Teachers for All: Investing in Botswana's Teacher Workforce

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REPUBLIC OF BOTSWANA
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Executive summary

Botswana has laid out an ambitious agenda to transition to a knowledge-based, high-income economy. Strengthening human capital by improving the quality of education at all levels will be key to accelerating Botswana's productivity growth.

Ensuring inclusive and equitable access to quality education is one of the key goals of the 2030 Education Agenda.

Teachers are critical to improving the quality of education. Ensuring inclusive and equitable access to quality education is one of the key goals of the 2030 Education Agenda. However, the uneven distribution of teachers – both across and within schools – contributes to disparities in class sizes and learning conditions.

Teachers for All (T4A) is a mixed-methods research programme that generates evidence on teacher allocation. This report presents findings from Botswana to support policymakers in understanding the distribution of teachers at the primary and secondary level as well as to inform ongoing efforts to improve teacher deployment.

Key findings

Botswana's primary pupil-teacher ratio (PTR) of 25:1 conforms to globally recognized best practices. This headline PTR figure, however, masks considerable variation across districts, subdistricts and schools. For instance, the Central (28:1), North-West (27:1) and Kweneng (26:1) districts experience higher PTR than the national average. Moreover, progress in improving overall teacher supply in recent years have not always reflected school-level teacher needs, pointing to inefficiencies in deployment.

Districts experiencing higher primary PTR than the national average:

28:1	27:1	26:1	25:1
Central	North-West	Kweneng	National average

Primary school teachers are distributed inequitably within schools, with Standard 1 experiencing larger class sizes compared with other standards on average

Primary school teachers are distributed inequitably within schools, with Standard 1 experiencing larger class sizes compared with other standards on average. This implies that learners in lower primary grades experience more challenging learning conditions, as larger class sizes are associated with lower learning. The cost of poor learning in early grades is particularly high. A deficit in foundational learning is difficult to address once learners move through the primary education cycle.

At the secondary level, science and mathematics subject teachers are less efficiently distributed, despite the sciences representing a strategic priority for Botswana. Science teachers tend to serve more learners relative to humanities teachers and experience greater imbalances in deployment. This suggests variation in teacher workload and learning conditions in science classrooms.

Female teachers are particularly underrepresented in the sciences despite comprising much of the teaching force. Emerging evidence points to the key role that female teachers play in shaping education outcomes – as well as the broader aspirations of adolescent girls – underscoring the importance of placing female teachers into the science and mathematics fields.

Share of female teachers at the secondary level:

47%	18%	34%	39%	20%
Integrated Science	Physics	Chemistry	Biology	Additional Mathematics

The current human resource planning approach in the education sector has led to mismatches in teacher demand and supply. Teacher allocation is highly centralized, resulting in an oversupply of humanities teachers awaiting deployment while science teachers remain in short supply. Unclear teacher transfer processes further compound inefficiencies in teacher allocation.

Key policy recommendations

Prioritize resources to improve foundational learning

Utilizing more localized data in decision-making can strengthen teacher allocation. Leveraging school-level data can play an important role in improving the efficiency for future teacher allocations. Targeting resources towards subdistricts with higher PTRs, for instance, will have the highest returns in improving learning conditions.

Given that Botswana already benefits from a low national PTR, existing teachers should be supported to specifically address learning deficits by:

- **Supporting teachers once they are deployed through professional development, training and coaching.** Establishing a practical pre-service orientation programme for new teachers can help them be better-prepared for the classroom. This can be supplemented by an in-service training and classroom coaching strategy to help teachers continuously upgrade their content knowledge and pedagogical skills.

- **Institutionalizing evidence-backed strategies to improve learning.** This includes supporting teachers in scaling up targeted and evidence-backed learning interventions, such as teaching at the right level (TaRL) as well as implementing scripted lesson plans and structured currriculum support.

Prioritizing teacher deployment in earlier grades can support the Ministry of Education and Skills Development to improve learning conditions at a critical juncture of the education cycle. Policymakers may consider:

- **Developing a clear and transparent policy framework for assigning teachers between grades.** Providing school leaders with recommendations on deploying teachers within the school, including specific grade-level PTR norms, can provide concrete guidance and communicate expectations to head teachers.

- **Incentivizing teachers to serve in early grades.** A policy framework to retain teachers in early grades should be instituted. These may include additional opportunities for professional advancement within the primary level or financial incentives to teach at the primary level.

Existing teachers should be supported to specifically address learning deficits.

Strengthen human resource planning and forecasting

Strengthening human resource planning, forecasting and coordination can help streamline the teacher pipeline, including:

- **Stronger coordination between the Ministry of Education and Skills Development and colleges of education/university faculties of education.** The Department of Teaching Service Management needs to improve the forecasting of teacher demand. This requires working with training institutions to reduce the intake in saturated fields such as humanities while promoting supply in higher-demand subjects such as the sciences.

- **Clarify, communicate and enforce guidelines on teacher rotations and transfers.** While the Ministry of Education and Skills Development and the Department of Teaching Service Management are currently formulating a new and comprehensive teacher transfer policy, formalizing and communicating explicit norms and expectations on teacher rotations, length of service in rural schools and compliance with transfer orders can improve allocation.

Teachers for All: Background

The 2030 Education Agenda promotes inclusive and equitable access to quality education for all. The equitable deployment of trained and qualified teachers is key to achieving education for all – ensuring every child can develop their full learning potential regardless of where they live.

The equitable deployment of teachers is key to achieving quality education for all.

The Teachers for All (T4A) **project aims to understand the magnitude and distribution of teacher shortages in sub-Saharan countries.** In Botswana, the project leverages administrative and learning assessment data to identify patterns in teacher distribution and support the agenda of the Ministry of Education and Skills Development (MESD) to improve teacher deployment. The analysis is guided by the following questions:

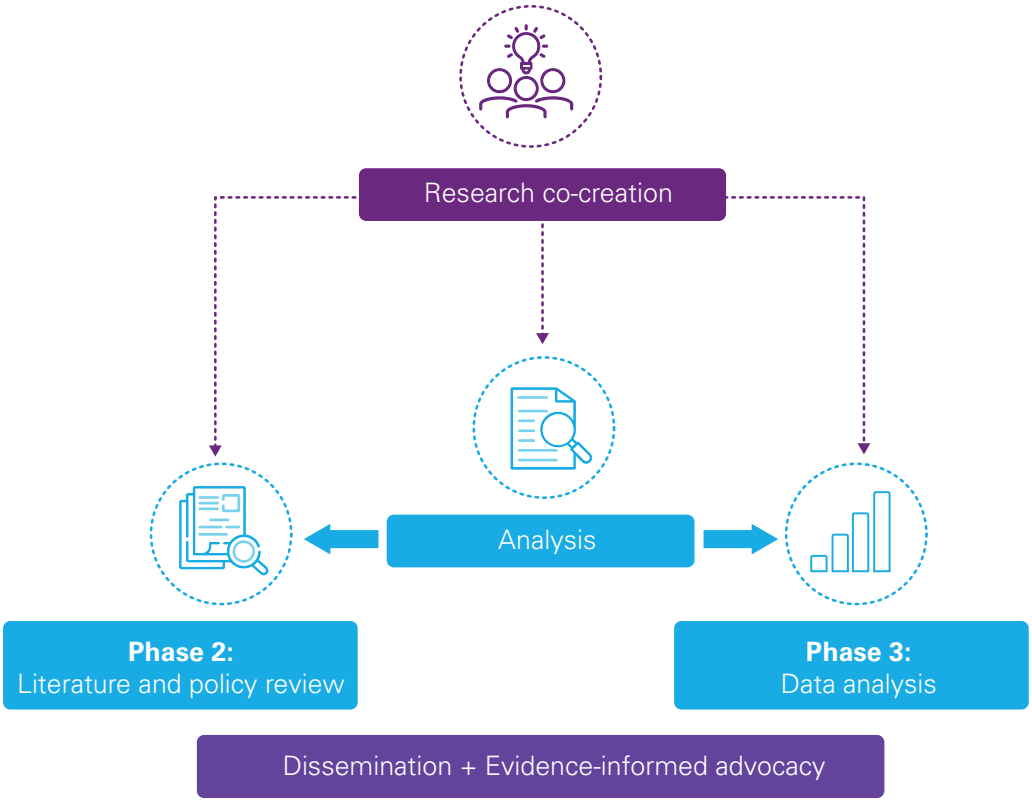
1. How are primary and secondary teachers distributed across Botswana? What are the **differences in teacher allocation across and within districts, subdistricts and schools**?

2. What are the differences in teacher allocation **across standards** within schools?

3. What is the **relationship between teacher allocation and learning outcomes**? Does learner performance vary based on school and teacher characteristics (qualifications, training and gender)?

4. What **strategies are used by the Teaching Service Management** (TSM) – centrally and in the regions – to support equitable teacher allocation?

Figure 1: T4A research phases



T4A relies on a multiphase research design, underpinned by a co-creation process to ensure the relevance of its scope and direction (Figure 1). A multi-stakeholder workshop with MESD officials, civil society organizations, researchers and development partners in June 2022 informed the design of the project. This process collaboratively shaped the research questions, ensuring that the project responds directly to challenges in Botswana and supports the MESD strategy, policy priorities and ongoing education reform agenda.

In addition, the project worked together with MESD officials (organized through a core technical team) to understand, generate and utilize data as well as strengthen the Ministry's capacity to leverage evidence in decision-making.

BOX 1: DEFINITIONS OF KEY CONCEPTS AND DATA SOURCES

This study focuses on the distribution of teachers within primary and secondary schools at the subdistrict level. Teacher allocation is captured through three key metrics:

Pupil-teacher ratio (PTR) captures the average number of pupils per teacher at various administrative levels.

- Going beyond the national PTR metric, calculating the PTR lower administrative levels enables policymakers to compare teacher allocation across geographical areas to inform policy actions.

- In addition to discrepancies in absolute PTR, exploring variation in PTRs (measured through the standard deviation) captures the spread or dispersion of PTRs. This metric quantifies the imbalance in teachers between schools inside a district and the extent to which resources are allocated efficiently.

The stream-teacher ratio (STR) is the metric used to assess teacher allocation at the secondary level. In contrast to primary (where one teacher is assigned to a single learner stream or pedagogical group), each stream in secondary has several specialized subject teachers. As a result, direct comparisons of PTR are not very informative. Instead, 'teacher allocation' focuses on the number of subject teachers in relation to the number of streams, which provides a comparison of implied workload per subject.

Teacher workload estimates the theoretical weekly workload of teachers for each subject. It is calculated based on the number of teaching hours scheduled per subject in a week, in relation to the number of subject teachers in a school. A high teacher workload implies an underallocation of teachers in a subject and vice versa. The weekly average worktime of teachers in classrooms in secondary education is estimated using the following formula:

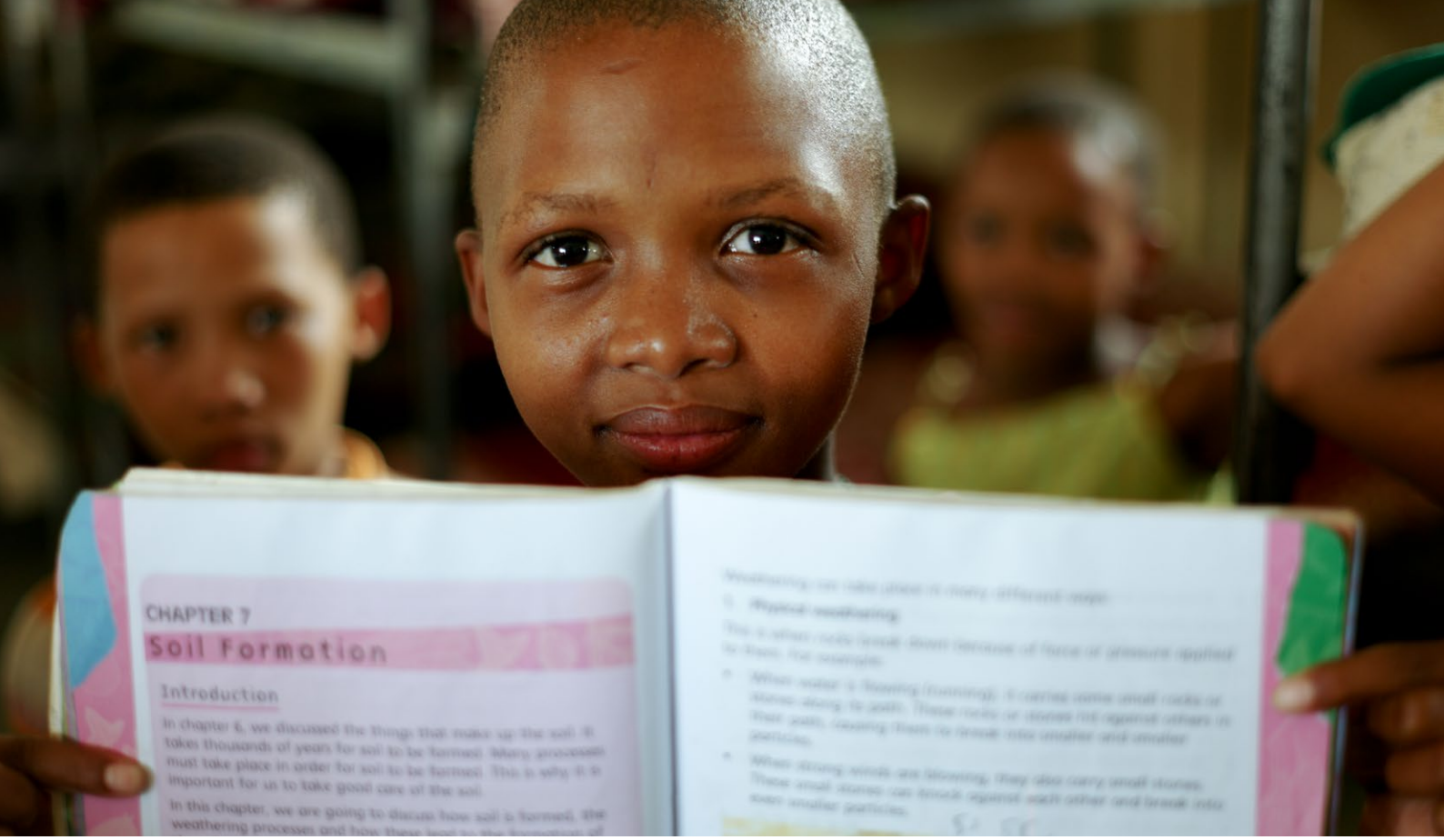
$$\textit{Theoretical weekly teaching load} = \frac{\textit{(Number of streams} \times \textit{Students' weekly instructional time)}}{\textit{(Teachers)}}$$

Degree of coherence in (measured through R^2) measures the strength of the relationship between the number of teachers and the number of pupil enrolments in a school. It is based on the principle that the number of teachers in a school should be consistent with – or explain the variation in – the number of pupils. Inequitable allocation of teachers implies the number of teachers is *not* consistent with the number of pupils enrolled, and is instead influenced by external factors.

In order to conduct this analysis, the project draws on the latest administrative data available, including:

- **Education Management Information System** (EMIS): EMIS data from 2018 and 2022 were used for the primary level analysis and 2022 EMIS data for the secondary level. Data were used to produce descriptive statistics and conduct regression analysis.

- **Learning assessment data:** The 2018 Primary School Leaving Examination (PSLE) from the Botswana Examinations Council was used to produce descriptive statistics. Learning data were also merged with 2018 EMIS data to assess the relationship between PTR and learning outcomes at the end of the primary cycle in Grade 7.



Country context

Botswana's Vision 2036 aims to transition the country to a high-income economy (Botswana, Vision 2036 Presidential Task Team, 2016). The vision lays out an ambitious agenda to expand the economic base through export-oriented, labour-intensive and private sector-driven growth. The Eleventh National Development Plan 2017–2023 translates this vision into a concrete strategy, prioritizing investments in education and skills.

Botswana has invested heavily in expanding its education system. This commitment is reflected in high budget allocations to the education sector, which have exceeded 25 per cent of the annual public spending in recent years (Botswana, 2016, p.70). This has led to impressive strides in education coverage. At the primary level, the gross enrolment ratio was 99 per cent at the primary level in 2021 and has remained stable in recent years.[1] However, enrolment rates tend to decline in secondary. While most learners transition to

1 Data drawn from the UNESCO Institute for Statistics (see http://data.uis.unesco.org/Index.aspx).

junior secondary school after completing primary school, the gross enrolment ratio in senior secondary tends to drop to 60 per cent (World Bank Group, 2019).

A 2017 analysis of learning levels by the MESD and its partners found that half of Grade 5 learners could not read a simple story.

Despite universal coverage at the primary level, the quality of foundational learning remains a key challenge for the sector. A 2017 analysis of learning levels by the MESD and its partners found that half of Grade 5 learners could not read a simple story.[2] One in three learners were falling two to three years behind in numeracy, with a third of learners unable to perform a simple subtraction and nine in ten learners could not perform simple division.[3]

These low learning outcomes are confirmed by regional learning assessments at different levels, including the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) assessment (Grade 6), the pre-Progress in International Ready Literacy Study assessment (prePIRLS) (Grade 4), PIRLS (Grade 5) and the Trends in International Mathematics and Science Study (TIMSS) assessment (Grade 4) (World Bank Group, 2019). In addition, the quality of learning falls as learners move through the education system. The majority of learners fail the Form 3 (Grade 10) Junior Certificate Examination (JCE). This in turn restricts their access to senior secondary and tertiary education, and contributes to a vicious cycle of low quality and enrolment at secondary.[4] Poor learning outcomes remain a binding constraint to Botswana's ambitions to improve productivity.

Botswana's low test scores have refocused attention on teachers. The MESD has invested significantly in increasing teacher numbers and improving the qualifications of the teaching force. The primary teacher population grew from 12,000 in 2000 to over 15,500 in 2022 and the secondary teacher population grew from 9,900 to 17,300.[5] The MESD has also been proactive in efforts to improve teacher management. For instance, to address the shortfall of qualified

2 The learning assessment was conducted by Youth Impact, the MESD and the University of Botswana. The assessment tested basic literacy and numeracy for 2,500 Standard 5 learners across 47 schools in Chobe and Kgatleng. For further details, see https://www.youth-impact.org/tarl and Pansiri et al. (2017).
3 Ibid.
4 In 2017, only 36 per cent of candidates for the JCE achieved a C or better grade.
5 Data drawn from EMIS 2022 and the UNESCO Institute for Statistics (see http://data.uis.unesco.org/Index.aspx).

primary school teacher candidates, the MESD redeployed 426 secondary school teacher graduates to the primary level in early 2022.[6] In addition, the MESD is in the process of recruiting and deploying an additional 3,000 primary school teachers in 2023.[7]

The MESD aims to further strengthen teacher management through a data- and evidence-driven approach.

The MESD aims to further strengthen teacher management through a data- and evidence-driven approach.[8] The Education and Training Sector Strategic Plan 2015–2020 underscores the need to better utilize the Education Management Information System (EMIS), including using existing data to improve strategic planning, management and policy implementation within the sector. Against this backdrop, the T4A research aims to support MESD's efforts by generating evidence on teacher allocation. This report presents findings from several data sources to support policymakers in understanding the existing distribution of teachers and to inform ongoing efforts to improve teacher deployment.

2.1 Institutional and policy framework

Botswana's education goals are underpinned by two national policies on education. The first national policy on education in 1977 aimed to universalize education access for Botswana's population. The second revised national policy on education (RNPE) in 1994 aimed to accelerate the economic transition from agriculture to a diversified and industrialized economy. The RNPE continues to frame Botswana's education policy goals by prioritizing improvements in quality and establishing a long-term PTR target of 30:1 (Botswana, 1994).

Teacher governance falls under the Public Service Act (2008), which sets the standards for all public servants in Botswana. Prior to this, teachers were administered under the Education Act (1996), the Unified Teaching Service Regulations (1976) and the Unified Teaching Service Code of Regulations (1976), which outline the terms and conditions of the employment of public teachers.

6 Data cited in the MESD presentation at a T4A research inception workshop held between 7 to 8 June 2022. The breakdown of this new deployment is outlined in Annex V.
7 Data were cited by the MESD during a consultation workshop for the T4A research held on 16 January 2023.
8 The Eleventh National Development Plan in particular proposes improved efficiency within the public service, including deploying a talent management strategy to foster the right competencies within the public service.

The updated Public Service Act designated the Directorate of Public Service Management (DPSM) as the employer of teachers, which monitors, appraises and audits compliance with public service procedures and standards at the MESD (Pansiri and Bulawa, 1991).

University degree graduates are given preference over diploma graduates at both the primary and junior secondary levels.

Institutionally, the MESD oversees education policy and programming.[9] The MESD manages core activities related to teaching and learning, including curriculum development and delivery, the provision of textbooks, and teacher policy and payroll. The Ministry of Local Government and Rural Development is responsible for other elements of education delivery, including funding and maintaining physical school buildings and hostels in rural areas, school feeding programmes, teacher housing facilities, furniture and equipment, and (non-learning) materials for the schools through the local councils (World Bank Group, 2019). The Ministry of Infrastructure and Housing Development is responsible for managing the maintenance of senior secondary schools as well as building classrooms and schools via funding from the MESD.

Education service delivery occurs through a three-tiered system of national-, district- and school-level actors. The national ministry (or headquarters) oversees policymaking and strategic coordination. District offices manage policy implementation and coordination, including in-service teacher training, inspection of primary and secondary schools, and provision of textbooks and stationery. Finally, schools deliver teaching and learning, ensure the provision of school meals and short-term maintenance of buildings.

Moreover, the education system consists of three types of schools. In addition to government schools owned and administered by the MESD, government-aided schools are mission schools administered by religious institutions, such as the Roman Catholic Church and the United Congregational Church of Southern Africa. Private schools are owned and run by individuals or companies.

9 A reorganization in 2017–2018 resulted in two new ministries: the MESD, which oversaw primary and secondary education; and the Ministry of Tertiary Education, Research and Technology, which managed higher education. These ministries were consolidated into one ministry in 2022.

2.2 Teacher deployment in Botswana

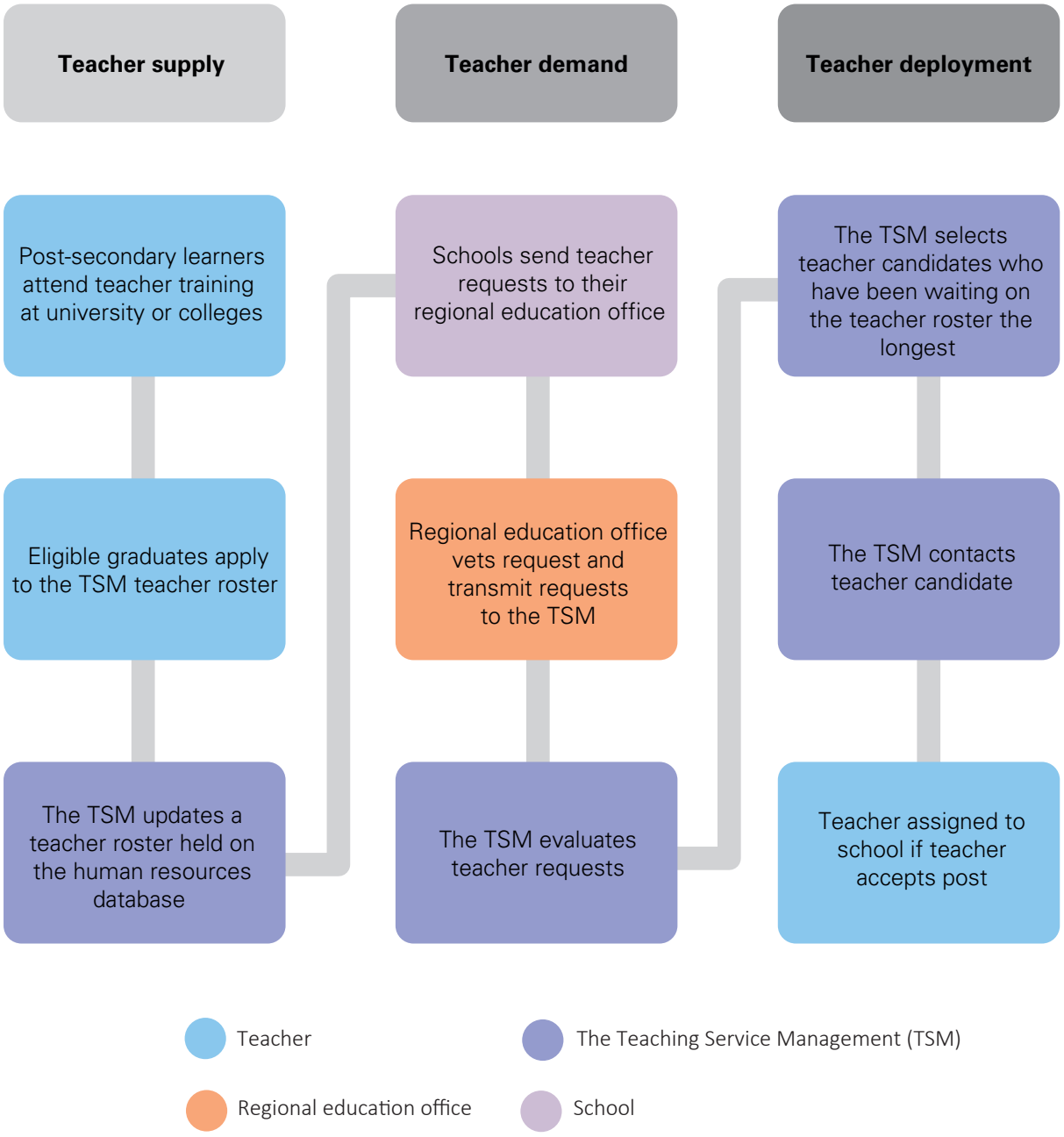
Within the MESD, the TSM oversees the management of the teaching force, which includes the recruitment and posting of teachers.[10] The TSM absorbs the majority of the MESD's recurrent budget expenditure. In 2018–2019, 64 per cent of the approved education budget was allocated to the TSM to finance teacher salaries. This was followed by the secondary education department at 22 per cent and corporate services at 10.3 per cent (World Bank Group, 2019).

New teachers are deployed to schools from an existing pool of qualified candidates. Requests for teachers are transmitted by the schools to regional education offices and then onto the TSM at the MESD. Teachers are then drawn from a standing teacher candidate roster (i.e., the human resources database at TSM), consisting of a pool of post-secondary learners who have undergone a teacher training programme or acquired an education-related qualification.[11]

In terms of selection, the TSM prioritizes eligible teachers who have been on the roster the longest (Botswana, MESD, 2013). While teachers are considered eligible to teach and qualified if they hold a teaching certificate (as specified in the Unified Teaching Service Act 1975), most teachers possess a diploma or degree. University degree graduates are given preference over diploma graduates at both the primary and junior secondary levels. The key steps of the teacher recruitment process are summarized in Figure 2.

10 The Human Resources department in the MESD manages non-teaching personnel.
11 Pre-service diploma training for primary teachers was conducted at four colleges of primary education at Francistown, Lobatse, Serowe and Tlokweng. However, colleges in Francistown and Lobatse were closed in 2017 and 2009 respectively. Teachers increasingly also acquire degrees from the faculty of education at universities.

Figure 2: Botswana's teacher recruitment process



To balance professional skills and teacher competencies, a multi-stakeholder task force produced an updated teacher transfer policy in 2006 (Botswana, TSM Directive No. 1 of 2006). A rotational system of five to eight years was instituted, with a minimum of two years of service at a duty station before a teacher can request a transfer. Duty stations range from urban, peri-urban, least remote, remote to remotest, and salary incentives are aligned with the broader public service management framework (Botswana, TSM Directive

No. 1 of 2006). An Inter-Regional Transfers Board – consisting of the Deputy Director, a TSM representative and chief executive officers from the region and supervisory department – oversee teacher transfers.

Teacher training programmes are theoretical and focused on content knowledge, leaving teacher candidates without sufficient practical pedagogical skills or classroom experience

There have been recent efforts to professionalize the teaching force, but the extent of implementation is unclear. The Botswana Teaching Professionals Council Board (BOTECO) was established under the Botswana Teaching Professionals Council Act (2019) to regulate the teaching profession.[12] In particular, BOTECO is mandated to maintain professional and ethical standards, license teachers, and establish, publish, review and maintain a code of ethics for educators.[13]

2.3 Key challenges in teacher deployment

Despite investments in the teaching workforce, teachers are not adequately prepared or supported to teach in classrooms. The Education and Training Sector Strategic Plan 2015–2020 points to the lack of training, support and capacity-building for teachers as key barriers to quality learning. Teacher training programmes are theoretical and focused on content knowledge, leaving teacher candidates without sufficient practical pedagogical skills or classroom experience. For instance, during a three-year teaching diploma programme, teacher candidates spend only 18 weeks in hands-on practical training (Major and Tiro, 2012; Iloany, 2014). Once assigned to a particular school, teachers are not provided pre-service orientation. In-service teacher training remains underfunded and lack subject matter experts in many subjects (World Bank Group, 2019). Recent SAQMEC IV data suggest that 44 per cent of Grade 6 learners were taught by teachers who had not attended in-service training in the past three years. This figure was higher in disadvantaged districts such as Chobe where the share was 80 per cent (SAQMEQ, Department of Educational Planning and Research Services Research Unit, 2018).

12 For more details on the BOTECO, see https://botswanalaws.com/Principal-Legislation/botswana-teaching-professionals-council.html.
13 Ibid.

The current teacher deployment process is supply-driven and not responsive to school needs.

The current teacher deployment process is supply-driven and not responsive to school needs (Bennell and Molwane, 2007). An overcentralized recruitment process results in school leaders having little say in the selection process of the teacher. Once schools identify a vacancy (or subject-specific vacancy at the secondary level), a teacher is assigned from the central roster in order of graduation date and is not selected based on school-specific needs or teacher profile. At the same time, long wait times on the TSM's teacher roster (which can be years for some subjects) not only affect the morale of teacher candidates, but also contribute to poor retention of content and pedagogical skills. This is further exacerbated by the lack of in-service training once teachers are deployed (Bennell and Molwane, 2007).

Inadequate strategic human resource planning has led to imbalances in teacher demand and supply:

- **At the primary level, there is a shortfall of qualified teachers willing to teach in primary schools.** This is driven by three reasons. First, teacher cohorts recruited during earlier stages of the system's expansion are nearing or have reached retirement age. Second, the closure of two out of four primary teacher training colleges has limited the MESD's ability to replace retiring teachers.[14] Finally, teachers have a strong incentive to upgrade their qualifications to move to upper levels for improved pay and prestige, leading to poor retention at the primary level. While the MESD has been proactive in addressing the shortfall, more systematic planning is required to ensure a stable supply of teachers at the primary level.

- **At the secondary level, misalignment in teacher supply has led to a teacher shortage in science, technology, engineering and mathematics (STEM) subjects, but a surplus in humanities subjects.** Teachers in high-demand STEM subjects receive school placements immediately. For instance, as of June 2022, all Physics teachers had been deployed immediately and only 11 registered teachers were awaiting deployment in

14 Of the four colleges of primary education, the one in Francistown was closed in July 2017 and the one in Lobatse in December 2009. Only the two colleges in Serowe and Tlokweng are currently operational.

Mathematics, 45 in Chemistry and 67 in Integrated Sciences. In contrast, teachers with humanities qualifications remain unemployed, with some teachers waiting since 2012 to receive school assignments following graduation from teacher training colleges. MESD officials noted that over 900 registered teacher graduates were awaiting deployment in English in June 2022, 639 in Geography, 303 in Setswana, 268 in Agriculture and 181 in Computer Studies.

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11

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45

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- **Botswana's generous scholarship regime incentivizes many college/university students to pursue teacher training.** The lack of alternative job prospects for graduates contribute to a large teacher candidate pool, often with humanities credentials that cannot be absorbed into schools. Prior estimates suggested that the output of teacher trainees is roughly double the average number of teachers that can be placed and employed (World Bank Group, 2019).

Schools in rural, remote and difficult-to-staff areas find it hard to attract teachers, and appointees frequently refuse or delay compliance with school assignments. While an existing transfer policy aims to balance and rotate teachers across regions, the process remains largely ad hoc due to unclear reporting lines and non-compliance. Transfers are either negotiated between regional directors or teachers directly request transfers based on medical grounds (Bennell and Molwane, 2007). Moreover, teachers in urban areas are often reluctant to transfer to rural schools, leading to overstaying. Inversely, teachers in rural duty stations are unable to transfer to more lucrative postings, creating an incentive for teachers to refuse or delay compliance with transfer orders.[15]

15 Data cited in the MESD presentation at the inception workshop, which are corroborated by World Bank Group (2019).

Key findings

Who are the teachers in Botswana?

3.1 A profile of teachers in Botswana

Botswana has invested significantly in increasing teacher numbers and improving the qualifications of its teaching force in recent years. Statistics drawn from EMIS data provide a profile of the teacher population in Botswana (summarized in Figure 3), with five takeaways:

The majority of teachers are female:

73%
at the primary level

57%
at the secondary level

1. **The teaching force has grown substantially since 2018.** The primary teaching workforce has grown 9 per cent from 14,315 in 2018 to 15,580 in 2022. The number of secondary teachers rose by 5 per cent from 16,508 to 17,310 between 2020 and 2022.

2. **The majority of teachers in the education system are female**, with significantly more female teachers at the primary level (73 per cent) compared with the secondary level (57 per cent). This share remains consistent even with the increase in teachers since 2018.

3. **Most teachers are on permanent contracts**, and this share is higher in secondary (85 per cent) relative to primary (76 per cent). The proportion of temporary and contract teachers has risen at the primary level since 2018 (from 8 per cent to 15 per cent), suggesting that recent recruitment has been through temporary and contract teachers.

At the primary level:

55%
of teachers hold diplomas

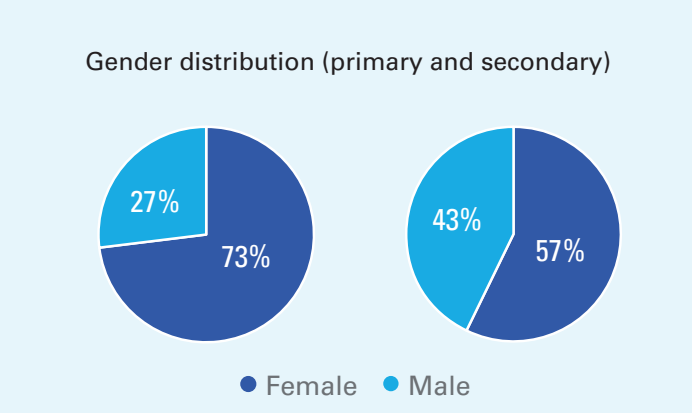
26%
hold certificates

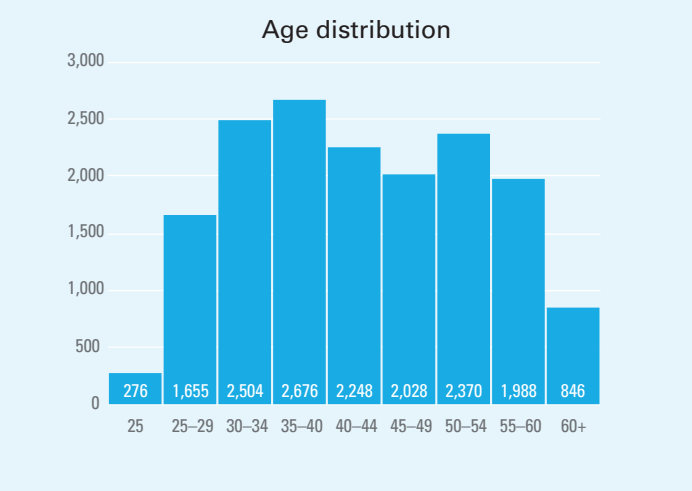
11%
hold degrees

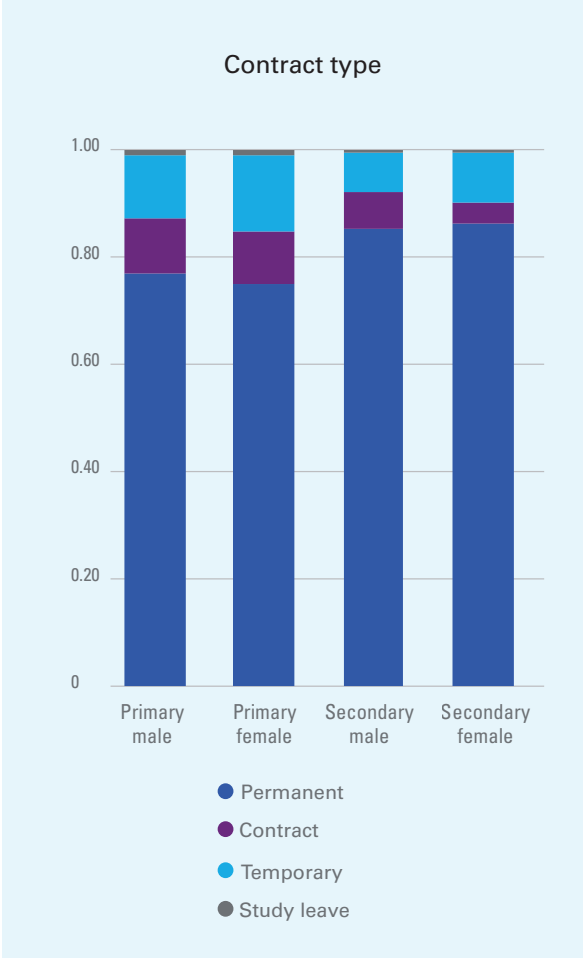
4. **The majority of teachers at the primary level hold diplomas, while the largest share of secondary teachers hold degrees.** At the primary level, 55 per cent of teachers hold diplomas, while the remaining hold certificates (26 per cent) and degrees (11 per cent). Male teachers tend to be marginally more qualified at the primary level with fewer certificates and more degree qualifications than their female counterparts. At the secondary level, virtually all teachers have upgraded from certificates since 2020. The largest share of secondary teachers possess degrees (54 per cent) followed by diplomas (40 per cent). The share of unqualified teachers is negligible, given that teacher recruitment occurs through teacher training institutions. In total, there were 32 unqualified teachers in the 2022 EMIS.

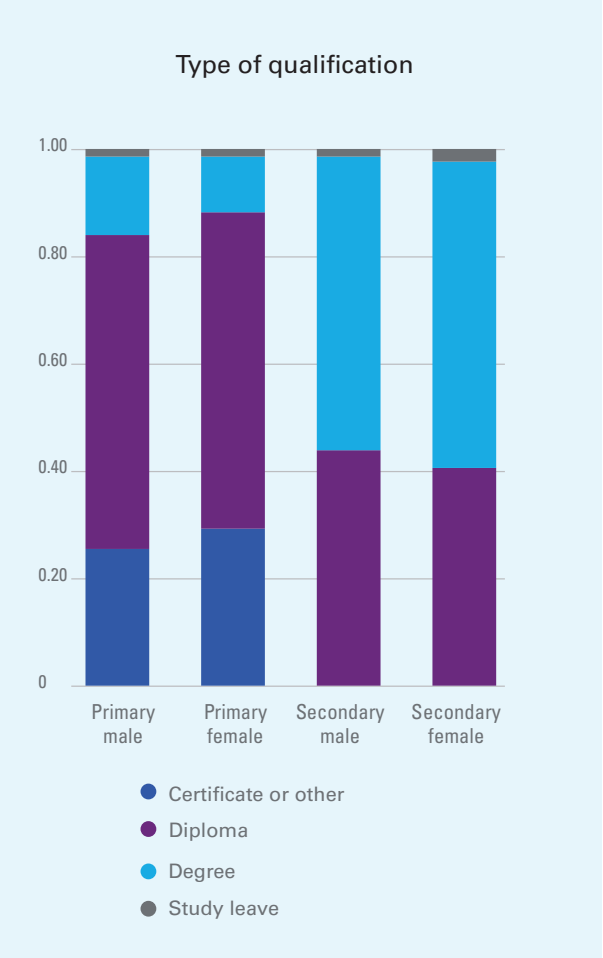
5. **Teachers in urban districts tend to be more qualified.** The share of teachers with a degree (or above) for both levels is highest in the urban census districts of Sowa, Gaborone, Southern and Ramotswa (see Annex III for maps illustrating spatial differences). At the other end of the spectrum, teachers with lower qualifications are also concentrated geographically. For instance, western districts of Ngamiland, Ghanzi and Kgalagadi have the lowest share of primary teachers with degrees. At the secondary level, the eastern districts of Chobe and Central have the lowest share of teachers with a degree.

Figure 3: Demographic profile of teachers in Botswana (2022)









Data source: EMIS 2022. Primary total: Male: 9,221, Female 12,297. Secondary total: Male: 7,459; Female: 9,851.

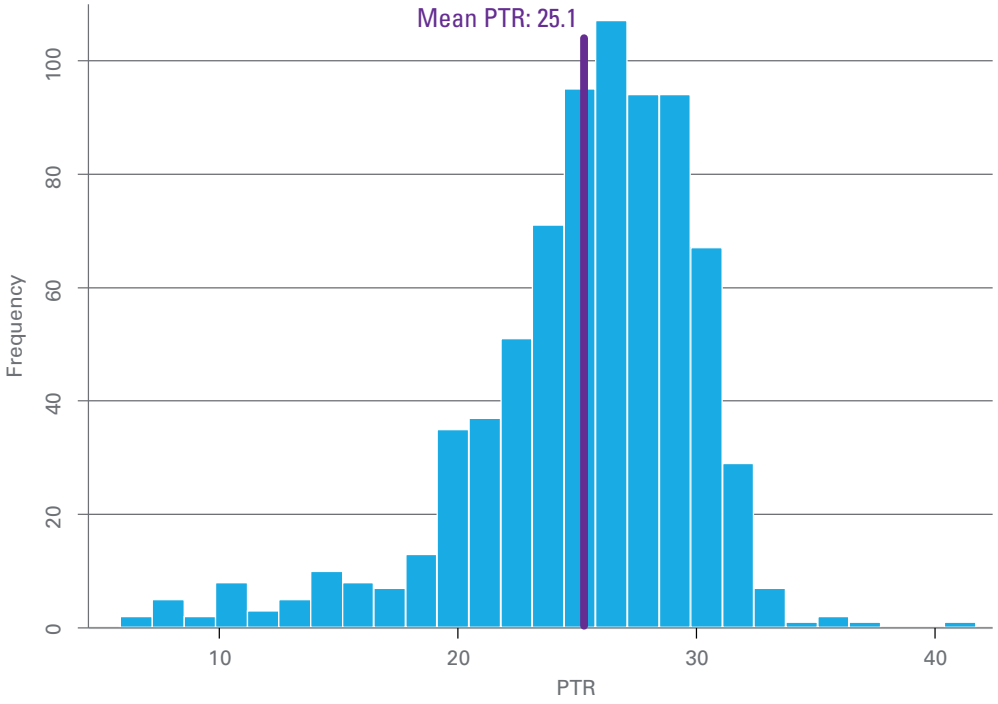
How are teachers distributed between schools?

3.2 Botswana has a low pupil-teacher ratio in primary schools

Botswana's average PTR was 25:1 for government primary schools in 2022.[16] This PTR calculation only includes teachers with a 'chalk in hand' (i.e., those with teaching assignments in the classroom).[17]

The 2022 PTR was lower (better) than the target PTR outlined in the 1994 RNPE of 30:1. It also represents a significant improvement from the 2018 PTR of 29:1. This is primarily driven by significant growth in the teaching force relative to learner enrolment between 2018 and 2022.[18]

Figure 4: Distribution of PTR across schools



Note: The histogram illustrates the variation in PTR across government primary schools in 2022. Despite a low PTR of 25:1, the dispersion of PTRs across schools in Botswana points to variation in how teachers are distributed.

16 The mean (average) PTR for public schools was 25:1 in 2022 while the median PTR was 25.8:1, with a standard deviation of 7.4. The mean and median differ because of the skewed distribution of the PTR. The sample in the histogram only includes government schools, which represents 89 per cent of schools in Botswana (757 schools out of a total of 846 primary schools).

17 To better reflect learning conditions inside classrooms, this PTR calculates only teachers with a stream assignment. As the estimate excludes administrative and non-teaching staff, it differs from official estimates of PTR. All statistics illustrated in this analysis use this PTR calculation approach. PTR and class size are used interchangeably.

18 Between the two years for which EMIS data was available for this analysis, total learner enrolment grew 4 per cent while the teaching force increased by 20 per cent nationally. For a breakdown by district, see Annex V.

For instance, while the mean PTR was

25:1

about a quarter of schools were above

29:1

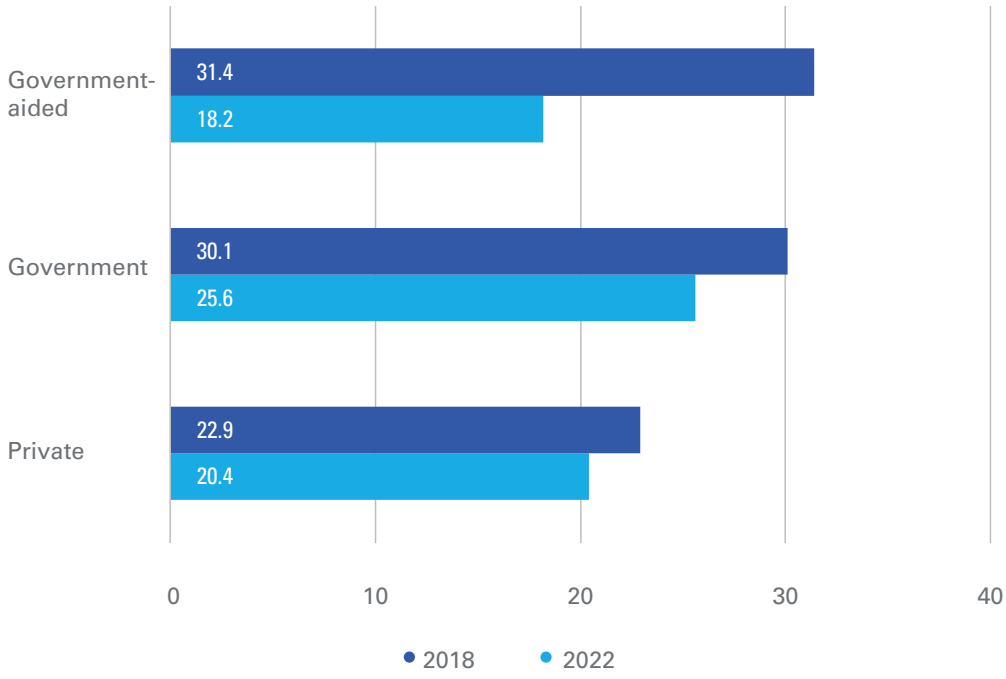
while another quarter had a PTR below

23:1

However, Botswana's national PTR provides a limited window in teacher allocation, concealing significant variation across schools.[19] For instance, while the mean PTR was 25:1, about a quarter of schools were above 29:1 while another quarter had a PTR below 23:1 (see Figure 4). In short, the aggregated PTR figure masks differences across schools, with many schools experiencing larger class sizes while others experience teacher surpluses.

The PTR also varies by school ownership (Figure 5). Government schools (the vast majority of schools) experience a slightly larger PTR (25.6:1) compared with private schools (20.4:1) and government-aided schools (18.2:1).[20] In other words, children in private schools may benefit from relatively better learning conditions compared with government and government-aided schools (there are only 10 government-aided schools in the system).

Figure 5: PTR by school ownership



Note: The bar graph illustrates the differences in mean PTR across school types. Government schools have higher PTRs than private schools.

19 The standard deviation for PTRs (a metric capturing the dispersion of PTR values from the mean) was 7.4 in 2022.

20 The majority of primary schools in Botswana are government schools. Out of 846 primary schools in 2022, there are 757 public schools, 79 private schools and 10 government-aided schools.

3.3 Despite a low pupil-teacher ratio, teacher deployment is geographically uneven

Going beyond national statistics reveals important subnational patterns in teacher allocation across districts and subdistricts:

- At the district level, primary school teachers are distributed unevenly, whereas Central (28:1), North-West (27:1) and Kweneng (26:1) districts experience the highest PTR on average (Figure 6A).

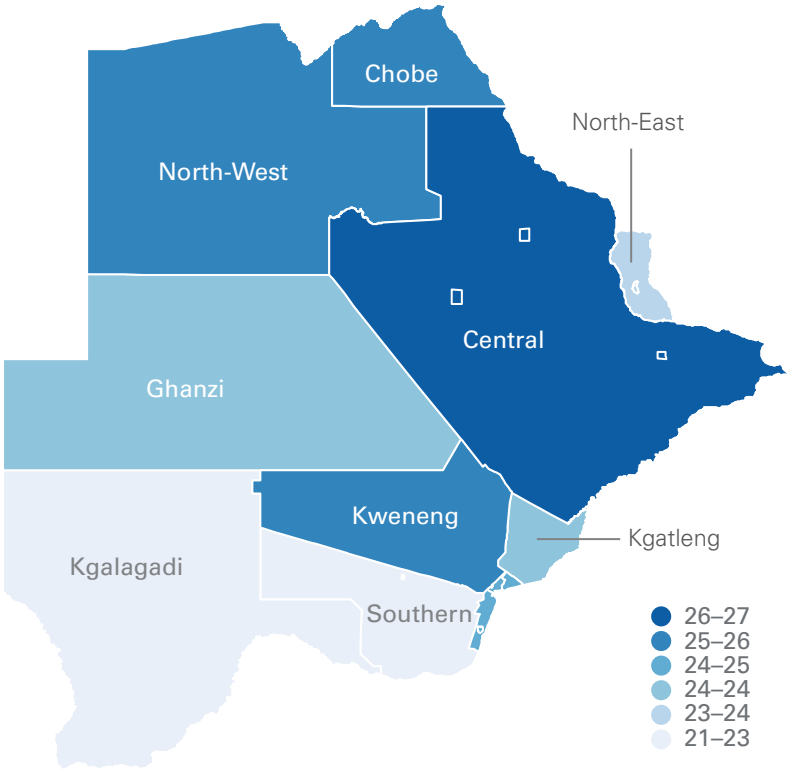
- Looking closer, specific subdistricts within districts experience higher PTRs. For instance, Boteti (28:1), Tutume (27:1), Bobonong (27:1) and Serowe/Palapye (27:1) in the Central district have higher PTRs than the average, along with Ngamiland West in the North-West District (Figure 6B).

Imbalances in teachers are more pronounced within subdistricts themselves.[21] In other words, schools in the same subdistrict can experience large differences in PTRs, pointing to inequities in how teachers are deployed. Figure 7 illustrates how the standard deviation of PTR differs across subdistricts. In the subdistrict of Tutume, for instance, PTRs for schools are clustered tightly around the mean PTR, implying that teacher distribution is similar (i.e., more equitable). In contrast, in Barolong the PTR range is wider, suggesting inequity in teacher distribution across schools.

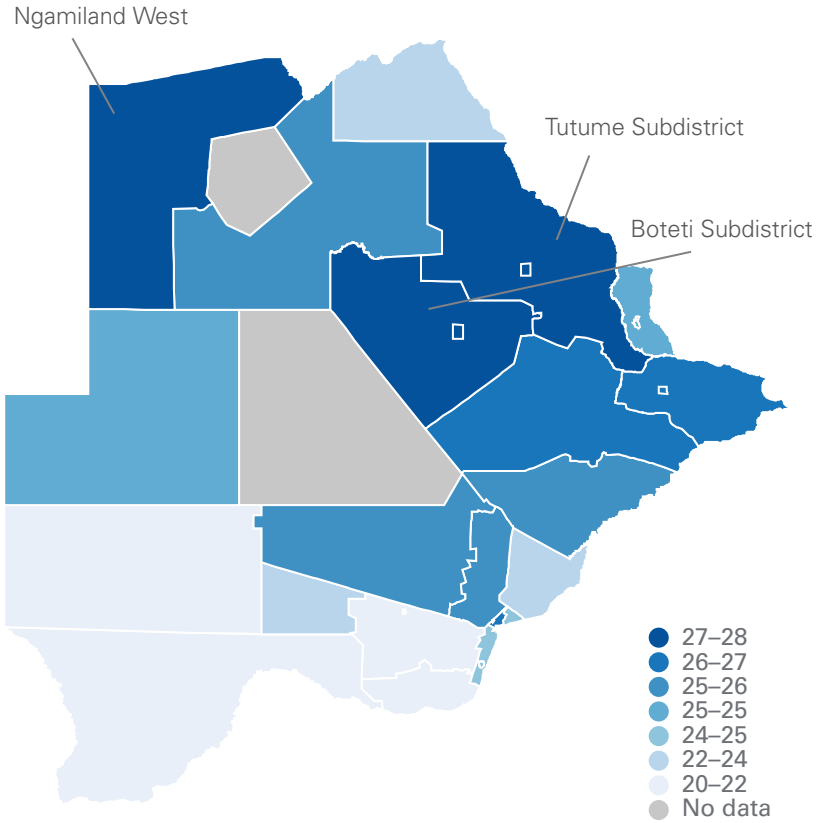
In short, while the national PTR exceeds (i.e., is lower than) the MESD's target, differences in PTRs both between and within subdistricts suggest that learning conditions vary between schools. Policymakers must draw on localized data – including targeting teacher deployments to needy districts and redistributing teachers within subdistricts – to create the conditions to improve learning.

21 Variation is the dispersion of PTRs across schools in a geographic area, represented by the standard deviation of PTRs. In 2022, the variation within subdistricts (7.1 standard deviation) was almost four times that of the variation between subdistricts (2.1 standard deviation).

Figures 6A and 6B: PTRs by district and subdistrict (2022)

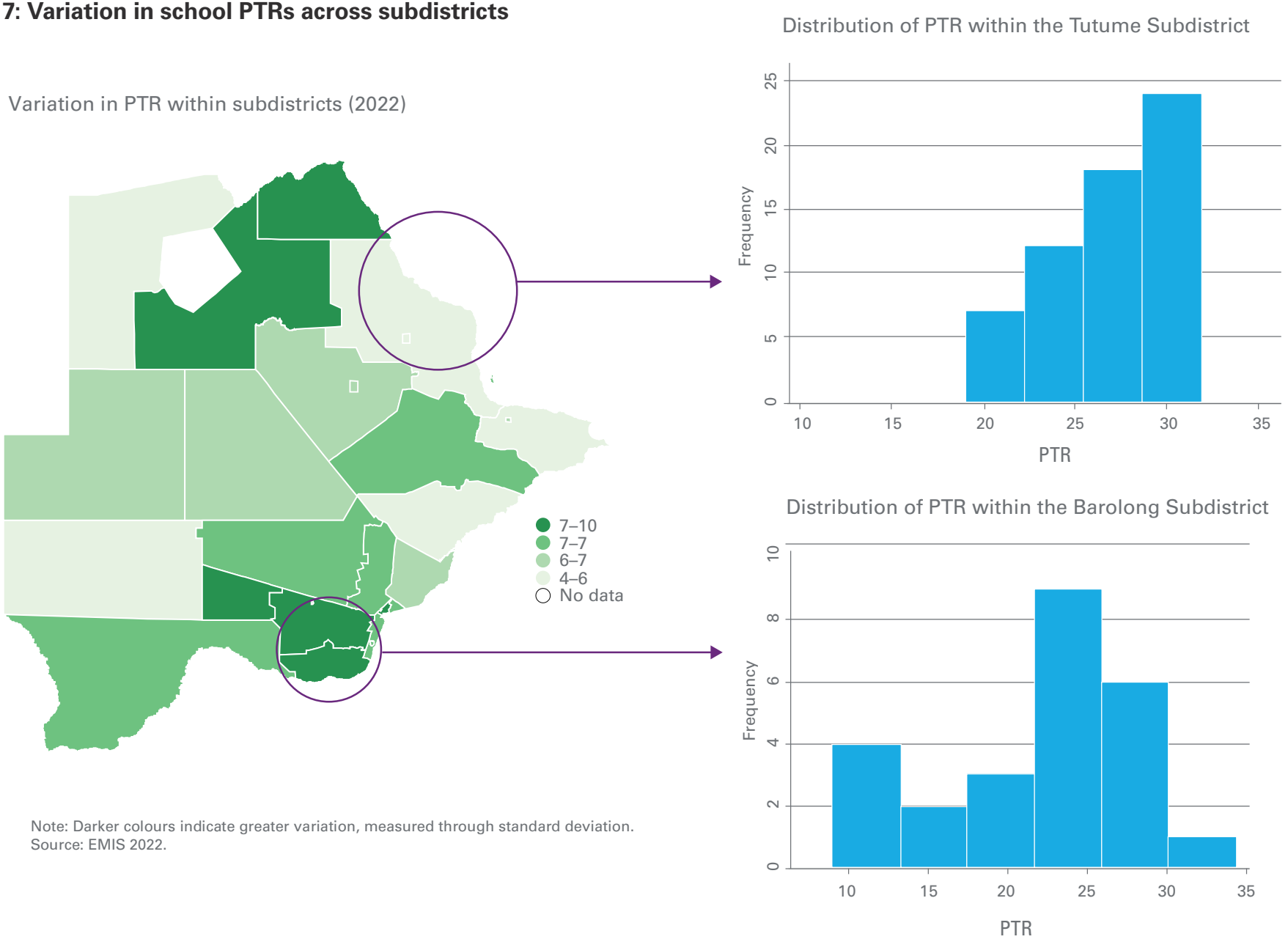


Note: Darker colours represent higher PTRs.
Data source: EMIS 2022.



Note: Darker colours represent higher PTRs.
Data source: EMIS 2022.

Figure 7: Variation in school PTRs across subdistricts



Note: Darker colours indicate greater variation, measured through standard deviation.
Source: EMIS 2022.

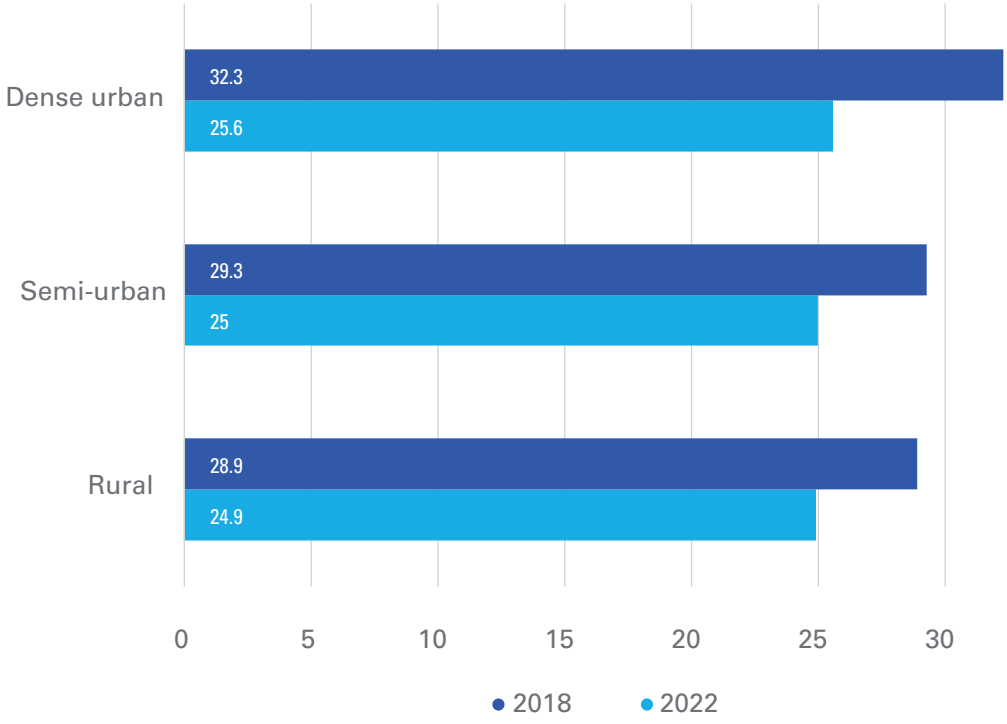
3.4 Urbanization has put pressure on schools in densely urban areas

Botswana has one of the highest urbanization levels in sub-Saharan Africa. Driven partly by migration and natural population growth, urban growth rates have averaged around 4 per cent a year and today, 72 per cent of Botswana's population live in an urban area.[22]

Botswana has one of the highest urbanization levels in sub-Saharan Africa.

The disproportionate pressure on urban schools has been met with a strong policy response. Densely urban areas such as Gaborone, Francistown, Lobatse and Selibe Phikwe recorded larger PTRs than rural schools in 2018.[23]

Figure 8: PTR by school location (2018 and 2022)



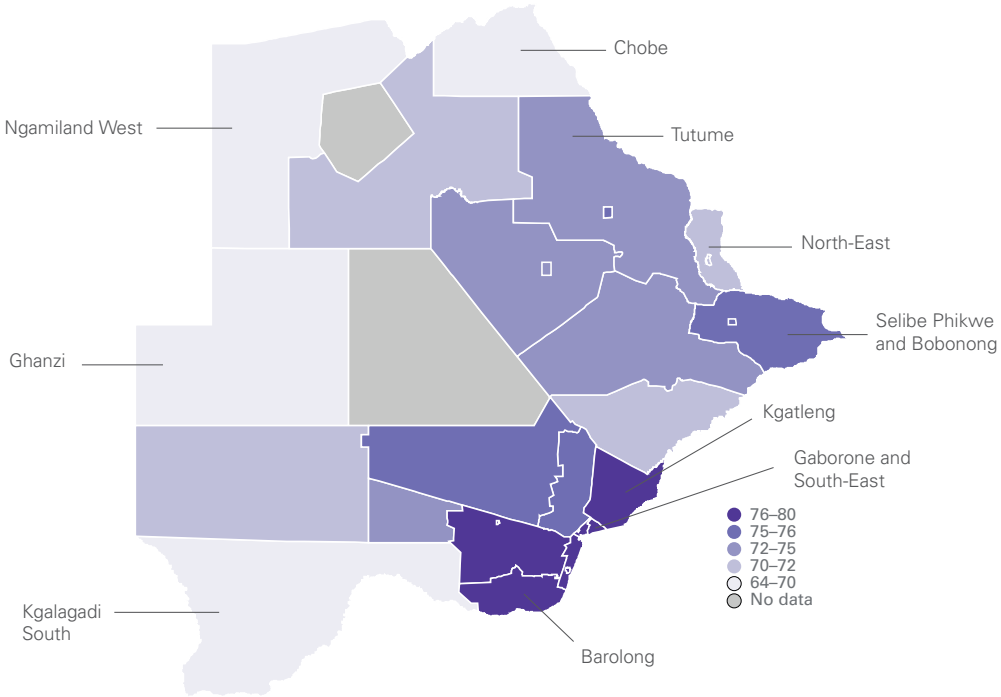
22 Data drawn from the World Bank Group (2018).

23 Classification of schools into dense urban, semi-urban and rural are based on authors' calculations using data from the 2022 Population and Housing Census. Schools are classified as dense urban (13 per cent of schools) if they are situated in population centres/census districts with a population density over 500 per square kilometre. This includes schools in Gaborone (density: 1,444, population: 244,000), Francistown (density: 1,296, population: 102,000), Lobatse (density: 701, population: 29,000) and Selibe Phikwe (density: 506, population: 41,000). Semi-urban schools (24 per cent of schools) are schools in towns/villages with populations above 20,000 but with low density, including Mogoditshane/ Mahalapye (population: 88,000), Maun/Ngamiland East (population: 85,000), Molepolole (population: 74,000), Tlokweng (population: 55,000), Serowe (population: 55,000), Palapye (population: 52,000), Mochudi (population: 50,000), Kanye/ Ngwaketse (population: 48,000), Mahalapye (population: 48,000), Letlhakane (population: 36,000), Ramotswa, (population: 33,000), Mmopane (population: 25,000), Thamaga (population: 25,000), Moshupa (population: 23,000), Tonota (population: 23,000), Bobonong (population: 21,000) and Gabane (population: 20,000). The remaining schools (63 per cent of schools) are classified as rural. The 2022 Population and Housing Census can be accessed at https://www.statsbots.org.bw/sites/default/files/2022%20Population%20and%20Housing%20Census%20Preliminary%20Results.pdf.

However, the MESD has made significant progress in allocating teachers to urban schools since 2018, reducing PTRs in urban schools, particularly in schools in densely urban areas (Figure 8). For instance, in Gaborone, teachers have grown 25 per cent relative to a 3 per cent rise in learner enrolment. Similarly, teachers have risen 27 per cent in Francistown relative to a 5 per cent growth in learner numbers and in Lobaste, teachers have grown 22 per cent relative to a 2 per cent fall in learner enrolment (see Annex V).

The share of female teachers across urban and rural primary schools is broadly similar. Densely urban schools (75 per cent) have a marginally higher share of female teachers than semi-urban and rural schools (73 per cent). This, however, masks a larger regional variation between rural and urban subdistricts. Figure 9 illustrates the percentage of female teachers across subdistricts with the lightest colours representing the lowest share of female teachers.

Figure 9: Percentage of female primary teachers by subdistrict



Note: Darker colours represent higher proportions.
Data source: EMIS 2022.

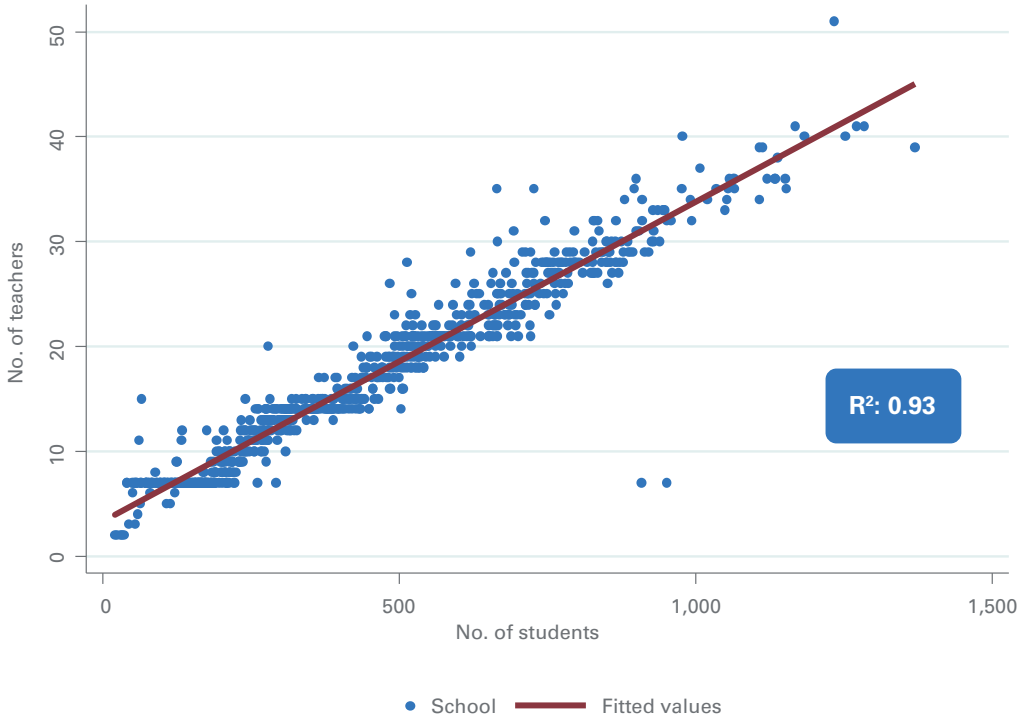
Notably, the urban subdistricts of Gaborone and Ramotswa have the highest share of female teachers:

80%

Notably, the urban subdistricts of Gaborone and Ramotswa have the highest share of female teachers (80 per cent). In contrast, more rural subdistricts such as Orapa (63 per cent), Chobe (65 per cent), Ngamiland West (65 per cent) and Kgalagadi South (69 per cent) have relatively fewer female teachers.

3.5 Coherence in teacher allocation is strong, but varies subnationally

Figure 10A: Relationship between number of learners and teachers



In addition to geographical patterns, examining the coherence of teacher allocation provides more granular insight. The coefficient of coherence is based on the principle that the number of teachers in a school should reflect and be proportional to the number of pupils. Put another way, the number of learners in a school should explain the variation in teachers, represented by R^2.

In Botswana, there is a strong coherence between learner enrolment and the assignment of teachers at the national level. Figure 10A plots the relationship between the number of learners and

teachers at each primary school, illustrating an R^2 of 0.93,[24] which exceeds the benchmark suggested by the Global Partnership for Education (0.8).

The aggregate coherence figure, however, conceals some variation at lower administrative levels. Figure 10B plots the lack of coherence (i.e., randomness) in each subdistrict.[25] The map illustrates two takeaways:

First, there is a geographic imbalance in coherence. In particular, the subdistricts of Ngamiland West, Kgalagadi North and Central Serowe tend to experience lower coherence (i.e., higher randomness) than the national average.

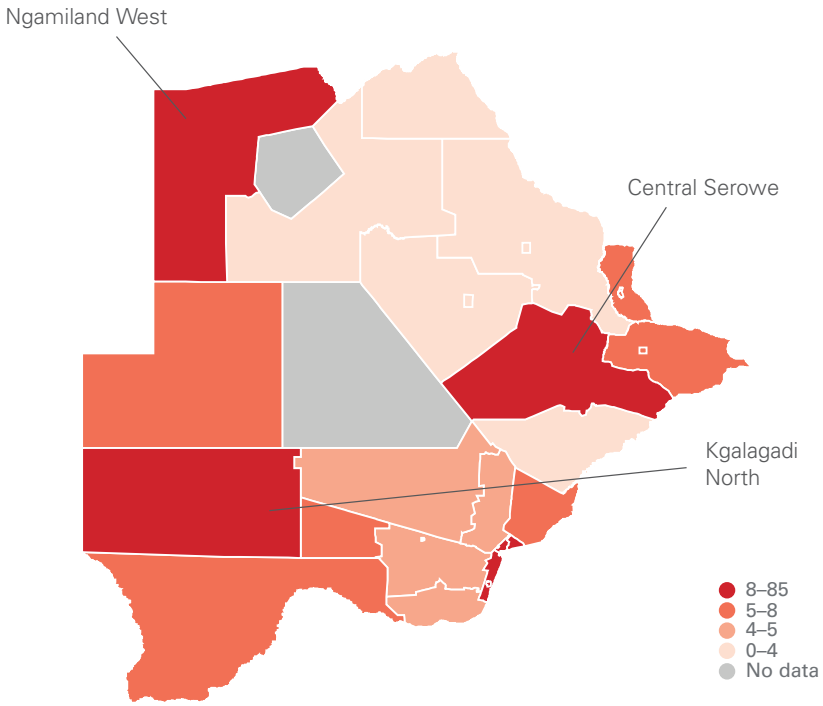
Second, urban subdistricts experience the lowest coherence (highest randomness). Gaborone, Jwaneng, Serowe/Palapye and Lobatse in particular experience the weakest alignment between learner enrolment and teacher deployment.[26] In other words, teacher deployment in schools in these areas is influenced by factors outside of learner enrolment.

24 Correlation is significant at the p-value <.001 level. This is a simple correlation without any control variables.

25 The degree of randomness is represented by ($1-R^2$), capturing the share of the phenomenon of teacher distribution linked to factors other than the number of pupils in the schools.

26 The Global Partnership for Education specifies a randomness value of 0.20 and below as an acceptable value for equitable allocation (meaning that 80 per cent or more of teacher postings are directly based on the number of learners to be taught).

Figure 10B: Differences in coherence of teacher allocation across subdistricts



Note: Darker colours represent higher randomness in teacher allocation.
Cut-offs represent quantiles of the distribution.
Source: EMIS 2022.

A number of contextual factors (outside of policy) influence teacher preferences and ultimately shape teacher distribution. Regression models, holding the number of learners in a school constant, underscore three school characteristics that are correlates of teacher allocation:[27]

- **Non-government schools have more teachers than government schools, once accounting for contextual factors.** Private schools are associated with 1.6 additional teachers and government-aided schools with two additional teachers, holding the number of learners, school location and other factors constant.

- **Larger schools have more male teachers (as a proportion).** In other words, while male teachers represent only 26 per cent of

27 Regression analysis, while not causal, illustrates which school, teacher and learner characteristics are most strongly associated with teacher allocation, accounting for various contextual factors. See Annex I for regression tables.

the overall teaching force, they tend to be concentrated in larger schools, holding all other factors constant.

- **The number of teachers is positively associated with school size.** Once controlling for all other factors, an additional teacher is associated with 33 additional learners in a primary school (or 0.03 teachers per additional learner). Moreover, an additional classroom in a school is associated with 0.8 teachers. This relationship is smaller for junior secondary, where an additional teacher (for both humanities and the sciences) is associated with 167 additional learners.

While the recruitment of over 2,400 primary school teachers have reduced overall class sizes, new teachers have not always been deployed efficiently.

3.6 Recent recruitments have reduced class sizes, but teachers have not always been deployed efficiently

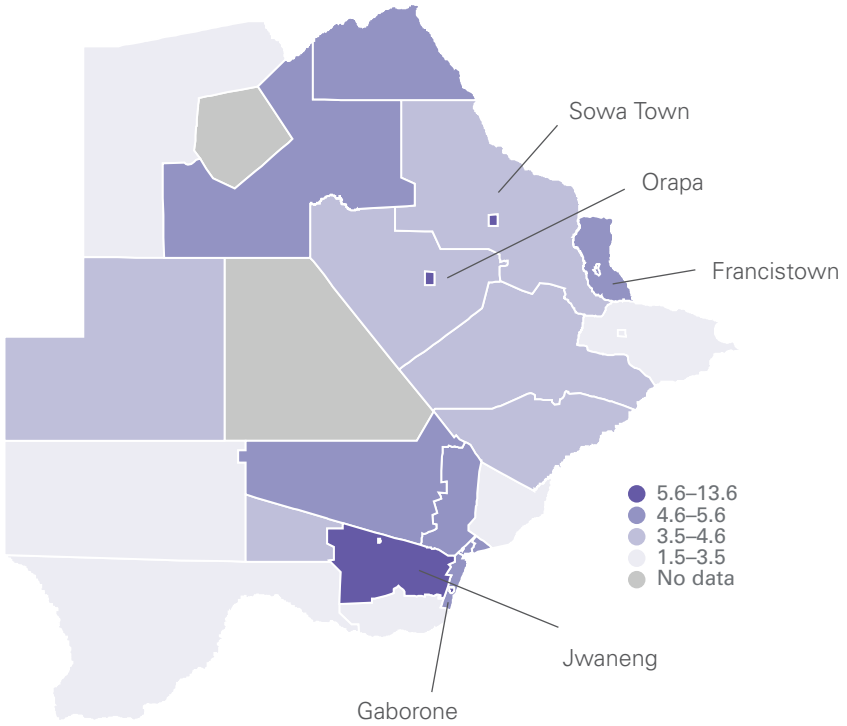
Botswana has made significant investments in teacher recruitment between 2018 and 2022. While the recruitment of over 2,400 primary school teachers have reduced overall class sizes, new teachers have not always been deployed efficiently.

The national PTR has improved since 2018, particularly in urban schools. Average class sizes have fallen from 29:1 to 25:1 nationally between 2018–2022 and schools in dense urban areas have benefited from the largest decreases in PTR, falling from 32.3:1 to 25.6:1 (as illustrated in Figure 11A, represented by the darkest shades of purple). Notably, the PTR in schools in Sowatown improved by 13.6 pupils per teacher, while Orapa, Jwaneng, Lobatse, Gaborone and Francistown have seen an average drop between five to seven pupils per teacher. Rural districts have also experienced improvements in PTRs, but to a smaller extent. Schools in the rural districts of Chobe and Ngamiland East benefited most from falling class sizes (by five learners per teacher).

However, the influence of new teacher recruitment on coherence was mixed:

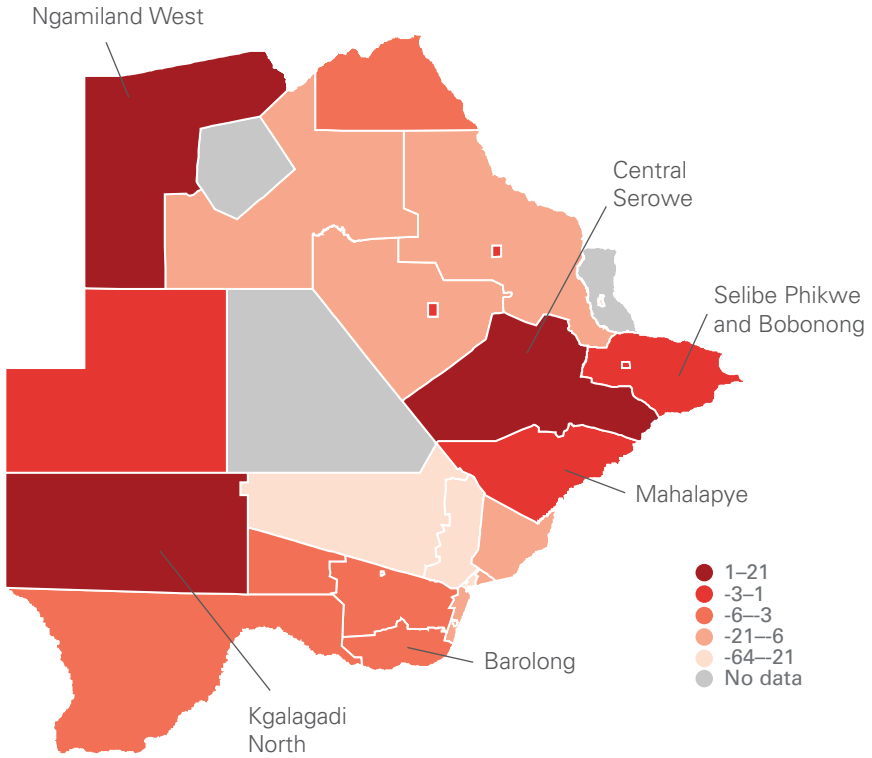
- **On the one hand, in urban schools in Gaborone and Francistown, the influx of new teachers increased alignment with larger learner bodies.** Responding to the demand for teachers led to substantial improvements in coherence (and a corresponding fall in the coefficient of randomness), as illustrated in Figure 11B.

Figure 11A: Decrease in PTR by subdistrict between 2018–2022



Note: The darker the purple, the larger the decrease in subdistrict PTR between 2018 and 2022.
Source: EMIS 2018/2022.

Figure 11B: Changes in teacher randomness between 2018–2022



Note: The darker shades of red represent decreases in randomness (or increase in coherence). Lighter shades of orange represent districts where learner-teacher coherence has increased.

Fewer teachers in early grades disadvantage learners at a critical juncture when they acquire basic literacy and numeracy skills.

- **On the other hand, coherence weakened in subdistricts where increases in teacher recruitment did not align with patterns in learner enrolment.** In particular, in subdistricts such as Bobonong, Barolong and Serowe, teacher numbers rose substantially while learner enrolment declined between 2018 and 2022 (illustrated in the darkest shades of red in Figure 11B). Similarly, in Ngamiland West, Kgalagadi South and Mahalapye, teacher numbers rose while the number of learners remained the same. In these subdistricts, the coherence fell (and randomness increased) between 2018 and 2022, suggesting that teacher deployment was influenced by factors outside of learner enrolment (darker shades of red in Figure 11B).

The MESD has made significant strides in improving teacher numbers. However, while new teacher allocations reduced class sizes, these efforts did not always reflect individual school needs. Leveraging school-level data – including current and projected learner numbers – can play an important role in improving the efficiency for future teacher allocations.

How are teachers distributed within schools?

3.7 Lower grades experience larger class sizes and more challenging learning conditions

Teacher distribution within schools had a disproportionate impact on foundational learning. Early evidence suggests that school leaders allocate more and better-qualified teachers to higher grades. This is done to improve school performance, as the highest grade is usually the only grade in the primary cycle where national examinations occur.[28] Conversely, fewer teachers in early grades disadvantage learners at a critical juncture when they acquire basic literacy and numeracy skills.

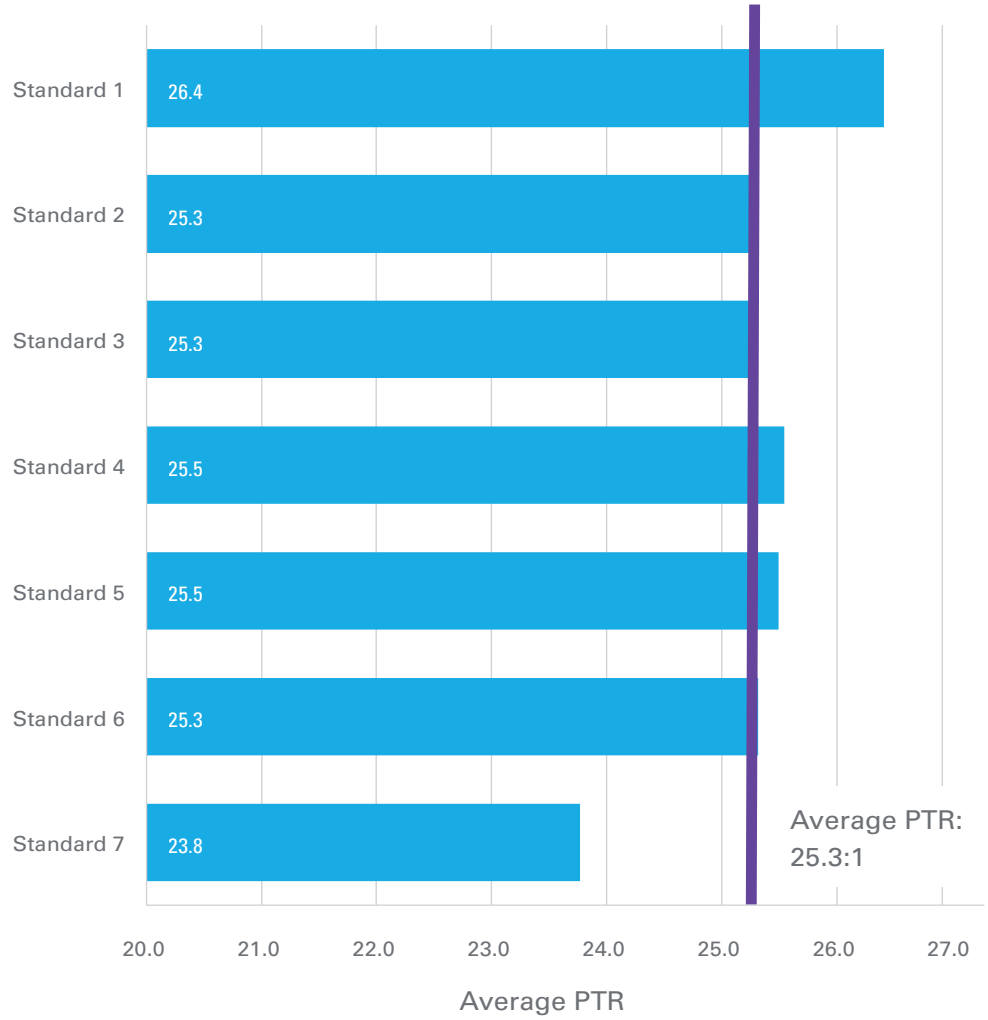
In Botswana, class sizes are larger in earlier grades. Figure 12 illustrates the PTR in each grade of the primary cycle. Notably, the mean PTR in Standard 1 is significantly higher (26.4:1) compared with

28 For countries with data, the PTR improves with each successive grade of education. More recent analysis shows that head teachers have a clear preference in allocating new teachers to Grade 8 to improve testing performance in national exams (Caro and Ndem, 2019; Zubairi, 2020).

the Standard 7 PTR (23.8:1), highlighting a 2.6 pupil difference in PTR between the first and last grades.[29]

In Botswana, class sizes are larger in earlier grades.

Figure 12: Differences in mean PTR across primary school grades



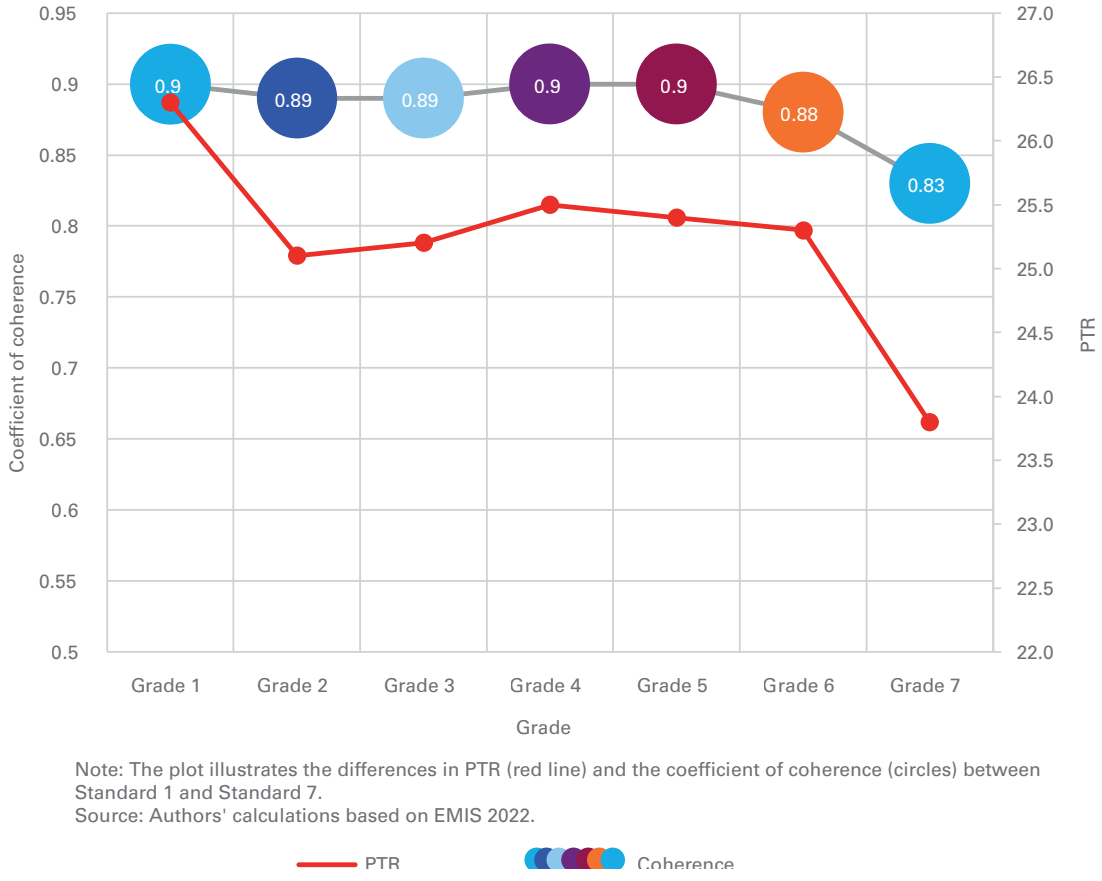
Source: Authors' calculations based on EMIS 2022.
Note: The bar graph illustrates the mean PTR between grades in the primary cycle. Calculation only includes teachers with teaching assignments and excludes administrative staff.

Moreover, the coherence in teacher allocation (i.e., the alignment between teachers and learners) is the lowest for Standard 7. This suggests that teachers are more likely to be allocated to Standard 7 not based on learner enrolment, but based on other considerations, likely including school-leaving examinations performance (Figure 13).

29 For countries with data, the PTR improves with each successive grade of education. More recent analysis shows that head teachers have a clear preference in allocating new teachers to Grade 8 to improve testing performance in national exams (Caro and Ndem, 2019; Zubairi, 2020).

The 'within school' inequity is particularly pronounced in urban subdistricts and private schools. Urban schools experience the largest differences in class sizes between early and later grades (4 pupils per teacher) compared with rural schools (2 pupils per teacher).[30] In addition, the gap between grades tends to be larger in private primary schools (6.2) compared with public schools (2.2). This finding is reinforced by regression models that account for various contextual factors,[31] suggesting that private schools may experience stronger incentives to improve learner test scores at the end of the primary cycle.

Figure 13: PTR and coefficient of coherence, by grade



Note: The plot illustrates the differences in PTR (red line) and the coefficient of coherence (circles) between Standard 1 and Standard 7.
Source: Authors' calculations based on EMIS 2022.

Larger class sizes in lower grades contribute to challenging learning conditions. Learners who fail to acquire basic literacy and numeracy skills not only fall behind in terms of grade-level

30 Urban subdistricts such as Orapa (6.2 pupils gap), Selibe Phikwe (6.1 pupils gap), Sowatown (5 pupils gap), Ramotswa (4.5 pupils gap) and Lobatse (4.3 pupils gap) experience the largest differences in class sizes between early and later grades. In contrast, schools in rural subdistricts such as Ghanzi (0.7 pupils gap), Kgatleng (1.1 pupils gap) and Chobe (1.5 pupils gap) see smaller gaps between the grades

31 For full regression results, see Annex I, Regression Table 1.

competencies, but are unable to engage with more advanced curricula as they progress through the education cycle, a phenomenon known as the 'Matthew effect'. The performance gap between learners may increase over time and the most disadvantaged learners may never catch up.

Focusing resources early in the primary cycle can yield high returns in terms of foundational learning.

Focusing resources early in the primary cycle can yield high returns in terms of foundational learning. School leaders often have significant discretion on how they choose to allocate teachers at the school level. Strengthening the school management framework, including proposing and communicating PTR norms for each grade, can provide concrete guidance for school leaders and signal that foundational learning is a policy priority.

How is teacher deployment related to learning outcomes?

3.8 Higher pupil-teacher ratio is negatively related to learner test scores

Learning levels are low at the primary level in Botswana. Building on existing learning assessments, this analysis uses average composite scores from the Primary School Leaving Examination (PSLE). The PSLE is the standardized assessment held at the end of the primary cycle at Standard 7, and provides a snapshot of the state of learner learning at the end of the primary cycle.

The average composite score from the 2018 PSLE exam was 37.4 per cent (out of a total score of 100 per cent).[32] Learners in schools situated in dense urban areas scored higher (41.4 per cent), compared with rural (37 per cent) and semi-urban schools (36.9 per cent). In contrast, the credit pass rate at the school level (which is calculated using more liberal criteria) was 71.5 per cent.[33] For the distribution of test scores, including individual subject scores, see Annex IV.

32 The mean composite test score is an average of six subjects assessed in the PSLE, which assesses competencies following the seven-year primary education cycle.

33 The credit pass rate is defined by the BEC as the share of learners that are awarded grades A to C (on a scale of A to E). Credit pass rates in 2018 were highest in densely urban areas at 85 per cent, followed by 71 in semi-urban and 69 in rural schools.

Figure 14A: Relationship between composite PSLE test score and PTR (Standard 7)

Note: The scatterplot illustrates a negative (i.e., downward sloping) relationship between composite PSLE test scores and PTR at Standard 7.
Source: EMIS 2018 and PSLE.

A one-pupil increase in PTR at the school level is associated with a 0.05 percentage point decline in learner test scores from the PSLE

A larger class size is negatively associated with learner learning outcomes. Figure 14A plots this relationship, illustrating that learning outcomes tend to decline as PTR increases at Standard 7. Regression models (which account for school, teacher and learner characteristics) reinforce this finding and underscore five factors related to learner learning scores and pass rates:[34]

- **Standard 7 PTR is negatively associated with learner test scores and credit pass rates.** A one-pupil increase in PTR at the school level is associated with a 0.05 percentage point decline in learner test scores from the PSLE or a 0.22 percentage point drop in the pass rate, holding other contextual factors including school location and teacher characteristics constant. It is important to note that this relationship does not imply causality. However, taken together with a broader global literature, this finding underscores that class sizes play an enabling role in improving learning outcomes.

34 Regressions were run at the school level with latest available learning assessment data (2018). See Annex I for regression tables and methodological notes.

Figure 14B: Summary of regression results

VARIABLE	DIRECTION OF RELATIONSHIP	RELATIONSHIP WITH TEST SCORES (%)
Class size		
PTR at Standard 7	Negative	-0.052*
School type (compared with government)		
Government-aided	Positive	5.691***
Private	Positive	10.113***
School location (compared with rural)		
Dense urban schools	Positive	2.180***
Gender (proportion)		
Female teachers in school	Positive	4.631**
Infrastructure		
Number of classrooms	Positive	0.041***
Electricity	Positive	3.081***
Hostel	Negative	-2.441**
Agriculture Lab	Positive	3.789*

Note: Only statistically significant coefficients shown. See Annex I for full regression tables.

- **Non-government schools and urban schools outperform others.** Compared with government schools, government-aided schools scored 5.6 percentage points higher on composite learning scores and private schools scored 10.1 percentage points higher, holding class size (at Standard 7) and all other contextual factors constant. Furthermore, schools in densely urban areas scored 2.1 percentage points higher than rural schools. These trends are somewhat expected, given the many resource, geographic and demographic differences between these different school types.[35]

35 EMIS data was at the school level and thus unable to account for differences in learner background.

- **In terms of school characteristics, the proportion of female teachers in a school and electricity access are positively related to learning and credit pass rates in a school.** Moreover, the presence of electricity in the school increases learning by 3 percentage points, holding all else constant. These patterns are also reflected in school-level pass rates.

- **Finally, the presence of a hostel in the school reduces test scores by 2.4 percentage points.** Given Botswana's vast landmass, hostels are often constructed for schools in remote and hard-to-reach schools. As such, a hostel may imply a school in a more disadvantaged and/or remote context.

While findings highlight the importance of maintaining appropriate class sizes, reducing the PTR on its own is not a silver bullet.[36] If teachers continue to pursue pedagogies based on lecturing at the blackboard and rote learning, reducing class sizes may not improve learner learning.

In addition to class sizes, the MESD should focus on strengthening classroom instruction. This includes supporting teachers to implement pedagogical approaches that specificially identify and address learning deficits. Providing teachers with scripted lesson plans and structured supports as well as targeting curriculum to existing learner competency levels – often referred to as teaching at the right level (TaRL) – have shown promise in improving foundational learning globally.[37] The MESD is already piloting the TaRL approach in primary schools, grouping learners by their level of knowledge instead of assigned grade.[38] Early evidence from TaRL in Botswana is encouraging, although more research is needed as roll-out continues.[39]

36 The global evidence on class sizes and learning outcomes remains mixed and varies based on country, grade level and subject. Broadly, the literature points to small but positive impacts from reducing class sizes (Sandefur, 2022, p. 88).
37 For evidence on best practices related to TaRL implementation, see Banerjee, et al. (2016).
38 In Botswana, the TaRL pilot is delivered in 30-day bursts over a 9-week period, with three assessment points. The baseline assessment is used to form the initial teaching groups for targeted instruction. Learners are then taught foundational numeracy and literacy skills in their learning groups for one hour a day. The MESD intends to scale up TaRL to all primary schools in 2023. For further details, see https://www.youth-impact.org/tarl.
39 Opare-Kumi (2023) demonstrates a positive impact on the mental health of learners participating in TaRL pilots, but the impact on learning is inconclusive. Additional research will be required as the roll-out of the programme continues.

The successful scale-up of targeted pedagogical interventions will require comprehensive support for teachers. Approaches such as TaRL place increased demands on the teaching force, as it relies on frequent formative assessments of learners as well as modifying the pacing and content of the curriculum. Given the increased workload placed on the teachers, pre-service training combined with a comprehensive in-service training and professional development strategy will be critical in institutionalizing improved pedagogical approaches.[40]

Approaches such as TaRL place increased demands on the teaching force, as it relies on frequent formative assessments of learners as well as modifying the pacing and content of the curriculum.

40 For an overview of effective teacher professional development best practices, see Popova, et al. (2022).

Teacher allocation at the secondary level

Given Botswana's aspirations to transition to a knowledge-based economy, strengthening the skills base will require investments across the education life cycle. Building on basic literacy/numeracy at the primary level, secondary education is a juncture where learners acquire more advanced competencies, including the foundation for specialized skills during college and university.

Given that several subject teachers serve each individual stream of learners at secondary, the modified metric for teacher allocation is the stream-teacher ratio (STR). The STR captures the number of learner streams each subject teacher serves in a school and highlights disparities in teacher allocation between subjects as well as the implied workload associated with providing the required subject hours specified in the curriculum framework.

This section explores the patterns in teacher distribution at the secondary level based on 2020 and EMIS 2022 data, and provides insights for improving secondary teacher deployment. At the secondary level, there are three types of schools: junior secondary, which are the majority of schools (207 out of 295 schools), senior secondary (32 schools) and private unified schools (56 schools). As all learners take the same subjects in junior secondary, STR provides a metric comparable to primary. However, at senior secondary, learners construct their own trajectories based on individual preferences, which include a combination of core subjects and electives. As a result, STR metrics between junior and secondary are not directly comparable.

207	37	56
junior secondary schools	senior secondary schools	private unified schools

4.1 The demand for secondary teachers has increased, especially for science teachers

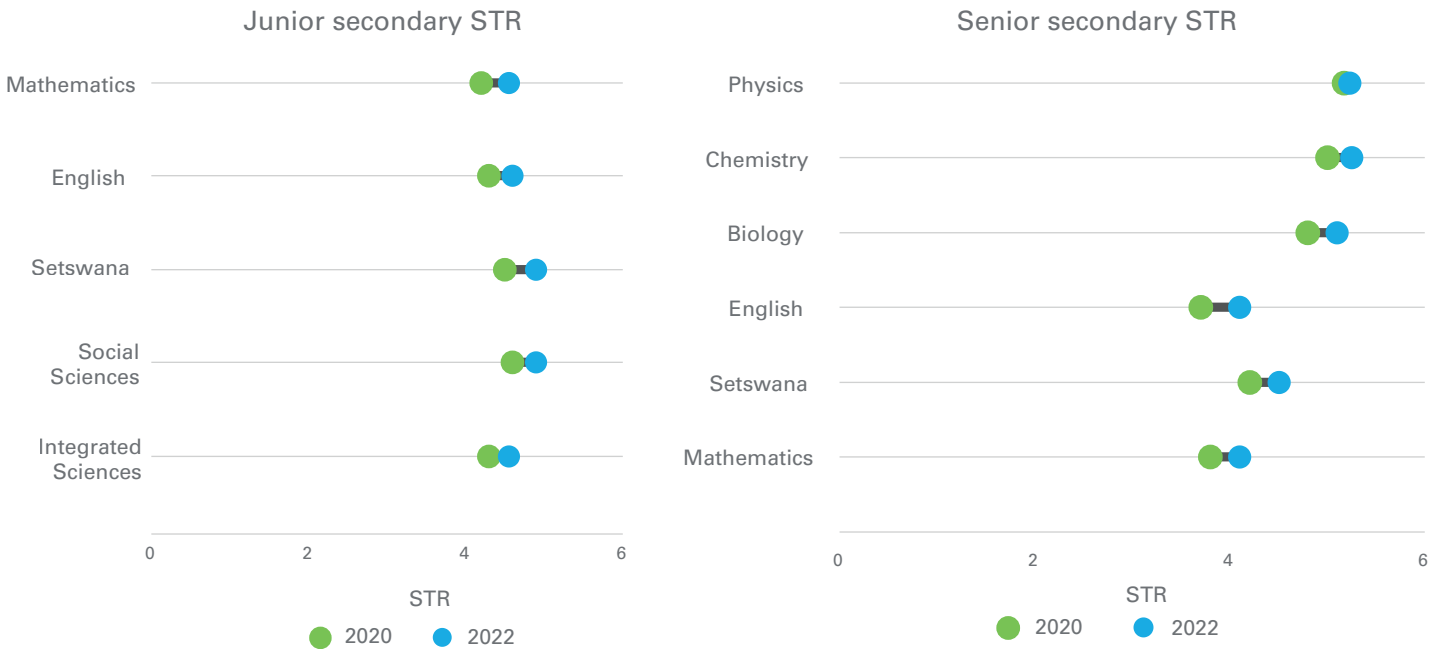
A growing population of primary learners, combined with increasing transition rates, has led to larger enrolments at secondary. This in turn has raised demand for secondary teachers. Between 2020 and 2022, the number of learners taking the PSLE at the end of the primary cycle has increased by 5 per cent (Botswana Examinations Council [BEC], 2022a). Growing transition rates have translated to larger class sizes at junior secondary, with the average STR increasing from 4.4 to 4.7. In senior secondary, the average STR has also increased from 4.5 to 4.7 between 2020 and 2022.[41]

41 The average number of streams increased from 14 streams in 2020 to 16 in 2022 at the junior secondary level and from 44 in 2020 to 48 in 2022 at the senior secondary level.

While average class sizes have increased across the board, teacher workload varies based on level and subject. Differences in STR indicate that teachers in different subject clusters experience different workloads.

- **In junior secondary, the distribution of teachers is relatively balanced across subjects.** Humanities teachers (including Setswana and Social Science teachers) serve five streams on average while English, Mathematics and Integrated Science teachers serve 4.6 streams on average. STR generally slightly increased across all subjects between 2020 and 2022, but similar STR suggests that workload does not vary.

Figure 15: Stream-Teacher Ratio in junior and senior secondary



- **In senior secondary, the discrepancy between subjects is sharper. Science teachers serve about one additional stream of learners compared with humanities subject teachers.** Within the science subjects, Chemistry teachers oversee 5.3 streams per school, followed by Physics (5.2) and Biology (5.1). In contrast, for core subjects such as English and Setswana, teachers serve about four streams per school on average.

As the quality of education gradually improves, a higher share of learners will pass the JCE. The number of JCE candidates has increased 7 per cent between 2020 and 2022, with a small improvement in credit pass rates (Grades C or better) (BEC, 2022b). Increasing transition rates to senior secondary will inevitably raise demand for specialized subject teachers. Stronger coordination between the MESD and teacher colleges/faculties of education will be key to strengthening the pipeline of future teachers, ensuring that subjects with high demand are met with adequate teachers.

4.2 Science, technology, engineering and mathematics teachers are less efficiently distributed than humanities teachers

At the school level, secondary teacher allocation does not always respond to learner needs. The lack of alignment is sharper for STEM teachers relative to humanities teachers.[42] Figure 17 compares the level of randomness (or lack of coherence) between humanities (left) and STEM teachers (right) at the district level, and provides two insights:

1. **Secondary teachers in both STEM and humanities subject clusters experience the lowest coherence in urban areas.** Teachers in densely urban areas (especially Sowatown, Francistown, Orapa and Selibe Phikwe) have the lowest coherence in both subject clusters (illustrated in Figures 17A and 17B in the darkest shade of red).

42 Teachers are clustered by subject domains. The STEM cluster consists of Integrated Science and Mathematics teachers. The humanities cluster is an average of teachers teaching English, Setswana and Social Studies.

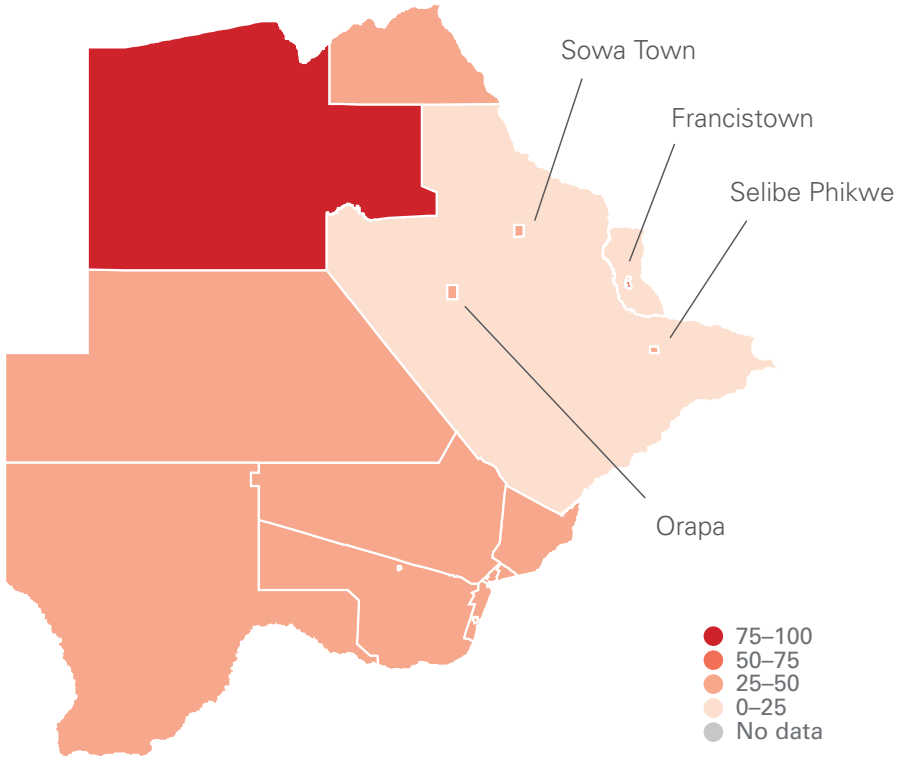
2. **Compared with humanities subject teachers, STEM teacher deployment is less responsive to school needs.** STEM teachers experience higher overall randomness compared with humanities teachers nationally (illustrated by darker reds on Figures 17B).[43] The lack of alignment between STEM teachers and secondary learners is particularly acute in the districts of Ngamiland, Kgatleng and Lobatse, where less than a quarter of the variation in teacher allocation is influenced by learner enrolment at a school. Similarly, in Ghanzi, Chobe and Kgalagadi, more than half the variation in STEM teachers is influenced by factors outside of learner enrolment. Moreover, STEM teachers also experience higher variation within districts relative to humanities teachers. This suggests imbalances in how STEM teachers are deployed across schools inside the same district.

Taken together, STEM teachers are less equitably distributed than humanities teachers, and their distribution is often inconsistent with school needs. This lack of alignment is particularly sharp in dense urban areas and rural districts, suggesting that teacher preferences may play an outsized role in deployment patterns. Reallocating STEM teachers across schools within districts, including using school-level enrolment data, is one path to improving the efficiency of teacher deployment.

43 Coherence for science teachers is 40 per cent, compared with 60 per cent for humanities teachers. This implies that less than half the variation in science teachers is explained by learner enrolment, compared with more than half for humanities teachers. Coherence (and randomness) is estimated at the district level due to low teacher numbers in some subdistricts.

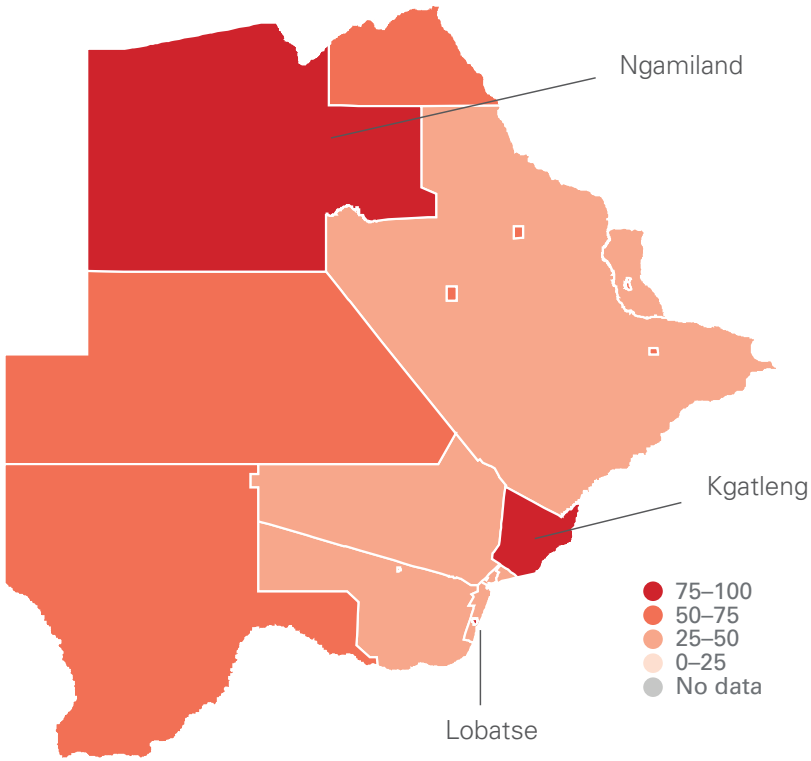
Figures 17A and 17B: Variation in teacher allocation in humanities and science/mathematics

Randomness in humanities teacher allocation



Note: Darker colours indicate greater randomness.
Source: EMIS 2022.

Randomness in science/mathematics teacher allocation



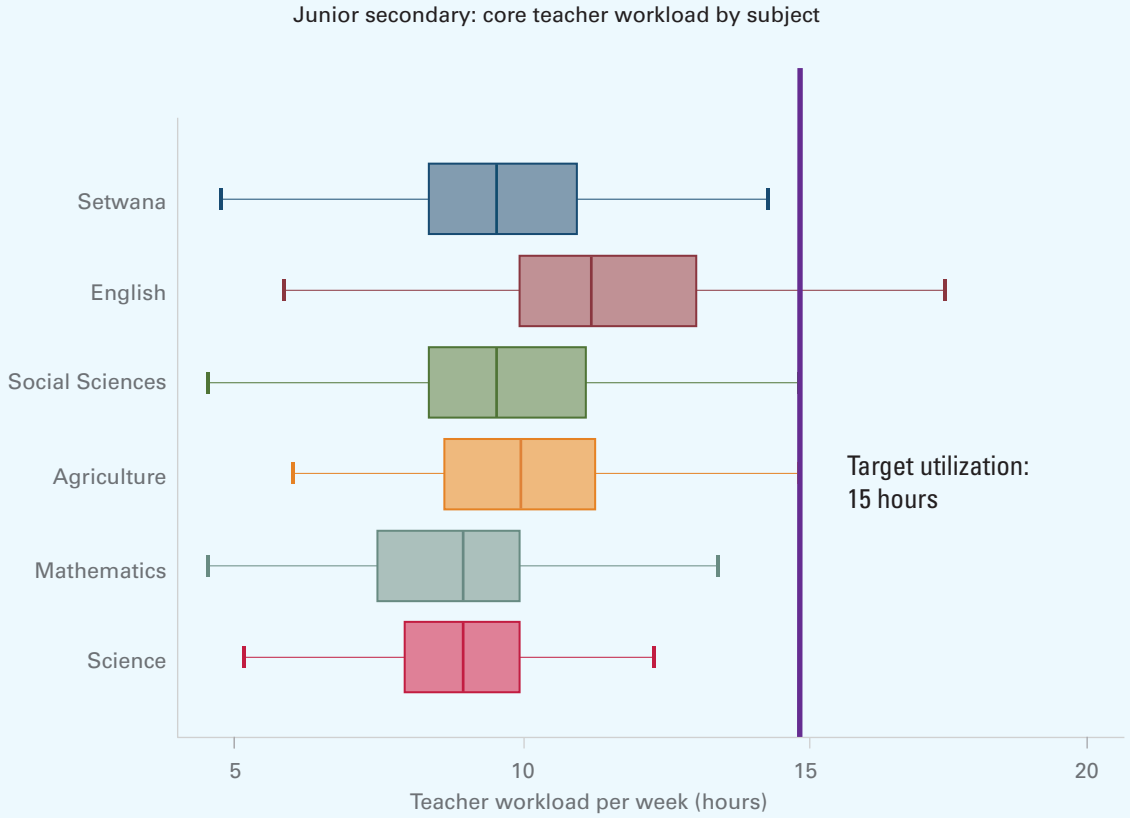
Note: Darker colours indicate greater coherence.
Source: EMIS 2022.

BOX 2: TEACHER WORKLOAD IN JUNIOR SECONDARY SCHOOLS

Variation in STR can be extended to approximate the weekly teacher workload, which captures the number of teaching hours scheduled per week per teacher.

On the advice of the TSM, the DPSM provides guidance on workload norms for teachers. The secondary curriculum framework notes that schoolteachers are expected to teach between 24 to 30 periods a week, translating to a minimum of 12 to 15 hours a week. For instance, in the junior secondary curriculum guidelines, learners are entitled to 5 periods of English or 2.5 hours per week.

Figure 18: Estimated teacher workload for junior secondary



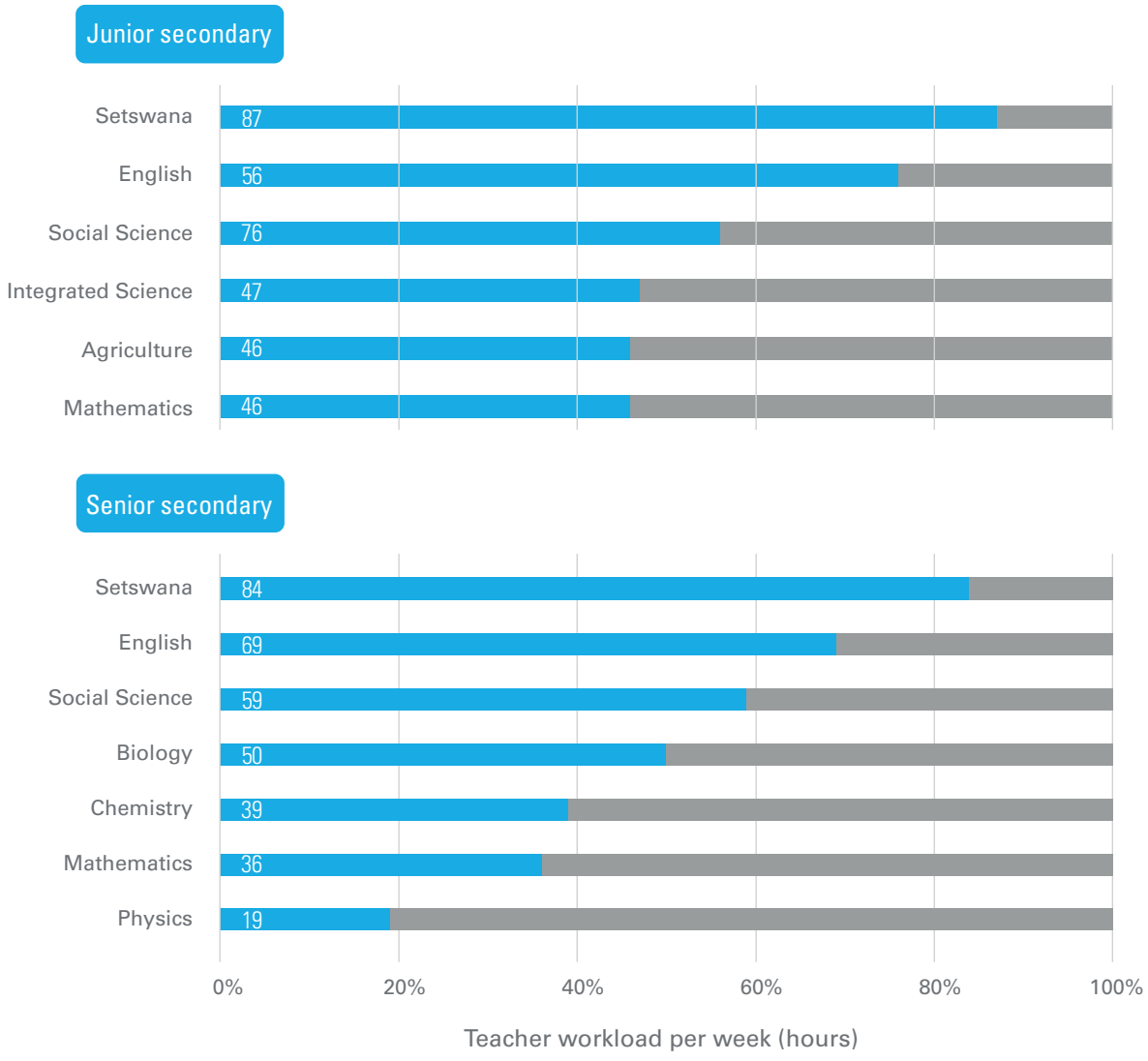
In practice, the average workload for teachers in junior secondary is around 10 hours a week, which is below the DPSM's guidelines. Moreover, large variance across and within subjects suggests that teacher workload differs depending on subject and school (Figure 18).

Along with teacher allocation, teacher utilization is a key metric of efficiency. The aggregate figures based on EMIS data reported here provide insights into high-level trends in utilization. However, aggregate estimates should be interpreted with caution as they do not reflect school-level context or behaviours and practices. Secondary schools often set class schedules and teaching hours to respond to local needs, which are not captured in the EMIS data. The MESD is undertaking a teacher workload audit in 2023 to provide detailed insights on teacher utilization and workloads.

4.3 Female teachers are underrepresented in science, technology, engineering and mathematics subjects

While a majority of teachers at the secondary level are female (57 per cent), they are distributed unevenly across subjects. Figure 19 illustrates the share of female teachers in selected subjects.

Female teachers are concentrated in humanities subjects in both junior and senior secondary. In 2022, the overwhelming number of Setswana (87 per cent and 84 per cent) and English (76 per cent and 69 per cent) teachers were female in junior and senior secondary, respectively (Figure 19). Social Science teachers are also majority female (56 per cent and 59 per cent).



Source: Authors' calculations using EMIS 2022.

In contrast, female teachers represented less than half of science and mathematics teachers. 47 per cent of Integrated Science teachers in junior secondary were female, and this share falls sharply for the individual science subjects in senior secondary.

Physics in particular is the most male-dominated subject, where only 18 per cent of teachers are female. This is followed by Chemistry (34 per cent) and Biology (39 per cent). Moreover, 46 per cent and 36 per cent of Mathematics teachers are female in junior and senior secondary. This share is even smaller for the elective subjects of Additional Mathematics (20 per cent), Statistics (33 per cent) and Design and Technology (14 per cent). For the share of female teachers in all subjects at the secondary level, see Annex IV.

Physics in particular is the most male-dominated subject, where only **18%** of teachers are female.

The distribution of female science teachers is also uneven based on geography. In particular, less than a third of science teachers are female in the Barolong subdistrict in Southern, Kgalagadi South in Kgalagadi and Chobe subdistricts (Figure 20A). The shortage of female teachers is especially acute for Physics, compounding overall teacher shortfalls in the subject (Figure 20B). Notably, fewer than 20 per cent of Physics teachers are female in Lobatse, Ngwaketse West, Southern, Mahalapye, Tutume, Francistown and Serowe/Palapye subdistricts.

The underrepresentation of female teachers in the sciences sustains a cycle of gender inequity. Globally, female teachers experience gender-related obstacles and discrimination at key steps of the teaching profession, from entry to promotion (Dunne, 2007). In Botswana, prior research revealed that female secondary school teachers are frequently overlooked for promotions and female head teachers are frequently undermined by school leaders.[44] The lack of female teachers (particularly in strategic subjects) perpetuates harmful norms through the lack of representation, curricula, social interactions, and the language and vocabulary used in schools (Carvalho and Evans, 2022).

Female teachers have been shown to be associated with a range of positive outcomes for girls and young women. In addition to core education outcomes, female teachers have positive associations

44 For additional background on the role of female leadership in schools, see Bergmann, Conto and Brossard (2022).

with young girls' socioemotional development and education aspirations.[45] In Botswana, while girls are outperforming boys at the primary level,[46] continuing to invest in girl's education (including supporting female teachers) is important for two reasons:

Gender gaps in pay, position and promotions remain persistent in Botswana and beyond.

1. **Young women increasingly outperform their male peers in school, but this advantage often does not carry over to the job market.** Gender gaps in pay, position and promotions remain persistent in Botswana and beyond. Young women may require stronger educational outcomes just to achieve equal labour market outcomes (Carvalho and Evans, 2022).

2. **Furthermore, increasing evidence shows that investment in girls' education yields high positive social externalities.** These include improvements in vaccination rates, child mortality and stunting stemming from increased investments in girls' education, in addition to reducing maternal early marriage, the risk of HIV and maternal mortality (Carvalho and Evans, 2022).

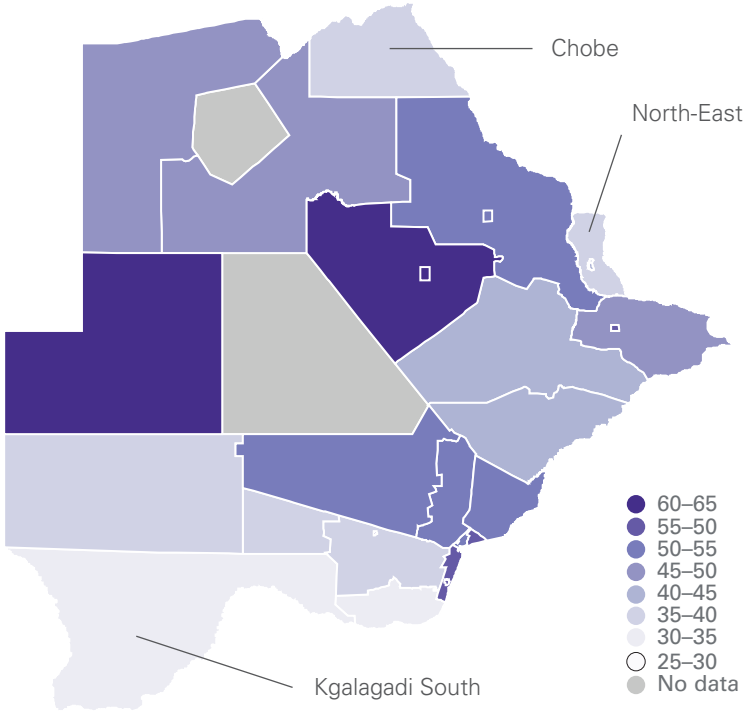
An equitable gender distribution of STEM teachers is also important for encouraging more girls and young women to pursue the sciences. Teachers play an outsized role in influencing the self-perceptions and aspirations of girls and young women. Emerging evidence points to female teachers serving as role models and shaping the goals of adolescent girls, including raising the odds that girls enrol in science and mathematics classes at university and pursue a career in STEM (Dee, 2007; Lim and Meer, 2020).

45 A growing body of literature points to the positive impacts of female teachers on the learning outcomes of female learners. For instance, Lee, Rhee and Rudolf (2019) find a positive effect on mathematics and reading for female learners across 10 West and Central African countries. More recently, Evans and Le Nestour (2022) find that female teachers are at least as effective in delivering learning outcomes for girls as male teachers, in addition to having a positive impact on non-learning outcomes, such as beliefs, aspirations and motivation to stay in school.

46 Girls have been shown to outperform boys in a number of international learning assessments in Botswana. Data from earlier years of EMIS also show that girls demonstrate less grade repetitions. See World Bank (2019, p. 54) for additional details. This finding is reinforced by regression analysis (discussed further in Section 3.8 and Annex I), which shows that all learners perform better under female teachers at the Grade 7 level, accounting for other contextual factors.

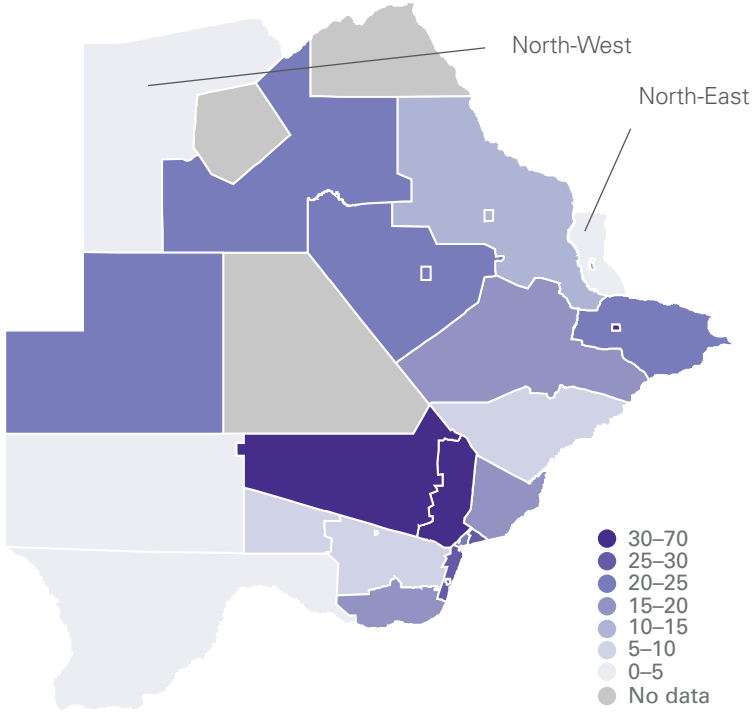
Figures 20A and 20B: Distribution of female Science teachers and female Physics teachers

Percentage of female Science teachers by subdistrict (2022)



Note: Darker colours represent higher proportions.
Data source: EMIS 2020.

Percentage of female Physics teachers by subdistrict (2022)



Note: Darker colours represent higher proportions.
Data source: 2020 EMIS.

Policy recommendations

Key findings

The Government of Botswana seeks to transition the country to a diversified and knowledge-based economy. Strengthening human capital, including improving education quality at all levels, will be key in accelerating Botswana's economic transformation.

While Botswana's primary PTR of 25:1 aligns with globally recognized best practices, the headline PTR figure masks differences across districts, subdistricts and schools. The uneven distribution of teachers contributes to disparities in class sizes and learning conditions.

Moreover, primary teachers are distributed inequitably within schools and lower grades experience larger class sizes on average. Larger class sizes imply that learners in Standard 1 experience more challenging learning conditions. 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 continues to grow as learners progress through the education system.

At the secondary level, science teachers serve more streams of learners relative to humanities teachers. The relative teacher shortfall is especially acute in Chemistry, Physics and Biology – subjects that are strategic priorities for Botswana's economic transformation.

Insufficient human resource planning in the education sector has led to mismatches in teacher demand and supply.

Furthermore, female teachers are underrepresented in the sciences despite comprising the majority of the teaching force. Evidence points to the key role that female teachers play in shaping education outcomes (as well as the broader aspirations of adolescent girls) underscoring the importance of female representation in STEM fields.

Insufficient human resource planning in the education sector has led to mismatches in teacher demand and supply. Teacher allocation is highly centralized, resulting in an oversupply of humanities teachers awaiting deployment while science teachers remain in short supply. Inefficiencies in teacher allocation are compounded by unclear transfer processes by teachers, which is characterized by frequent ad hoc requests or non-compliance with transfer orders.

Policy recommendations

1. Prioritize resources to improve foundational learning

The MESD/TSM can strengthen teacher allocation by utilizing a more localized approach, including:

- **Leveraging school-level data to improve the efficiency of future teacher allocations.** Targeting resources towards subdistricts with higher PTRs or lower coherence in teacher allocation, for instance, will have the highest returns in terms of improving learning conditions. Redeploying teachers within the subdistricts that experience the largest imbalances can also rapidly equalize learning conditions while respecting teacher preferences.

- **Reforming the teacher recruitment process by decentralizing teacher deployment decisions and calibrating incentives to retain teachers in difficult-to-staff schools.** Allowing school leaders to provide input on teacher assignments can improve teacher-school fit and retention as well as mitigate the risk of teacher turnover. Moreover, it is important to incentivize teachers serving in difficult-to-staff schools. Global evidence shows that strengthening and updating incentive structures (including a package of financial and non-financial incentives) combined with better housing support and career progression opportunities can help offset some of the costs of serving in challenging schools.[47]

Given that Botswana already benefits from a low PTR, the MESD should prioritize addressing learning deficits by developing the capacity of the existing teaching force, including:

- **Strengthening teacher capacity through a scalable professional development regime.** At present, teachers receive theory-focused academic training in colleges/universities before being deployed to schools. Providing practical, hands-on and pedagogy-focused pre-service training, supplemented by a comprehensive in-service training strategy that can be feasibly scaled, can provide scaffolded support for the teaching force. Global evidence points to several principles to improve the efficacy of teacher training:[48]

    - Focusing on specific subject-based pedagogical training, such as techniques to teach algebra or scripted plans to improve early-grade reading, are most effective in improving classroom instruction.

    - Shifting away from lectures towards practical lesson enactment can allow teachers to practice in the presence of other teachers and receive formative feedback.

    - Follow-up visits once teachers return to the classroom can support teachers in transitioning the skills training to day-to-day classroom practice.

47 Evidence is strongest for fiscal incentives when it comes to recruiting teachers to disadvantaged schools (Evans and Acosta, 2023).
48 For a detailed overview of effective teacher professional development principles and techniques, see Popova and Evans (2022).

Supporting existing teachers to adopt high-impact classroom practices can mitigate the learning crisis.

- **Scaling up evidence-backed pedagogical strategies in the classroom.** Botswana has a capable and well-qualified teaching force. Supporting existing teachers to adopt high-impact classroom practices can mitigate the learning crisis. For instance, providing remedial instruction or tailoring curriculum to the existing competency level of learners, often referred to as structured pedagogy and TaRL, has shown promise globally. To ensure that these practices are institutionalized, the MESD should ensure that both administrators and front-line teachers are adequately trained and supported as structured pedagogy approaches are scaled up.

Prioritizing teacher deployment in earlier grades can support the MESD in improving learning conditions at a critical juncture of the education cycle. Strengthening efforts to improve foundational learning will require a stronger policy focus within the primary subsector.

- **Developing a clear and transparent policy framework on the assignment of teachers between grades.** Providing school leaders with guidance on deploying teachers within the school, including specific grade-level PTR norms, can signal that this is a policy priority, provide concrete guidance and communicate expectations to head teachers.

- **Incentivizing teachers to serve in early grades.** Given incentives to upgrade credentials to move to secondary school, policies to teach in early grades should be strengthened to improve teacher retention at the primary level. These may include allowing professional advancement within the primary level, additional financial bonuses for serving in early grades or requiring teachers to teach a certain number of years in primary before being eligible to progress to higher grades.

2. Strengthening human resource planning and forecasting

Strengthening human resource planning, forecasting and coordination can help streamline the teacher pipeline. The establishment of the BOTECO in 2020 represented an important step

in establishing a framework and standardizing teacher policy. Building on this momentum, human resource planning can be improved through:

Address barriers for female learners in pursuing STEM pathways in school and future careers.

- **Stronger coordination between the MESD and colleges of education or university faculties of education.** With improving transition rates to secondary, demand for secondary teachers is expected to increase. The TSM will need to improve the forecasting of teacher demand as well as utilize data on existing teacher placement and attrition to target future teacher deployments. This includes working with teacher training institutions to reduce the intake in saturated fields such as humanities while promoting supply in higher-demand science subjects.

- **Clarify, communicate and enforce guidelines on teacher deployment and transfers.** While the MESD/TSM is currently formulating a comprehensive teacher transfer policy, there is a need to better institutionalize and communicate expectations on teacher rotations in the short term, including communicating norms on length of service in rural schools and enforcing compliance with transfer orders.

- **Targeting scholarships and bursaries for college and university programmes.** Raising the eligibility criteria for bursaries for teacher trainings can address the oversupply of teacher candidates. At the same time, increasing incentives and improving pathways for the remaining candidates into STEM specializations can improve the supply of teachers in these fields.

- **Address barriers for female learners in pursuing STEM pathways in school and future careers.** In the short term, policies to improve gender equity may cover providing childcare, establishing quotas for leadership positions for female school heads, enacting laws and policies outlawing discrimination, and enforcing laws against gender-based violence. In the longer term, it is also important to address various facets of gender bias in the classroom. Encouraging more learners to pursue STEM careers will involve fostering more female science teachers and systemic efforts to encourage female learners to move beyond stereotypes.

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Annex I: Regression tables

Regression table I: Number of teachers per school (primary and junior secondary) and differences between Grade 1 and Grade 7, regressed on school, teacher and learner characteristics (full models shown with district-level fixed effects)

	Number of teachers in a school (primary)		PTR difference between Grade 1 and Grade 7		Number of humanities teachers (junior secondary)		Number of science/ mathematics teachers (junior secondary)	
School size								
Learner total	0.029***	(0.000)	-0.001	(0.006)	0.005***	(0.000)	0.006***	(0.001)
School ownership (reference category: government)								
Government-aided	1.956*	(0.676)	4.558*	(1.664)				
Private	1.560**	(0.374)	5.025*	(2.000)				
School location (reference category: rural)								
Dense urban	0.466	(0.291)	-0.190	(1.263)	0.191	(0.208)	0.010	(0.400)
Semi-urban	0.282	(0.192)	-0.864**	(0.234)	0.263	(0.170)	-0.058	(0.327)
Gender characteristics								
Proportion of female teachers	-1.539*	(0.542)	1.518	(2.647)	0.624	(0.998)	0.543	(1.915)
Proportion of female learners	0.032	(2.254)	-4.662	(5.837)	-3.235	(2.816)	-2.203	(5.403)
Female head teacher	0.135	(0.244)	-0.037	(0.359)	-0.072	(0.146)	0.402	(0.280)
Teacher characteristics								
Academic qualification: teachers with a degree and above (proportion)	0.172	(0.827)	-1.320	(2.162)	1.210	(1.708)	0.089	(3.277)
Infrastructure								
Number of classrooms	0.076**	(0.018)	-0.030	(0.057)	0.039*	(0.019)	0.021	(0.037)
Wheelchair access	0.134	(0.161)	0.343	(0.631)	0.026	(0.152)	-0.042	(0.292)
Special education	0.194	(0.226)	-0.009	(0.692)	0.321	(0.361)	0.155	(0.692)
Electricity	-0.247	(0.251)	-0.908	(1.672)	0.520	(2.390)	0.443	(4.586)
Water	0.340	(0.587)	2.696**	(0.751)				
Resource room	0.135	(0.247)	-2.745	(1.644)	-0.076	(0.208)	0.666	(0.400)
Science lab	0.326	(0.367)	2.628	(1.340)	0.049	(0.517)	-0.194	(0.991)

Agriculture lab	-0.280	(0.795)	-0.603	(1.724)	-0.397	(0.249)	-0.575	(0.478)
Computer lab	-0.448	(0.318)	-0.276	(0.884)	0.006	(0.555)	0.244	(1.065)
Library	-0.168	(0.407)	-0.715	(0.774)	-0.106	(0.339)	-0.072	(0.650)
Learner toilet (latrine)	0.077	(0.171)	-0.398	(0.729)	0.149	(0.199)	0.500	(0.381)
Learner toilet (flush)	-0.588**	(0.167)	1.453	(0.937)	0.253	(0.165)	0.367	(0.317)
Teacher toilet	0.221	(0.314)	1.052	(0.675)	0.115	(0.247)	0.325	(0.474)
Teacher total			0.074	(0.144)				
Constant	3.702**	(1.068)	-1.472	(3.797)				
Observations	845		830		207		207	
R-squared	0.936		0.047		0.66		0.39	
Standard errors in parentheses								
*** p<0.05**	**p<-0.01	***p<-0.001						

Regression Table II*: PSLE composite learning score and pass rate** regressed on Grade 7 PTR, along with school, teacher and learner characteristics (full models shown with and without district-level fixed effects; standard errors in parentheses)

	Learner composite score		Learner composite score with fixed effects		Pass rate		Pass rate with fixed effects	
School characteristics								
Grade 7 PTR	-0.052*	(0.025)	-0.050*	(0.023)	-0.215*	(0.092)	-0.219**	(0.084)
School ownership (reference category: government)								
Government-aided	5.691***	(1.650)	5.240**	(1.696)	16.741***	(3.727)	15.042*	(6.240)
Private	10.113***	(2.108)	10.417***	(2.000)	20.788***	(4.370)	21.746**	(7.360)
School location (reference category: rural)								
Dense urban	2.180***	(0.602)	1.039	(0.731)	9.778***	(1.864)	5.202	(2.690)
Semi-urban	0.248	(0.379)	-0.132	(0.438)	2.140	(1.381)	0.761	(1.612)
Gender characteristics								
Female head	0.527	(0.417)	0.332	(0.371)	1.448	(1.568)	0.760	(1.366)
Female learners in Grade 7 (proportion)	-2.082	(5.934)	-2.709	(5.005)	-2.679	(20.657)	-6.217	(18.414)
Female teachers in school (proportion)	4.631**	(1.535)	3.448**	(1.313)	17.520**	(5.516)	13.125**	(4.833)
Teacher characteristics								
Academic qualification: teachers with a degree and above (proportion)	0.930	(1.566)	0.254	(1.427)	6.593	(5.549)	3.535	(5.252)
Special education training (proportion)	3.016	(2.203)	2.163	(2.576)	10.725	(8.400)	5.863	(9.477)
Contract type: permanent (proportion)	1.211	(1.274)	-0.060	(1.182)	2.541	(4.432)	-1.778	(4.349)
Citizenship type: non-citizen (proportion)	1.401	(4.175)	0.504	(3.636)	0.691	(8.217)	-2.551	(13.378)
Infrastructure characteristics								
Number of classrooms	0.041***	(0.012)	0.026	(0.018)	0.130**	(0.047)	0.080	(0.065)

Wheelchair access	-0.187	(0.337)	-0.448	(0.328)	-0.491	(1.224)	-1.519	(1.206)
Special needs access	0.819	(0.657)	1.191	(0.798)	3.351	(2.128)	5.234	(2.937)
Electricity	3.081***	(0.689)	2.531***	(0.608)	10.888***	(2.692)	8.890***	(2.238)
Water	0.234	(1.622)	0.001	(1.569)	5.874	(6.512)	5.876	(5.773)
Hostel	-2.441**	(0.814)	-2.153**	(0.656)	-8.621*	(3.422)	-7.440**	(2.414)
Resource room	-0.495	(0.835)	-0.564	(0.796)	0.295	(2.763)	-0.820	(2.929)
Science lab	0.693	(0.879)	0.904	(0.934)	0.701	(2.832)	0.912	(3.436)
Agriculture lab	3.789*	(1.587)	6.722	(4.318)	4.775	(4.088)	16.309	(15.887)
Computer lab	0.687	(0.812)	0.455	(0.707)	2.834	(2.910)	2.016	(2.601)
Library	-0.046	(0.060)	-0.070	(0.057)	-0.102	(0.215)	-0.137	(0.210)
Constant	30.253***	(3.650)	34.090***	(3.252)	40.773**	(13.455)	54.722***	(11.964)
Observations	701		701		701		701	
Adjusted R-squared	0.307		0.266		0.216		0.145	
Standard errors in parentheses								
p<0.05	p<0.01	p<0.001"						

*Methodological note: Regressions were run with robust standard errors at the school level and fixed effects at the district level, with latest available learning assessment data (2018). The total sample was 701 schools, constructed by merging data from BEC exam centres with MESD EMIS. As there was no common identifying key between BEC exam centres and MESD schools, a 'fuzzy merge' process was used to successfully link 85 per cent of exam centres and schools (701 out of 820 schools).

**The mean composite test score is an average of six subjects assessed in the PSLE. The examination covers Mathematics, Setswana, English, Social Studies, Science, Agriculture, and Religious and Moral Education. The PSLE is designed to assess competencies for candidates who have completed seven years of primary education or its equivalent. The exam is held once a year (Letter and Composition for English and Setswana in August; all other papers in October). In contrast, the credit pass rate at the school level, which is calculated using more liberal criteria, was 71.5 per cent. The credit pass rate defined by the BEC as the share of learners who are awarded grades A to C at the school level, while grades D to E are considered pass grades. U denotes failure to achieve minimum requirements. Credit pass rates were highest in densely urban areas at 85 per cent, followed by 71 per cent in semi-urban and 69 per cent in rural schools (BEC, 2018).

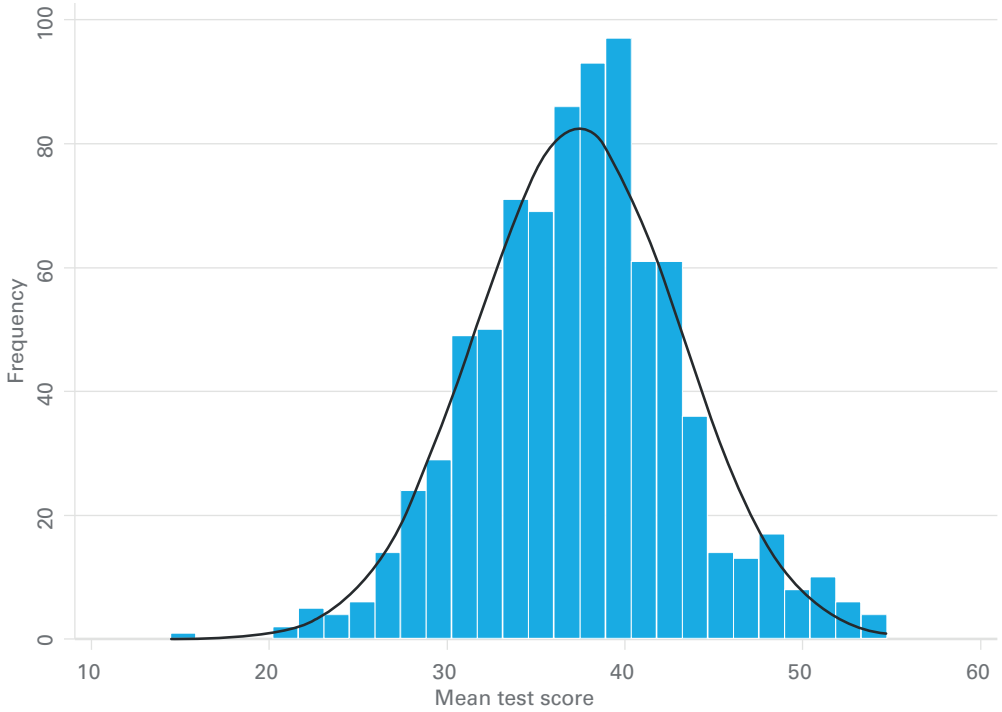
Regression Table III: PSLE subject scores regressed on Grade 7 PTR, school and teacher characteristics (full models shown with district-level fixed effects; standard errors in parentheses)

	English		Mathematics		Science		Setswana		Agriculture		Religious/Moral Education	
School characteristics												
Grade 7 PTR	-0.033	-0.032	-0.058*	-0.023	-0.048*	-0.023	-0.060*	-0.023	-0.083**	-0.026	-0.025	-0.024
School ownership (reference category: government)												
Government-aided	7.137**	-2.392	4.954**	-1.728	5.598**	-1.727	3.524*	-1.699	3.951*	-1.936	5.477**	-1.773
Private	16.631***	-2.821	10.304***	-2.038	11.115***	- 2.037	3.518	-2.007	9.457***	-2.284	11.438***	-2.107
School location (reference category: rural)												
Dense urban	1.901	-1.031	0.851	-0.745	1.135	-0.745	-0.138	-0.732	1.177	-0.835	1.529*	-0.778
Semi-urban	-0.407	-0.618	-0.237	-0.446	-0.209	-0.446	0.543	-0.439	-0.434	-0.5	-0.166	-0.458
Gender characteristics												
Female head	0.184	-0.524	0.361	-0.378	0.532	-0.378	0.258	-0.372	0.6	-0.424	0.105	-0.389
Female learners (proportion)	3.667	-7.058	-7.914	-5.099	-4.989	-5.097	-2.957	-5.04	-5.471	-5.714	1.846	-5.233
Female teachers (proportion)	5.393**	-1.852	1.911	-1.338	2.071	-1.338	2.746*	-1.32	4.551**	-1.5	4.751***	-1.373
Teacher characteristics												
Academic qualification: teachers with a degree and above (proportion)	1.659	-2.013	-0.547	-1.454	-0.174	-1.454	0.735	-1.431	0.046	-1.63	0.045	-1.502

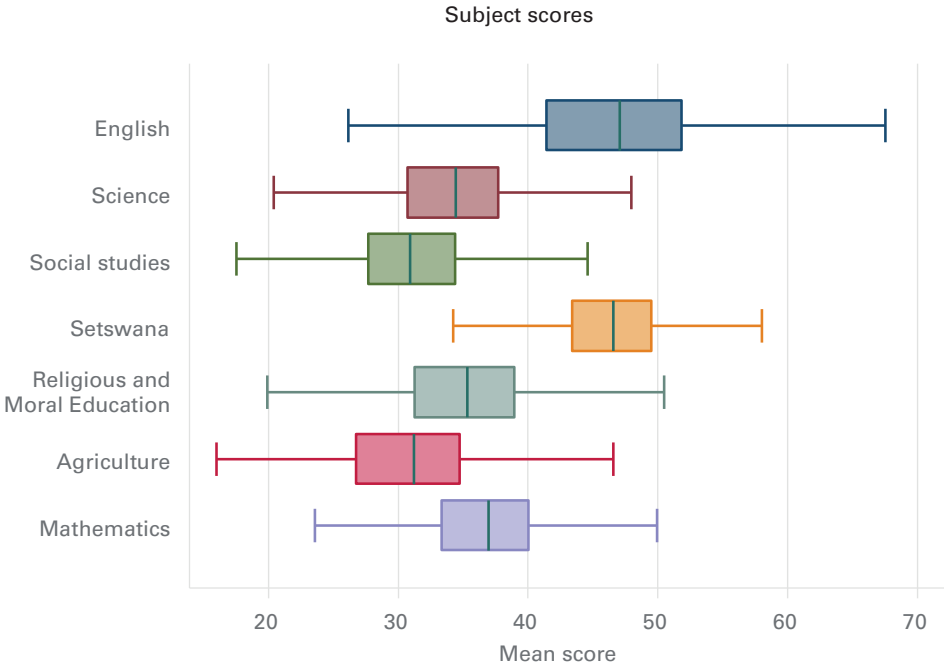
Special education training (proportion)	4.514	-3.632	1.329	-2.624	0.527	-2.623	2.388	-2.582	3.197	-2.941	1.09	-2.692
Contract type: permanent (proportion)	0.928	-1.667	-0.704	-1.204	-0.692	-1.204	0.009	-1.184	0.138	-1.349	0.409	-1.235
Citizenship type: non-citizen (proportion)	-0.077	-5.128	0.33	-3.705	0.936	-3.703	0.454	-3.682	-1.694	-4.151	0.209	-3.901
Infrastructure characteristics												
Number of classrooms	0.046	-0.025	0.032	-0.018	0.024	-0.018	0.012	-0.018	0.03	-0.02	0.025	-0.019
Wheelchair access	-0.717	-0.462	-0.438	-0.334	-0.375	-0.334	-0.391	-0.329	-0.645	-0.374	-0.316	-0.343
Special needs access	1.577	-1.126	0.769	-0.813	0.559	-0.813	1.686*	-0.8	1.551	-0.911	1.215	-0.834
Electricity	4.363***	-0.858	1.736**	-0.62	2.302***	-0.62	1.650**	-0.61	2.475***	-0.695	2.703***	-0.636
Water	-0.089	-2.213	0.067	-1.599	-0.657	-1.598	0.059	-1.572	0.774	-1.791	0.241	-1.64
Hostel	-3.263***	-0.925	-2.210***	-0.668	-2.017**	-0.668	-1.924**	-0.657	-2.233**	-0.749	-1.947**	-0.686
Resource room	-0.64	-1.122	-0.748	-0.811	-0.814	-0.811	-0.415	-0.798	-0.749	-0.909	-0.384	-0.836
Science lab	1.117	-1.317	0.317	-0.951	1.444	-0.951	1.197	-0.936	0.781	-1.066	0.785	-0.981
Agriculture lab	5.348	-6.089	8.351	-4.399	5.395	-4.398	8.27	-4.328	8.938	-4.93	6.022	-4.537
Computer lab	0.742	-0.997	0.579	-0.72	0.363	-0.72	0.162	-0.71	0.445	-0.807	0.484	-0.74
Library	-0.086	-0.081	-0.073	-0.058	-0.053	-0.058	-0.087	-0.057	-0.127	-0.065	-0.041	-0.06
Constant	35.327***	-4.586	38.911***	-3.313	34.553***	-3.312	45.056***	-3.265	28.186***	-3.712	27.245***	-3.4
Observations	701		701		701		699		701		700	
Adjusted R-squared	0.301		0.247		0.285		0.068		0.172		0.27	
Standard errors in parentheses												
*** p<0.05**	** p<0.01	*** p<0.001										

Annex II: Distribution of 2018 PSLE learner test scores

Distribution of composite test score



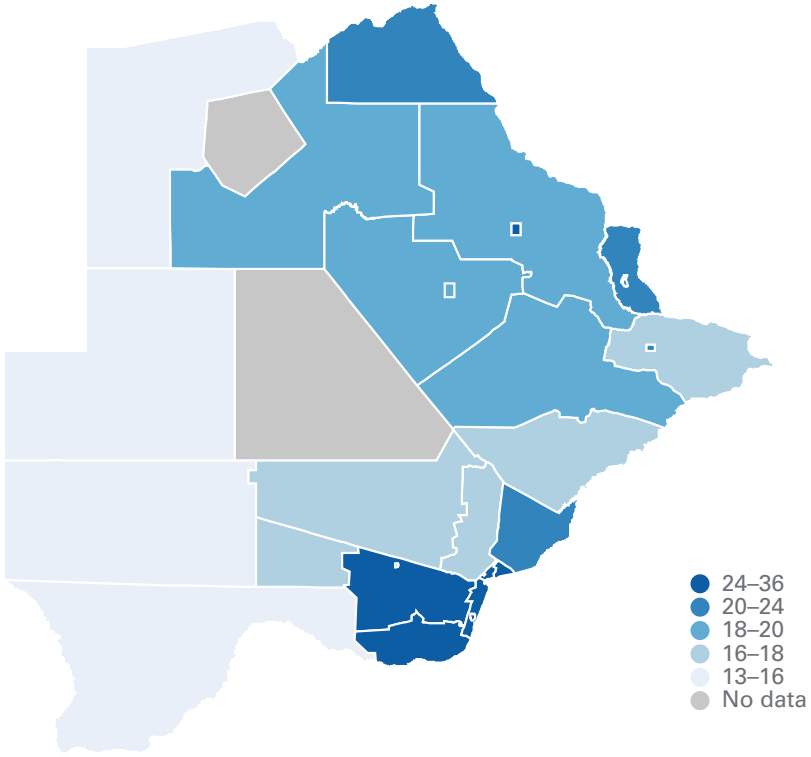
Distribution of subject scores



Source: BEC, 2018.

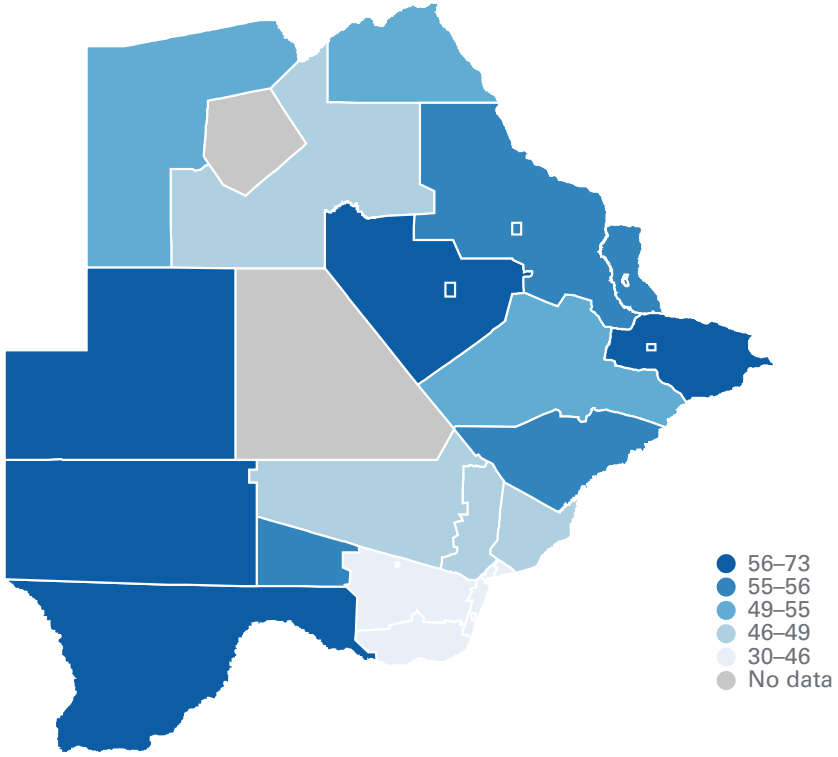
Annex III: Distribution of teacher qualifications

Share of primary teachers with a degree or above (2022)



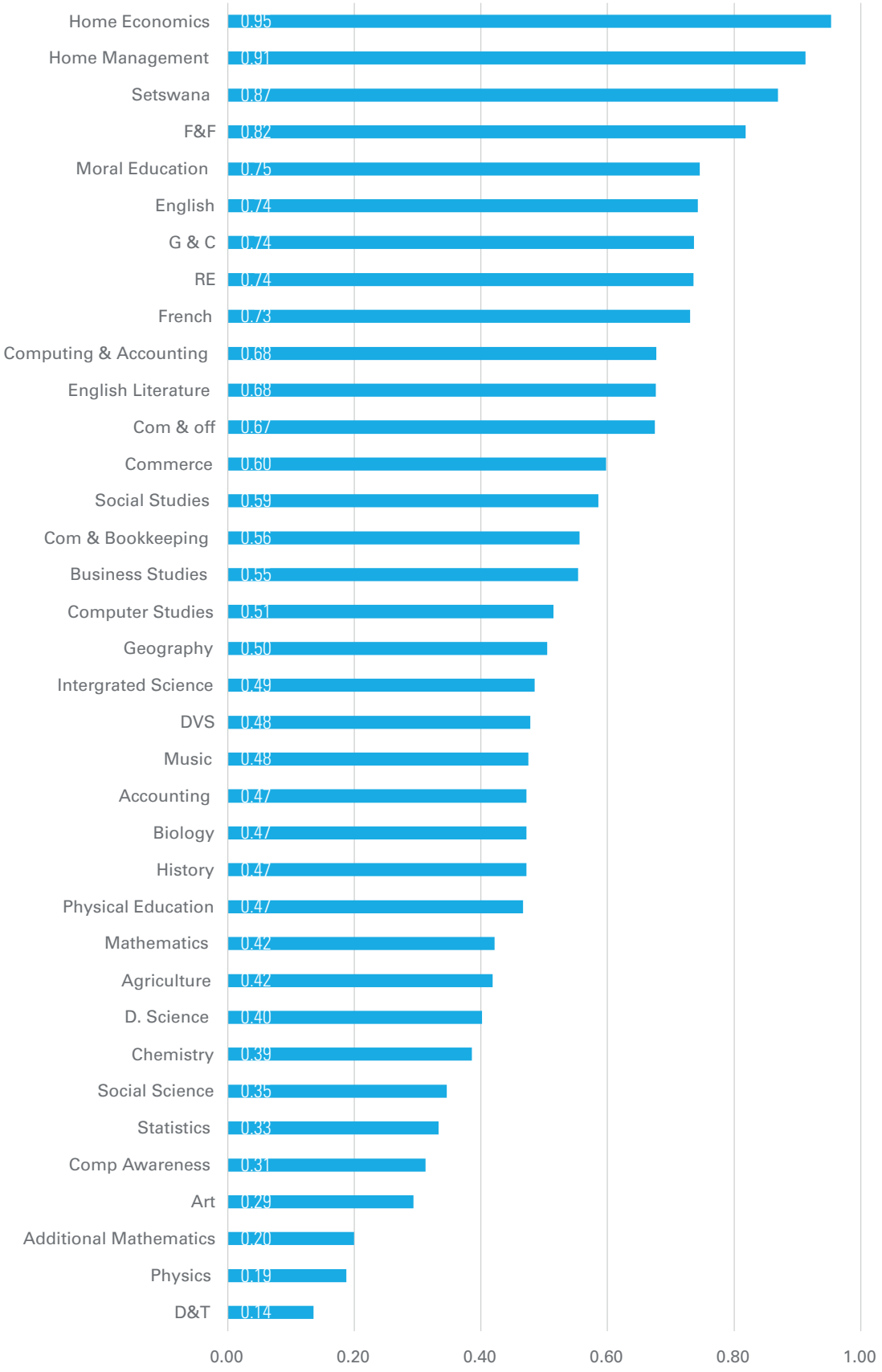
Note: Darker colours represent higher proportions. Data source: EMIS 2022.

Share of secondary teachers with a diploma or below (2022)



Note: Darker colours represent higher proportions. Data source: EMIS 2022.

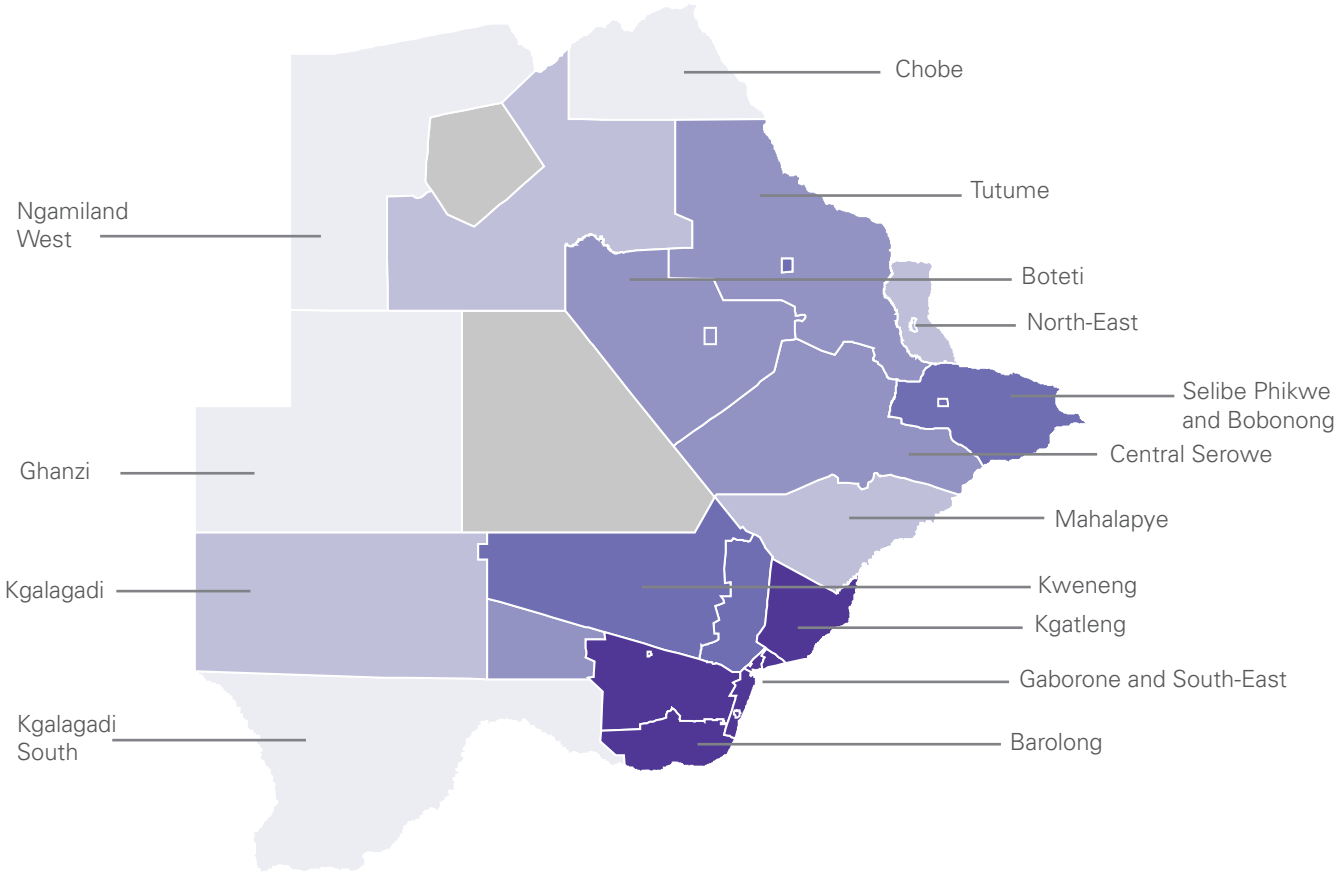
Annex IV: Share of female teachers by subject



Annex V: Change in primary learner and teacher totals (2018–2022)

DISTRICT	LEARNERS		TEACHERS		LEARNERS	TEACHERS
	2018	2022	2018	2022	Percentage change	
Barolong	4,140	3,927	166	175	-5%	5%
Bobonong	15,055	15,332	503	560	2%	11%
Boteti	13,176	14,322	397	500	9%	26%
Chobe	4,109	4,226	137	173	3%	26%
Francistown	15,469	16,204	481	610	5%	27%
Gaborone	32,812	33,637	1,015	1,265	3%	25%
Ghanzi	8,681	9,146	280	345	5%	23%
Jwaneng	2,854	2,850	95	119	0%	25%
Kgalagadi North	3,654	3,661	157	169	0%	8%
Kgalagadi South	6,061	6,129	243	261	1%	7%
Kgatleng	15,422	16,779	531	657	9%	24%
Kweneng	52,185	54,073	1,654	2,013	4%	22%
Lobatse	5,425	5,336	175	214	-2%	22%
Mahalapye	24,643	24,687	791	930	0%	18%
Masunga	12,122	12,291	463	512	1%	11%
Ngamiland East	16,527	18,124	500	657	10%	31%
Ngamiland West	17,848	18,052	607	667	1%	10%
Ngwaketse	31,723	33,787	1,121	1,371	7%	22%
Orapa	1,118	1,441	35	57	29%	63%
Ramotswa	11,710	12,551	376	484	7%	29%
Selibe Phikwe	7,359	7,608	243	278	3%	14%
Serowe/ Palapye	33,185	34,428	1,066	1,260	4%	18%
Sowa	542	528	14	21	-3%	50%
Tutume	29,468	29,962	923	1,077	2%	17%
Total	**365,288**	**379,081**	**11,973**	**14,375**	**4%**	**20%**

Annex VI: Subdistricts of Botswana



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