalancing teachers across schools inside a district can improve equity in learning conditions, especially for disadvantaged schools in rural schools. Deploying teachers locally also reduces the risk of uprooting or displacing teachers or forcing teachers to

travel longer distances, and this increases the likelihood that teachers will stay at their assigned schools.

- **Empower and build the capacity of local actors, such as DEBS and DHRMCs.** Local actors and community members are better placed to understand teacher preferences, local conditions and physical or socio-cultural barriers, especially for female teachers. Local communities are also better able to monitor teacher attendance, proactively address challenges and ensure that teachers comply with service guidelines.
- **Address systemic and administrative constraints to teacher placement.** At present, the MoE is unable to deploy teachers to schools where other teachers have left but still remain registered under the payroll system. Modernizing the payroll system to facilitate teacher deployments and transfers will improve the MoE's ability to deploy teachers to where they are most needed.



ANNEX I

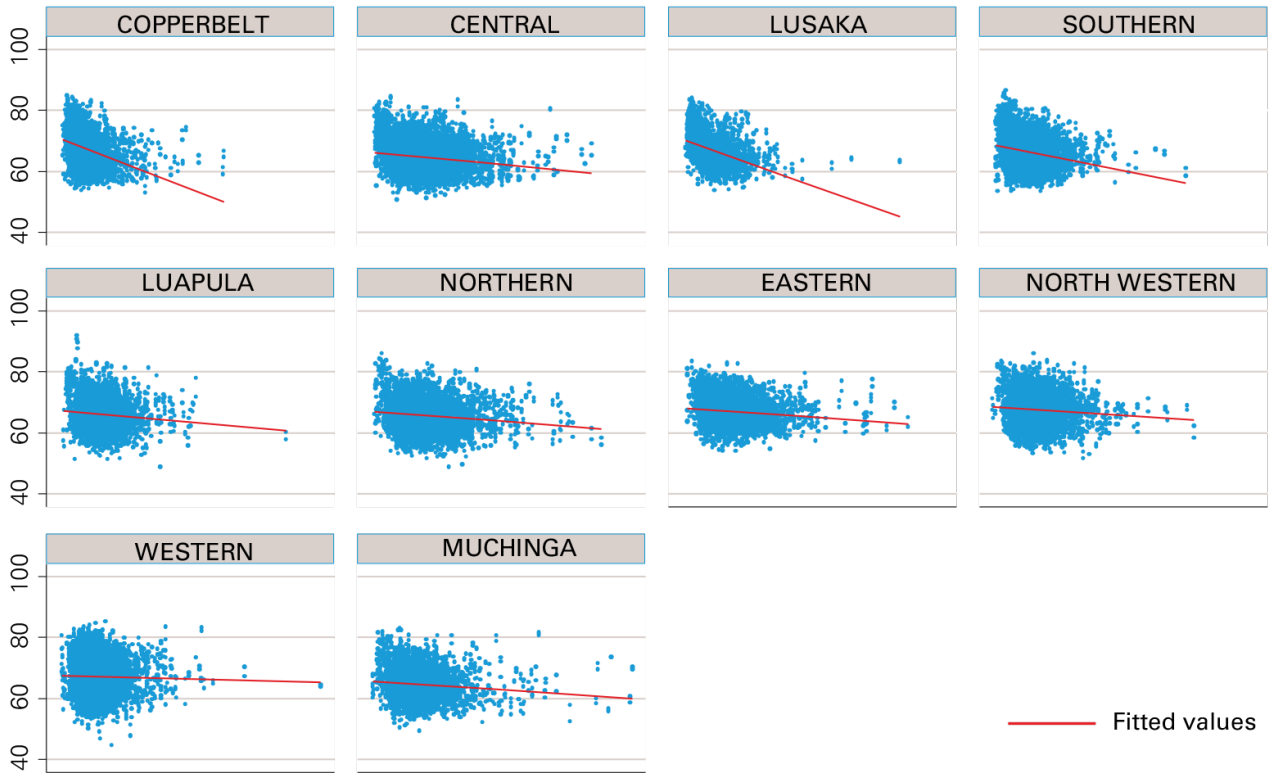
Teacher recruitment criteria

General criteria		
<ol style="list-style-type: none"> 1. Must be a Zambian national 2. Must be between 18-45 years old 3. Must be a registered member of the Teaching Council of Zambia 4. Must be ready to work anywhere where their services are required for a minimum period of four years before applying for a transfer 		
Early education	Primary school	Secondary school
<ol style="list-style-type: none"> 1. Must have a Grade 12 School Certificate or a General Certificate of Education (GCE) with 5 credits or better, including English. 2. Must be from an accredited teacher training college with a minimum training period of two years. 	<ol style="list-style-type: none"> 1. Must have a Grade 12 School Certificate or a GCE with 5 credits or better, including English, mathematics and a science subject. 2. Must be from an accredited teacher training college with a minimum training period of a 3-year diploma. 	<ol style="list-style-type: none"> 1. Must have a Grade 12 School Certificate or a GCE with 5 credits or better, including English language and a teaching subject. 2. Must be from an accredited teacher training college or university with a minimum training period of three-year diploma and four-year degree 3. Candidates with professional qualifications in natural sciences, mathematics, design and technology, business studies, ICT and agricultural science will be given priority.

ANNEX II

Relationship between learning outcome and PTR by province

Composite Student Score



Pupil-Teacher Ratio

ANNEX III

Regression tables

Regression Table I

Number of teachers per school, average years served in school and PTR difference, regressed on learner, teacher and school characteristics. (Full models shown with and without district-level fixed effects; standard errors in parenthesis.)

VARIABLES	Number of teachers		Number of teachers (with district fixed-effects)		Average years in school		Average years in school (with district fixed-effects)		Difference in PTR between lower and upper primary		Difference in PTR between lower and upper primary (with district fixed-effects)	
School-level characteristics												
Number of learners	0.011***	0	0.011***	0	0	0	0	0	-0.003	-0.018	0.001	-0.018
Rural	-10.603***	-0.402	-8.672***	-0.453	-1.602***	-0.217	-1.188***	-0.226	5.703	-21.894	20.591	-23.861
Distance from DEO	-0.004**	-0.002	-0.007***	-0.002	-0.002**	-0.001	-0.003***	-0.001	0.04	-0.038	0.086*	-0.04
Electricity access	0.994***	-0.223	1.102***	-0.22	0.361**	-0.111	0.340**	-0.105	-14.108	-8.645	-29.932**	-9.109
Water access	-0.117	-0.317	-0.128	-0.313	0.103	-0.157	-0.330*	-0.149	-7.553	-8.526	-6.995	-8.782
Communications access	-0.124	-0.513	0.112	-0.514	-0.375	-0.254	-0.066	-0.244	-9.107	-12.94	-1.95	-13.752
Infrastructure: Total toilets	0.320***	-0.037	0.257***	-0.037	0.060**	-0.019	0.028	-0.018	2.24	-1.966	1.932	-2.111
Infrastructure: Total classrooms	0.364***	-0.027	0.355***	-0.026	0.026	-0.014	0.025*	-0.013	-1.402	-1.535	-0.623	-1.656
Infrastructure: Computer lab	2.386***	-0.294	2.440***	-0.284	0.424**	-0.147	0.222	-0.136	6.428	-22.703	11.197	-23.815
Characteristics of the school's staff												
Female school head	-0.425	-0.261	-0.311	-0.25	-0.173	-0.129	-0.149	-0.119	-4.687	-10.31	2.791	-10.737
Proportion of female teachers	4.854***	-0.463	3.809***	-0.456	-0.235	-0.233	-0.511*	-0.219	-13.944	-14.926	-16.881	-15.281
Academic qualification: Above Grade 12 (proportion)	-0.571	-2.276	-0.935	-2.178	-2.224*	-1.125	-2.712**	-1.034	-3.664	-55.111	-18.497	-54.343
Academic qualification: Below Grade 12 (proportion)	1.309	-1.395	1.202	-1.338	2.169**	-0.691	1.819**	-0.636	-8.72	-48.213	-49.672	-52.104
Professional qualification: Degree (proportion)	0.927	-0.733	0.94	-0.726	0.618	-0.365	-0.274	-0.347	26.839	-23.389	10.16	-24.801
Professional qualification: Certificate (proportion)	-0.920*	-0.409	-1.196**	-0.418	1.447***	-0.203	1.367***	-0.199	-14.656	-12.16	-21.072	-13.064
Contract type: Permanent (proportion)	-0.111	-0.93	0.255	-0.911	0.253	-0.47	1.204**	-0.443	83.727*	-32.522	61.568	-33.754
Teacher age	-0.001	-0.006	-0.005	-0.006	0.013***	-0.003	0.008**	-0.003	0.093	-0.125	0.088	-0.125
Number of teachers					0.053***	-0.008	0.036***	-0.008				
_cons	8.944***	-1.201	7.724***	-1.188	7.880***	-0.607	7.378***	-0.576	-31.807	-39.552	-30.758	-41.789
N	3558		3558		3551		3551		359		359	
R-sq	0.778		0.812		0.189		0.367		0.062		0.288	
Standard errors in parentheses												

* p<0.05 ** p<0.01 *** p<0.001

Regression Table II

Learning scores regressed on PTR and learner, teacher and school characteristics

Dependent variable: Composite learning score	Naïve model		Learner characteristics		Teacher characteristics		Full model	
PTR	-0.022***	(0.002)	-0.019***	(0.002)	-0.014***	(0.002)	-0.009***	(0.002)
Female learner			0.264**	(0.093)	-0.710***	(0.193)	-0.747***	(0.200)
Average learner age in grade			-0.541***	(0.050)	-0.365***	(0.047)	-0.319***	(0.049)
Average age of school teachers					0.016	(0.010)	0.012	(0.010)
Proportion of permanent and pension teachers					-7.336***	(0.277)	-5.681***	(0.315)
Proportion of female teachers					-0.242	(0.274)	-0.759*	(0.312)
Interaction: Girl learner and female teacher					1.882***	(0.340)	1.868***	(0.349)
Proportion of teachers with Grade 12 qualification					1.012	(0.812)	0.706	(0.816)
Proportion of teachers with degree or higher					2.516	(1.483)	2.427	(1.448)
Proportion of teachers with a certificate or lower (none)					-0.394	(0.400)	-0.423	(0.408)
Proportion of teachers with a diploma					-0.333	(0.401)	-0.307	(0.408)
Is the school located in an urban neighbourhood?							1.669***	(0.186)
Female school head							0.066	(0.116)
Toilets per 100 learners							0.734***	(0.079)
Proportion of learners receiving bursary support							-0.831*	(0.356)
Does the school have electricity access (any source)?							-0.073	(0.114)
Does the school have water access (any source)?							0.198	(0.185)
Distance from the DEBS office (in km)							0.002	(0.001)
Does the school provide sanitary towels for girls?							0.121	(0.102)
Does the school have a library?							0.769***	(0.164)
Constant	67.094***	(0.113)	74.351***	(0.715)	77.273***	(1.191)	74.128***	(1.254)
Observations	8921		8844		8815		8203	
R-squared	0.162		0.178		0.253		0.274	
Standard errors in parentheses								

* p<0.05 ** p<0.01 *** p<0.001

Note: Regressions run at the learner level, with district fixed effects.

Regression Table III

Subject scores regressed on PTR and learner, teacher and school characteristics

Dependent variable: Subject score	English		Maths		Zambian Language	
PTR	-0.013***	(0.002)	-0.007**	(0.002)	-0.008***	(0.002)
Female learner	-0.367	(0.253)	-0.967***	(0.244)	-0.883***	(0.202)
Average learner age in grade	-0.494***	(0.063)	-0.423***	(0.061)	-0.070	(0.049)
Average age of school teachers	0.023*	(0.011)	-0.005	(0.011)	-0.002	(0.010)
Proportion of permanent and pension teachers	-8.745***	(0.418)	-9.017***	(0.369)	-1.083***	(0.297)
Proportion of female teachers	0.415	(0.391)	-1.164**	(0.380)	0.028	(0.304)
Interaction: Girl learner and female teacher	1.881***	(0.445)	1.283**	(0.448)	2.475***	(0.353)
Proportion of teachers with Grade 12 qualification	1.480	(1.146)	0.688	(1.071)	0.067	(0.767)
Proportion of teachers with degree or higher	3.986*	(1.913)	2.285	(1.668)	1.652	(1.508)
Proportion of teachers with a certificate or lower (none)	-0.147	(0.518)	0.792	(0.495)	-0.676	(0.410)
Proportion of teachers with a diploma	-0.081	(0.515)	0.419	(0.498)	-0.507	(0.416)
Female school head	0.049	(0.145)	0.355*	(0.153)	0.135	(0.113)
Toilets per 100 learners	0.788***	(0.099)	0.464***	(0.079)	0.374***	(0.065)
Proportion of learners receiving bursary support	-1.324**	(0.432)	-0.924	(0.565)	-0.418	(0.440)
Does the school have electricity access (any source)?	0.137	(0.142)	-0.043	(0.142)	-0.045	(0.114)
Does the school have water access (any source)?	-0.046	(0.236)	0.302	(0.233)	0.171	(0.182)
Distance from the DEBS office (in km)	-0.001	(0.002)	-0.001	(0.002)	-0.001	(0.001)
Does the school provide sanitary towels for girls?	0.232	(0.132)	0.159	(0.134)	0.018	(0.099)
Does the school have a library?	1.261***	(0.214)	0.914***	(0.195)	0.183	(0.158)
Textbook-pupil ratio for subject: books_eng	0.877***	(0.190)				
Textbook-pupil ratio for subject: books_math			0.724***	(0.193)		
Textbook-pupil ratio for subject: books_zam					0.446**	(0.157)
Constant	76.898***	(1.662)	79.264***	(1.556)	68.622***	(1.197)
Observations	8253		8267		8221	
R-squared	0.357		0.292		0.348	
Standard errors in parentheses						

* p<0.05 ** p<0.01 *** p<0.001

Note: Regressions run at the learner level, with district fixed effect

for every child, answers

UNICEF Innocenti – Global Office of Research and Foresight
Via degli Alfani, 58
50121 Florence, Italy
Tel: (+39) 055 20 330
Fax: (+39) 055 2033 220
researchpublications@unicef.org
www.unicef-irc.org

@UNICEFInnocenti on Twitter, LinkedIn, Facebook,
Instagram and YouTube

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