COVID-19 and inequality in reading outcomes in South Africa: PIRLS 2016 and 2021

COVID-Generation working paper

By Bianca Böhmer and Gabrielle Wills December 2023





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ABSTRACT

Using the South African Grade 4 2016 PIRLS Literacy and 2021 PIRLS datasets, this paper examines the impact of COVID-19 on learning inequality. In the context of a large decrease in the average reading score from 320 in 2016 to 288 in 2021 (a decline of 31 PIRLS points representing 50% to 60% of year of learning), reading inequalities were exacerbated across various dimensions. The gap between top achieving and low achieving students grew, with the percentage of very low achieving students (<200 points) doubling from 13.4% to 26.5%. Disparities between richer and poorer schools increased. In 2021, a student in the wealthiest 10% of schools was 10 times more likely to learn to read with meaning by Grade 4 than a child in the poorest 70% of schools, compared to a fivefold difference in 2016. Boys in the poorest 70% of schools also experienced a more significant reading decline than girls (-53 vs. -44 points). Language group disparities reflect inequalities in socio-economic status, with English and Afrikaans schools showing no difference in achievement between 2016 and 2021, while significant declines were observed in schools tested in one of the nine official African languages. Moreover, mean achievement gaps between schools widened, and within schools, heterogeneity in outcomes increased. An item level analysis validates the aggregate declines in PIRLS in South Africa, with lower scores in 2021 on 94% of items common across 2016 and 2021. An increase in the percentage of students achieving zero for all items on a comprehension passage is also evident in 2021. Additionally, a significant rise in nonattempted items explains some of the decline in achievement in 2021.

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SUMMARY

Education systems have undergone profound changes in the wake of the global COVID-19 pandemic. The impact of the pandemic on learning outcomes has been a subject of considerable concern, with large average global learning losses reported of approximately half a school year (Patrinos et al., 2022). The South African education system also experienced significant disruptions throughout 2020 and 2021 with prolonged school closures, partial openings, and rotational timetabling. After almost two years of the pandemic, previous studies reveal that South African students experienced substantial learning loss in reading ranging from about a half to four-fifths of a year of typical reading development by the end of 2020 (Ardington et al., 2021) and between about 40%- 106% of a year of learning in language and mathematics by the end of 2021 (Van der Berg et al., 2022; Wills & Van der Berg, 2022). Evidence from the Western Cape also suggests widening inequalities in learning across wealthier and poorer schooling contexts during the pandemic (Van der Berg et al. 2022).

Report objective

In this paper, we contribute new evidence on pandemic effects on reading scores and inequalities in reading in South Africa through an in-depth analysis of data from the 2016 and 2021 Progress in International Reading Literacy Study (PIRLS) – a Grade 4 reading comprehension assessment. The release of PIRLS 2021 provides the first nationally representative view of academic achievement in South Africa after school disruptions.

Initial reports comparing PIRLS data reveal a decline in reading achievement at the Grade 4 level in South Africa from 2016 to 2021 (Department of Basic Education, 2023b; Mullis et al., 2023). The percentage of students unable to reach the low international benchmark – a signal of reading for meaning – increased from 78% in 2016 to 81% in 2021. After a period of improvement in reading as seen in rising PIRLS performance from 2006 to 2016 (Van Staden & Gustafsson, 2022), the national reading score average dropped from 320 in 2016 to 288 PIRLS points. This decline represents between 50% to 60% of a year of learning², where a year of learning in South Africa in PIRLS points is about 55-60 points. In standard deviation terms, a 31 point decline translates into 30% of a standard deviation.³

² Previous reports have referred to a 2016 to 2021 learning loss in PIRLS of 80% of a year of learning (see Spaull, 2023), where a year of learning is assumed to be 40 points. However, as Spaull and Pretorius (2019, p153) note "the oft-cited 40-point figure for a year of learning is based on three Nordic countries". In 2006, when a nationally representative sample of Grade 4 and 5 students from the same schools were assessed at the same time on the same assessment, the difference between the Grade 4 and 5 average was 49 PIRLS points (Howie et al. 2008, p.19). More recently, a difference of between 55 and 60 points is observed for Grade 4 and 5 samples tested in South Africa 2016,

³ Relative to South Africa's 2016 PIRLS standard deviation (SD) of 106.5, 31.4 points translates into 30% of a SD. But relative to Jakubowski et al.'s (2023) within-country global average SD of 82.4, a 31.4 point decline is 38% of a SD.

In this paper, we build on the preliminary findings in PIRLS reports. Utilising PIRLS data from 2016 (pre-pandemic) and 2021 (about one and half years after the start of the pandemic) we explore what the implications are of changes to PIRLS samples for learning loss estimates and provide more specificity on inequalities in learning losses across language groups, gender and by school socio-economic status (SES). In addition, we add more nuance on learning loss estimates by examining changes in response patterns at the item level for passages that were asked in both 2016 and 2021.

Large increases in learning inequality

South Africa had an unusually unequal education system prior to COVID-19. These inequalities have been evident along socio-economic, language, and gender lines. For example, children in the wealthiest 10% of schools outperformed students in the poorest 10% of schools by about two standard deviations in 2016 (~200 points).

Unfortunately, the pandemic exacerbated disparities. In line with global trends, the analysis in this study unveils an increase in inequality in reading achievement along various dimensions. These include widened learning inequality to the extremes of the performance distribution and heightened inequality across socio-economic status, language groups, and across boys and girls. Furthermore, we find an increase in inequality between schools and greater heterogeneity within schools in reading achievement.

• The Grade 4 PIRLS reading achievement distribution in South Africa widened from 2016 to 2021.

Compared to 2016, there has been a substantial increase in 2021 in the percentage of the PIRLS sample that are struggling readers. While the percentage of students unable to reach the low international benchmark (400 points) only increased from 78% to 81%, the percentage of students unable to achieve a very low threshold of 200 PIRLS points doubled from 13.4% in 2016 to 26.5% in 2021. This represents a marked rise in Grade 4 students that may need to develop more foundational reading skills such as decoding or oral reading fluency. By contrast, at the other end of the performance distribution, there was a small rise in the percentage of students reaching the high international PIRLS benchmarks from 1.9% (2016) to 3.0% (2021).

• Inequality in reading achievement has increased along the lines of socioeconomic status, language and gender.

While English and Afrikaans students showed no significant score changes from 2016 to 2021, significant reading score declines were observed among students tested in African languages, widening achievement gaps across language groups. This trend strongly correlates with a widening gap based on school SES, leading to larger learning disparities between the rich and the poor. Compared to a child in the poorest 70% of schools, a child in the wealthiest 10% of schools was 5 times as likely to learn to read by the end of Grade 4 in 2016 but 10 times as likely to learn to read in 2021.

Examining gender differences, girls consistently outperformed boys in reading by 52 PIRLS points in 2016, a gap that remained constant from 2016 to 2021. However, when focusing on boys and girls tested in African languages, boys experienced greater learning losses than girls. Similarly, boys in lower SES schools —the lowest-achieving group before the pandemic—experienced the most significant learning losses.

• Inequality in reading achievement has increased between schools.

The gap in achievement between the average performance of the best and worstperforming schools has increased. The proportion of top-achieving schools, with an average score of 400 or above, remained similar between 2016 and 2021. However, for the majority of schools and students, the average score of the schools declined by a substantial amount. The proportion of schools with lower average achievement of about 200 and 250 more than doubled, increasing by about 150%.

• Inequality in reading achievement has increased within schools with wider gaps between the best- and worst-performing students in the same school.

Concerningly, the range of Grade 4 PIRLS scores within schools has widened post-COVID, presenting instructional challenges for teachers. The average Grade 4 teacher in 2021 faces a class with students whose reading abilities span almost four grade levels as the average school achievement differences between a student at the 10th and 90th percentile increased from 199 points in 2016 to 221 points in 2021. This has implications for classroom management and available support for struggling students.

Large learning losses are evident even after accounting for differences in the Grade 4 samples across 2016 and 2021

The sample of Grade 4 students assessed in 2016 and 2021 differed across various dimensions. Some notable differences to the demographic makeup and characteristics of the groups include a decrease in students' average age, a reduction in the proportion of students that are boys, higher levels of reported access to digital devices and the internet, higher absenteeism rates, a higher proportion of students in more urban areas and smaller class sizes in 2021.

Many of these differences can be directly attributed to the pandemic and responses to it, such as more lenient progression requirements which has resulted in a lower retention rate in Grades 3 and 4 in 2020 (leading to a decrease in age and a decrease in the proportion of boys), increased absenteeism rates even for students attending on an alternating or rotational basis, and changes in the timing of the PIRLS assessments. However, even if these differences are taken into account, it does not diminish the magnitude of the learning loss. On the contrary, all indications suggest that these sample differences are contributing to an underreporting of the learning loss in PIRLS.

Large reading losses confirmed through an item level analysis

An item level analysis was undertaken on the seven passages that were included in both the 2016 PIRLS Literacy assessment and the 2021 PIRLS assessment. Four key findings emerged from this analysis:

- The percentage of students who were able to answer the items correctly decreased between 2016 and 2021 for almost every one of the 107 common items. The decreases were large and statistically significant for about three-quarters of the items.
- The percentage of students achieving zero on every item of the assessment passages common across 2016 and 2021 increased by roughly a factor of 2 to 4. This is consistent with a doubling of the percentage of very low-achieving students (scoring below 200 points).
- The non-attempt rate increased sharply, and particularly for multiple-choice items. If a student does not provide any answer to an item and simply leaves it out, this is deemed a 'non-attempted' item. Both the percentage of students that left out items and the average number of non-attempted items increased markedly in 2021 relative to 2016, with 2 to 3 times as many items left out per passage. We find that the non-attempt rate rises for almost every item and is very pronounced for multiple-choice items.
- Compared to 2016, proportionally more students struggled in 2021 to complete (or even start) the assessments. For one of the passages, "How we learned to Fly", almost 3% of the students assigned this text in 2021 did not attempt to answer any item compared to less than 0.5% of students in 2016. The percentage of students who got to the last item in the passage decreased by 18 percentage points (down to 67% in 2021 from 85% in 2016).

All these findings point to the fact that many more Grade 4s in 2021 compared to 2016 are struggling to make meaning of the texts and answer related questions on those passages. Many more students in 2021 are not even attempting items, giving up or taking a very long time to complete assessments. The development of reading skills was clearly impeded by school disruptions. But PIRLS scores may also have deteriorated due to deficits in other skills taught and practised at school, such as concentrating on a single task, writing and familiarity with test-taking (including familiarity with multiple-choice question formats).

Concluding remarks

Despite significant learning losses indicated by PIRLS, it doesn't necessarily imply a uniform setback across the entire education system or a permanent hindrance to progress made up until 2020. The 2021 Grade 4 cohort, heavily impacted by COVID-19 disruptions in their foundational Grade 3 year, may potentially experience some learning recovery.

Recommendations for accelerating learning recovery include curriculum consolidation, extending instructional time, and improving learning efficiencies. Only the Western Cape

has initiated a coordinated recovery plan, emphasising the importance of maximising instructional time, prioritising foundational subjects, and providing additional out-of-school support and weekend classes for students and educators. Nationally, continuing the Presidential Youth Employment Initiative at schools, opens the opportunity to deploy teaching assistants to support this recovery process.

Tracking the 2021 Grade 4 cohort's progress is crucial, with potential larger pandemic effects at the Grade 12 level possibly emerging closer to 2030. However, there is a lack of nationally standardised data for systematic tracking, leaving the extent of recovery and the persistence of learning backlogs uncertain.

This paper underscores a deepening of the learning and reading crisis in South Africa due to COVID-19 disruptions, affecting the majority of students attending less-resourced schools, particularly boys at such schools. Urgent remedial support is essential to help children catch up on lost development over the two years of disruptions. This requires a national effort on a large-scale recovery programme that includes additional instructional time or resources allocated to foundational skills and provides wholistic support to students and teachers.

1 INTRODUCTION

The COVID-19 pandemic has been the largest global shock to education in recent history. School closures impacted 95% of countries, with an average duration of full and partial closures lasting 224 days (UNESCO et al., 2021). Against this context, an expanding body of literature focuses on pandemic learning losses, as countries and institutions monitor the repercussions of school closures and disruptions. A number of meta-studies on learning losses are now available (Betthäuser et al., 2023; Jakubowski et al., 2023; Moscoviz & Evans, 2022; Patrinos et al., 2022). Additionally, the recent release of the 2021 Progress in International Reading Literacy Study (PIRLS), assessing Grade 4 reading comprehension outcomes, marks the first large-scale standardised international evaluation of global learning losses.

Mirroring findings from existing meta-studies, Jakubowski et al. (2023) identify substantial global learning losses using PIRLS. A straightforward comparison of PIRLS points between 2021 and prior assessments suggests an average 15-point decline across countries, equivalent to 18% of a standard deviation (SD). However, when considering variations in testing dates, student ages, and grades across countries, the decline increases to 27 PIRLS points, or 33% of a standard deviation. This equates to a setback exceeding a year of schooling (Jakubowski et al. 2023:2). Confirming conclusions by Patrinos et al. (2022), Jakubowki's PIRLS analysis reveals more substantial learning losses in regions with prolonged school closures, accompanied by an increase in learning inequality among students. Generally, students from lower-income households exhibit greater learning losses both in PIRLS and other studies (Jakubowski et al. 2023; Patrinos et al. 2022). The effects vary among students with higher or lower pre-pandemic learning outcomes, although it appears that students who were struggling prior to the pandemic tended to fare worse (Patrinos et al., 2022).

While understanding global trends in learning losses is crucial, the impacts of COVID-19 on schooling are often specific to each country and its context. It is imperative for countries to gain clarity on the magnitude of learning losses, identify the subjects, grades, or locations most affected, and track learning recovery over time. A careful examination of the data underlying these estimates is also essential when assessing learning losses.

In this study, we focus on the developing country context of South Africa, using PIRLS 2016 and 2021 to examine learning losses and related inequalities in reading comprehension. The South African schooling sector experienced a combination of total shutdowns, partial openings and rotational timetabling or platooning from 18 March 2020 until the end of 2021 (Notice 302 of 2020, 2020; SAnews.gov.za, 2020).⁴ It was only in

⁴ Plans also changed very suddenly, in response to increases in infection rates which contributed to an overall sense of uncertainty. In 2020 the first complete shutdown took place form the 18 March to the 7 June, during which all schools were shut. A small proportion of schools attempted some form of remote learning during this time. A phased return to schools started with the Grade 7 and 12s. The Grade 3s (Grade 4 in 2021) returned on the 6 July as a part of the second group of children returning to school. However, schools shut down again three weeks later on the 27 July, kicking off the winter holidays early due to a spike in cases. School reopened

February 2022 that daily school attendance returned to normal. Opportunities for remote learning, particularly in 2020, were extremely limited. Nationally, just 12% of youth aged 5-24 years were attending institutions that offered remote instruction in 2020 and only 6% reported participating in remote instruction (Statistics South Africa, 2022). Not surprisingly, large learning losses have been experienced in South Africa, observed in declines in early grade reading development at the grades 1-4 level and learning losses in grades 3, 6, and 9 mathematics and language outcomes (Ardington et al. 2021; Van der Berg, 2021; Wills and van der Berg, 2023). However, these studies all relied on non-nationally representative data. Adding to this earlier evidence, this study uses nationally representative PIRLS data to interrogate learning losses in South Africa, building on the preliminary findings in initial PIRLS reports (Department of Basic Education, 2023b; Mullis et al., 2023). We interrogate the implications of changes to PIRLS samples for learning loss estimates and provide more specificity on inequalities in learning losses across language groups, gender and socio-economic status (SES). In addition, we examine changes in response patterns at the item level for passages that were asked in both 2016 and 2021.

Section 2 offers a comprehensive overview of the global landscape of COVID-19 pandemic-related learning losses and repercussions for educational inequality. It delves into the specific impact of the pandemic on the provision of education in South Africa during the years 2020 and 2021. Furthermore, it explores available evidence on learning loss within South Africa, the pandemic's influence on attendance and progression, and the alterations made to curriculum and assessment policies in response to the pandemic. In Section 3, we provide a detailed examination of the data, focusing on South Africa's PIRLS Literacy assessments in 2016 and PIRLS in 2021. This section outlines common passages across both assessments and emphasises variations in student characteristics between the two years. Section 4 outlines key considerations when comparing the two years and elucidates the methodology employed for distributional analyses. Section 5 presents the empirical findings, identifying differences in average reading scores nationally and within demographic sub-groups and schools. This section is followed by a comparison of achievement and response patterns on shared items between the years 2016 and 2021. The paper concludes in Section 6, summarising the key insights. It also advocates for a targeted recovery and support programme to strengthen foundational literacy skills for the cohort of students affected by the pandemic and to reverse the increases in learning disparities.

on the 24 August 2020, with all grades back on the 31 August to a system of alternating days, alternating weeks or platooning.

2 BACKGROUND

2.1 Global evidence of COVID-19 learning loss

In many high-income countries, there was a rapid shift to online instruction as a temporary solution for continued learning at the start of the pandemic. Conversely, low- and middle-income countries (LMICs) faced challenges with remote learning and their school closures were prolonged; for example, Uganda, Bangladesh, the Philippines, Mexico, Iraq and Venezuela experienced complete closures and disruptions for over a year (UNESCO, 2022). Despite attempts in many contexts to address the crisis, through online instruction, radio and television programming, provision of worksheets and self-study materials, phone calls and text messages and afterschool catch-up programmes (Fauvrelle, 2020; Feruzi & Li, 2020; Madhubhashini, 2021; Uwezo Uganda, 2021; Singh et al., 2022; Angrist et al., 2023), the pandemic's impact on learning was extensive. Meta-studies suggest an average loss of about half a year of schooling (Patrinos et al., 2022).

While high-income countries have more evidence of learning losses, robust results have been calculated for some middle-income countries like China, the United Arab Emirates, Mexico, Brazil, Russia, Columbia, and South Africa (Betthäuser et al., 2023; Patrinos et al., 2022). Learning loss estimates in middle-income countries are more varied than those in high-income ones. In LMICs, Patrinos et al. (2022) found higher average learning loss compared to higher-income countries. Out of the 42 countries in the meta-analysis by Betthäuser et al. (2023), the only three middle-income countries included had the three highest learning losses. Moscoviz & Evans (2022), focusing on LMICs, found more mixed evidence, with some reporting high losses while others reported none or slight improvements. Limited evidence exists regarding changes in learning outcomes in low-income countries.

Learning losses are not solely due to reduced teaching time; COVID-19 introduced additional stressors (such as illness, death, loss of income and rising domestic violence), impacting household conditions and children's physical and mental health (Hevia et al., 2022; UNESCO et al., 2021). School closures were also associated with limited access to school feeding schemes. Extended school absence increased the dropout risk in some countries, although this was typically not an issue in South Africa (Department of Basic Education, 2022b).

While education systems may eventually return to pre-pandemic paths, the prolonged disruptions could significantly diminish the educational and employment outcomes of children affected during the 2020–2022 period. Globally, the projected loss to future earnings due to the pandemic is estimated at about \$17 trillion in present value (UNESCO et al., 2021).

2.2 Global evidence of inequality impacts of COVID-19

The pandemic also exacerbated global learning inequality, both between and within countries. Generally, higher-income countries with better initial learning outcomes experienced shorter school closures and fewer disruptions than LMICs. They also had swifter and more effective pandemic responses. The consequence was a widened achievement gap across high-income countries and LMICs (UNESCO et al., 2021). Within nations, the pandemic also disproportionately affected the poorest students, leading to substantial and unequal impacts on human capital accumulation (Patrinos et al., 2022). This pattern is consistent across high-, middle- and low-income countries, although the evidence in LMICs is more varied. Gender-based differences in learning loss, where these were reported, were generally not significant (Lichand & Alberto Doria, 2022; Moscoviz & Evans, 2022). In studies that identified a significant effect by gender the results are varied; some found greater losses for boys (Birkelund & Karlson, 2023) and some for girls (Ardington et al., 2021; Contini et al., 2022).

Even high-income countries, better equipped to respond, witnessed increased achievement gaps at the national level. In the United States, Kuhfeld et al. (2022) observed widened gaps between low- and high-poverty elementary schools, though this trend was less apparent in middle schools. Mathematics suffered more significant losses (20-0.27 standard deviations) than reading (0.09-0.18 standard deviations) when comparing same-grade peers in 2019 and 2021. Italy also experienced a decline of 0.19 standard deviations in Grade 3 mathematics, with girls (-0.29 standard deviations) and higher-performing students (up to -0.51 standard deviations) from lower-educated families facing the greatest losses (Contini et al., 2022).

Growing disparities in learning outcomes are also apparent in middle-income countries. In three Mexican states, Hevia et al. (2022) observed significant declines in reading (0.34–0.45 standard deviations) and even more substantial declines in mathematics (0.62–0.82 standard deviations) by comparing test results from November 2018 to May 2021. Students in the lowest socio-economic status (SES) quartile experienced reading performance declines twice as large as those in the top SES quartile. However, mathematics performance declines were similar across SES quartiles. No systematic gender-based differences in learning losses were identified (Hevia et al., 2022).

In Uganda, an assessment of about 15,000 children in 2018 and 2021 showed that the gap between better readers and non-readers had widened. The percentage of children in grades P3-P7 that understood a P2-level English story rose from 32% in 2018 to 39.5% in 2021. Simultaneously, the percentage of children classified as still being at the "nonreader" level⁵ doubled from 6.2% in 2018 to 11.6% in 2021, reaching 25.1% in the lowest grade, P3. This signals an increase in learning inequality (Uwezo Uganda, 2021). Evidence also shows that food-insecure, low socio-economic status (SES), and pre-pandemic public school-enrolled children in Accra, Ghana, performed 0.2-0.3 standard deviations

⁵ In the assessment the student is first asked to identify 5 letter sounds. They are classified as a non-reader if they are unable to correctly identify at least 4 letter sounds out of the 5 selected letters.

worse than wealthier peers (Wolf et al., 2021). Tentatively, Amin et al. (2021) also found greater learning loss in mathematics and reading among girls from less wealthy families in 24 rural villages in Bangladesh.

2.3 Learning inequality in South Africa prior to COVID-19

South Africa's education system was highly unequal prior to the COVID-19 pandemic. Children at school with a high socio-economic status (SES) substantially outperformed their peers in lower SES schools. For instance, before the pandemic, the disparity in SEACMEQ III reading scores between the wealthiest and poorest 20% of students was 1.7 standard deviations (an average of 605 points compared to 436) (Van Der Berg et al., 2011). Studies between 2007 and 2011, using four standardised assessments, revealed that the learning gap in mathematics between the poorest 60% and the wealthiest 20% equated to about three grade levels by the 3rd grade, expanding to about four grade levels by grade 9 (Spaull & Kotze, 2015). Differences between SES quintile 5 and SES quintile 1 schools in TIMSS 2019 also exceeded a standard deviation (Spaull et al., 2022). Average learning outcomes also differ widely across race (which is closely related to language), parental education, provincial location of schools, whether schools are fee-paying vs non-fee-paying and school quintile – sub-groups, which all tend to be highly correlated with SES (Spaull, 2019; Van der Berg & Gustafsson, 2019).

A substantial portion of learning inequality stems from disparities between schools, with a notable proportion driven by a high proportion of schools that consistently and persistently underperform, offering limited opportunities for even moderate academic achievement. In 47% of schools participating in 2015 TIMSS not a single student reached the TIMSS intermediate international benchmark. This contrasts sharply with Botswana, a neighbour and peer country, where this scenario occurred in less than 10% of schools (Van der Berg & Gustafsson, 2019).⁶

Gender is another major differentiating factor in South Africa. Girls outperform boys in almost all subjects across all grades, and the differences are larger in primary school and larger for language and literacy subjects than for mathematics and science subjects (Spaull & Makaluza, 2019; Zuze & Reddy, 2014). This is consistent with what is observed globally, particularly in high- and middle-income countries, where girls almost universally outperform boys in literacy assessments.⁷

Gender differences also show up in repetition patterns in South Africa; boys of any age are much more likely to repeat a year and drop out (Department of Basic Education, 2023a).⁸

⁶ However, there appears to be a slight convergence between schools over the period 2011 to 2019 (Gustafsson & Taylor, 2022). Gustafsson & Taylor (2022) demonstrate a decline in the inter-class correlation from 0.49 to 0.33 from 2011 to 2016 for the PIRLS data set and from 0.51 to 0.48 from 2015 to 2019 in the TIMSS datasets.

⁷ In the most recent PISA assessment, in 2018, girls outperformed boys in reading in every single participating country, generally by a large and significant margin (OECD, 2019).

⁸ These higher retention rates among boys are also reflected in higher drop-out rates, with boys more likely to drop-out and less likely to successfully complete their schooling at every level. Van Broekhuizen & Spaull

Hofmeyr (2022) notes that much of the pro-girl advantage in PIRLS is tied to girls progressing more rapidly through the early grades. Girls also report more positive attitudes towards reading, contributing to their reading achievement gaps.⁹ However, this pattern doesn't extend to mathematics, where differences in attitude are not as pronounced.

2.4 COVID-19, learning losses and schooling in South Africa

High peaks in the rates of COVID-19 infections in South Africa necessitated a strict national pandemic response, which also had a major impact on the schooling system. In 2020, it is estimated that about 54% of contact time was lost simply due to changes to the school calendar. In addition, absenteeism rates remained high throughout the two years, adding to lost face-to-face teaching time. With higher absenteeism rates, average attendance in 2020 was closer to 41% of pre-pandemic contact time (Department of Basic Education, 2022b). In 2021, complete shut-downs due to COVID-19 were fewer¹⁰ but rotational timetabling¹¹ continued in most schools for the full length of the year. Only schools that had sufficient, large enough classrooms or were small enough to meet the distancing requirements were able to accommodate all their students on a daily basis. On rotational timetabling days where attendance was possible in Term 3 of 2021, the average attendance rate was 78%, whilst this was only 45% in the worst third of schools (Department of Basic Education 2022). These constraints would have advantaged wealthier schools as well as smaller, potentially rural schools.¹²

Early on in the pandemic in 2020, there were concerns that the shut-down could lead to large-scale drop-outs from the schooling system in South Africa (Shepherd & Mohohlwane, 2021). These fears of drop-out proved to be unfounded (Department of

⁽²⁰¹⁷⁾ show that by the end of secondary school, 17% more girls than boys reach matric and 27% more girls obtain bachelors passes, which qualifies them to enrol at university.

⁹ The pro-girl achievement gap may be attributed to learning styles and available resources that are better suited for or more effectively utilized by girls (Hofmeyr, 2022; Zuze & Reddy, 2014). Additionally, it is challenging to untangle whether grade progression, confidence, and interest in the subject result from academic success or enable higher academic achievement.

¹⁰ Although the start to the year was delayed by 2 weeks due to the second wave on COVID-19 cases and the winter holidays started 10 days earlier than planned due to the third wave (Kubheka, 2021).

¹¹ Rotational timetabling was not consistently applied across schools, as an attempt had been made in late July to get all primary school students to return to school on a daily basis (Department of Basic Education, 2021b).

¹²Independent schools were given the option of returning on a different schedule to public schools.

Basic Education, 2022b)¹³ even though the pandemic substantially affected attendance patterns.¹⁴

2.4.1 Learning losses

Due to the ongoing impacts of COVID-19 on schools, it was anticipated that there would be significant setbacks in the learning process, leading to a widening gap in educational attainment. A study conducted by Van der Berg et al. (2022) in the Western Cape revealed substantial declines in academic performance among grade 3, 6, and 9 students in 2021 compared to their counterparts in 2019. Specifically, these students exhibited a lag of 40-70% of a school year in language and 90-106% in mathematics.

Furthermore, the study indicated an exacerbation of educational inequalities, with students in quintile 5 schools experiencing comparatively smaller learning losses than their peers in other quintiles. Notably, students in the lowest income quintiles experienced the worst of these adverse effects on learning, exacerbating pre-existing disparities. The analysis also identified heightened learning losses in Grade 6 for schools transitioning from isiXhosa to English as the Language of Learning and Teaching (LOLT), suggesting that the challenges of language transition were compounded by the impact of COVID-19.

Examining reading losses after the first year of the pandemic, Ardington et al. (2021) find that Grades 2s and 4s in non-fee-paying school samples in the Eastern Cape, KwaZulu-Natal and Mpumalanga were between 57% and 70% of a year behind in home language reading and between 62% and 81% of a year behind in English reading. At the Grade 4 level in no-fee schools, those with the highest initial reading proficiency experienced the largest reading performance declines resulting in a convergence in outcomes (Ardington et al., 2021). The Grade 2 results were more mixed but suggested some divergence. Wills & Van der Berg (2022) report that after two years of COVID-19 disruptions (end of 2021), the home language reading development of Grade 4's in no-fee schools in the North West was 54%–118% of a year of learning behind that of 2018 Grade 4 cohorts.

The release of the 2021 PIRLS results quantifies, at a national level, the effect that the pandemic had on reading comprehension. Mean reading achievement declined from 320 points in 2016 to 288 points in 2021, lowering the percentage of children reaching the low international benchmark from 22% to 19% (Department of Basic Education, 2023b; Mullis et al., 2023). In this paper, we interrogate this data further, adding to existing analysis and providing new insights into how inequalities in learning were exacerbated.

¹³ A small proportion of parents delayed entry into Grade R and 1 (~27,000), and there were a very small number of additional drop-outs at primary level (~19,000) (Department of Basic Education, 2022b). Conversely, the enrolment at secondary levels substantially increased, in large part due to more lenient progression requirements, but potentially aided by the worsening economic circumstance leading to fewer economic alternatives outside of school and school feeding schemes which attract students to schools.

¹⁴ As a part of the Early Grade Reading Study in 215 no-fee schools in the North West, the main reasons that students gave for absenteeism in 2021 were sickness (44%), followed by fear of getting COVID-19 (28%) (Bisgard et al., 2022).

2.4.2 South African response to learning losses and lost contact teaching time

Large reductions in teaching time in 2020 and 2021 necessitated revisions to the curriculum policy (in particular, the Annual Teaching Plans or ATPs) to reduce the scope of curriculum content and to introduce more flexibility in the pacing of the curriculum as outlined in The Curriculum Assessment Policy Statements (CAPS) and ATPs.¹⁵

As schools reopened in June 2020, content was 'trimmed' and teachers were tasked with covering 'fundamental skills and content' - the minimum required skills and content that would be needed for that grade. Decisions around content order, time spent and scope of work were left up to schools, and leeway was provided to include other content. For 2021, the recovery annual teaching plans (RATPs) were released in December 2020 to support curriculum recovery over a three-year period (Department of Basic Education, 2020b).¹⁶

In 2020 and 2021, assessment requirements were also reduced or altered along various dimensions including: reducing the number of assessments for some subjects; altering the types of assessments (e.g. from a test to a project), reducing the scope of the content covered, adjusting the standards for the assessment and moderation; and giving more weight to school-based assessments (Department of Basic Education, 2020a).¹⁷ Promotion requirements were also reduced and greater leeway was provided (up to 5%) for mark adjustment. Notably, the requirement to pass mathematics in the Intermediate Phase was dropped, provided all other pass requirements had been met, although this was first implemented in 2021 (Department of Basic Education, 2021a, 2022a).

Hoadley (2023) concludes that "the focus was on retaining the curriculum whilst allowing for flexibility in coverage through weakened controls over moderation, assessment and promotion requirements, ceding most curriculum and assessment decisions to the school and classroom levels. Given a very unequal system, this meant that curriculum coverage and learning losses mapped onto and deepened pre-COVID-19 patterns of educational disadvantage."

Reductions in the progression requirements and changes to curriculum and assessments led to an increase in progression across all grades, particularly at the secondary level (see Figure 1). At the Grade 4 level specifically, repetition rates declined by about 3 percentage points between 2018 and 2020 (Department of Basic Education, 2022b). Gender differences in repetition rates that existed before the pandemic persisted into 2020, albeit

¹⁵ The Curriculum Assessment Policy Statements (CAPS) with a pace setter in the form of the Annual Teaching Plans (ATPs) were the primary curriculum document prior to the pandemic. CAPS outlines the framework behind the curriculum; details the scope and depth of topics; and provides guidelines around time allocation and assessment practices. The ATPs were a daily planner for each team intended to be used for pace-setting, indicating the topic to be taught and the timing of assessments. Both were provided centrally.

¹⁶ The content of the RATPs was much closer to the scope of the original CAPS document, though some reordering had taken place. These provided more guidance both in terms of content scope and time allocations to certain topics than the 'fundamentals' in 2020. Compared to a pre-pandemic scenario, schools were also given more scope to adapt the curriculum to their needs with the RATPs.

¹⁷ The weighting of school-based assessments in the Foundation Phase (Grade 3) remained at 100% and in Grade 4 changed from 80% in 2019 to 75% in 2020.

rates being lower for both girls and boys at the end of 2020. In 2018, 10-year-old boys were twice as likely to repeat as 10-year-old girls and were still almost twice as likely to repeat as girls in 2020 (Department of Basic Education, 2022b). The changes in repetition rates have implications for interpreting shifts in Grade 4 PIRLS results between 2016 and 2021.



Figure 1: Grade specific learner repetition rates in 2018, 2019 and 2020

Source: Figure 12 on p. 15 of the Department of Basic Education Data Report titled "Grade promotion, repetition and dropping out 2018 to 2021" released in 2023

Apart from adjustments to curriculum and assessment, little else has been done to mitigate learning losses in South Africa. A state-wide remediation programme, with allotted budgets, was not prioritised timeously as a response to COVID-19 learning losses. It was only after three years, just before the release of PIRLS (2021) results in 2023, that a national Learning Recovery Program (LRP) was introduced. But this programme lacked specificity and real promise for change (Hoadley, 2023). By exception, one of nine provinces, the Western Cape, adjusted their Foundation Phase (Grades 1-3) instructional time to give more emphasis to core subjects (specifically mathematics and language) from mid-2022 (Western Cape Ministry of Education, 2023) and rolled out a three-year #BackOnTrack programme in May 2023. This programme has been allocated R1.2 billion and targets grades 4 to 12, providing online and in-person support programmes (Western Cape Education Department, 2023).

3 DATA

The Progress in International Reading Literacy Study (PIRLS) evaluates fourth-grade students' reading achievement internationally. Assessments were conducted in 50 countries in 2016 and in 57 countries in 2021 (Mullis et al., 2017, 2023). South Africa participated in PIRLS in 2006, 2011, 2016, and 2021. This paper primarily focuses on the differences between the 2016 results, four years before the COVID-19 pandemic, and the 2021 assessments conducted after about 1.5 years of pandemic-related disruptions.

3.1 Sample size

In South Africa, PIRLS data is collected on a nationally representative sample of students, stratified by language of instruction in the Foundation Phase (Grades 1-3). The sample is representative across all 11 official languages. Table 1 shows the sample size of schools and students by test language in each year.

	# of schools		# of stu	ıdents
Test language	2016	2021	2016	2021
English	43	41	2 089	1 479
Afrikaans	38	22	1 228	679
isiNdebele	7	15	277	711
isiXhosa	34	29	1 301	1026
isiZulu	44	48	1732	1857
Sepedi	17	36	898	1603
Sesotho	20	27	1148	966
Setswana	30	28	1 275	1048
siSwati	21	26	970	1 121
Tshivenda	22	25	939	914
Xitsonga	17	24	953	1 018
Total	293	321	12 810	12 422

Table 1: Number of schools and students that wrote the PIRLS assessments in 2016 & 2021

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets.

3.2 Sample changes from 2016 to 2021

Due to COVID-19 disruptions, there were some adjustments to the data collection timelines for the PIRLS 2021 assessments. In some countries, data collection took place at the end of 2021, a year later than originally scheduled. In 2016, data collection in South Africa took place from October to December. This period was extended from August to December in 2021. Some of the 2021 Grade 4 cohort would have written up to 2 months earlier in the school year, experiencing 1-2 months less instructional time than the Grade 4 2016 cohort. This very slightly reduced the average age of the sample by about one month.

In addition to changes in when the test was administered, when comparing PIRLS results across 2016 and 2021 attention must be paid to variations in (a) the testing population, (b) the mode of test administration and (c) the length and content of the tests themselves (Kuhfeld et al., 2022). While the length and content of the PIRLS tests may have remained consistent over the two years, the underlying population of Grade 4's and those selected on the test day altered during the pandemic. Additionally, there were some alterations to how tests were administered, including assessment timing.

The 2016 and 2021 student samples are compared in Table 2. Significant differences between the two years are seen in almost all characteristics. Many of these differences appear to be directly linked to the pandemic. The Grade 4's in 2021 were about 0.4 of a year (~5 months) younger than the 2016 cohort. Three factors contributed to this decline: some of the 2021 sample were tested up to two months earlier; Grade 4 retention was lower in 2020, reducing the number of overage students in the grade in 2021; and there was an increase in absenteeism, which appears to have been more prevalent among overage students. The proportion of girls in the sample increased, possibly due to higher absenteeism among boys or gender differentials in repetition rate reductions. The 2021 sample appears to contain a slightly higher proportion of urban schools and children in 2021 are more likely to state that they always or often speak at home the language of the test.

Measures of home wealth seemingly increased between 2016 and 2021.¹⁸ For some of these measures, an increase from 2016 would have been expected even in the absence of a pandemic. For example, the expansion of digital connectivity over time is expected, whilst the presence of daily print newspapers will likely decrease as print media moves online. However, the trajectory of this change for some measures may have altered due to the pandemic. Specifically, the need for an internet connection, a home computer, a desk and books would have increased during lockdown as remote work and remote learning became the norm. Such items may have been procured by households, but could also have been supplied by workplaces to assist with remote work, an unlikely prepandemic scenario.

We also find that if a pooled school SES measure is calculated (method described in Section 4.2.1), the average is higher in 2021 (0.114 compared to 0.095). This index uses parent employment and education as well as one type of household asset, books, as inputs. These means should not shift as quickly as digital assets, making this potentially a more stable metric. Thus, this increase may indicate that the sample selected in 2021 may have been slightly wealthier, or that it may be picking up an actual increase, for example, in the average amount of schooling completed by parents. If this is broken down by language groups (see Table A 4 in the Appendix), the sample of Afrikaans schools has a pooled SES score in 2021 that is an entire standard deviation higher relative to 2016. This suggests that the Afrikaans schools that were selected to be in the 2021 sample were

¹⁸ Student-reported wealth metrics are also notoriously noisy and differ systematically by gender with boys reporting higher asset levels than girls within the same schools (Hofmeyr, 2022).

much wealthier than those selected in 2016. The inverse took place for the sample of Siswati and Sepedi schools, where the 2021 sample has a lower mean SES score (by more than a third of a standard deviation) relative to the 2016 sample of schools.

Variable	2016	2021	Difference
Age	10.645	10.250	-0.396 ***
Female	0.480	0.494	0.014 **
Urban – Size (population over 100K)	0.184	0.196	0.012 **
Urban – Location (urban, suburban, city or large town)	0.411	0.491	0.080 ***
School SES (pooled across 2016 and 2021)	0.073	0.113	0.039 ***
Class absenteeism	0.036	0.130	0.094 ***
Speak test language often	0.754	0.784	0.030 ***
Not hungry	0.658	0.618	-0.040 ***
More than 25 books at home	0.184	0.220	0.036 ***
Have home computer	0.498	0.612	0.114 ***
Have a desk to study	0.594	0.634	0.040 ***
Have own room	0.586	0.575	-0.011 *
Have an internet connection	0.329	0.442	0.113 ***
Daily newspaper at home	0.477	0.415	-0.063 ***
Have a school library	0.391	0.405	0.014 **
School has enough instructional	0.491	0.481	-0.010
School has enough supplies	0.533	0.481	-0.051 ***
School has enough buildings	0.509	0.538	0.030 ***
School has enough heating and light	0.513	0.585	0.072 ***
School has enough instructional material	0.472	0.463	-0.008
School has enough technologically competent staff	0.541	0.454	-0.087 ***
School has enough reading instructional materials	0.533	0.532	-0.001

Table 2: Mean sample characteristics in 2016 and 2021

Source: South Africa Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets, student weighted. Notes: ***p<0.01, ** p<0.05, * p<0.1. The Urban – Location variable include densely populated urban areas, suburban areas (in the fringes or outskirts of urban areas) as well as medium size cities and large towns, whilst non-urban locations include small towns or villages and remote rural areas.

3.3 Common items

The PIRLS assessments use a matrix-sampling booklet design, so each booklet number has a specific combination of the available assessment passages. One passage would appear in multiple booklets, which allows for comparison and estimation of expected results for passages that were not in the student's booklet. To account for its matrixsampling booklet design, the PIRLS datasets contain five plausible values of the reading scores for each student.

There were seven reading passages and related items that were administered in both the Grade 4 2016 PIRLS literacy and 2021 PIRLS assessments in South Africa. As the exact same items were asked in both years, we can compare differences in performance at the

item level. A list of the passages asked in both 2016 and 2021, along with the text difficulty level and type, is provided in Table 3.

Difficulty Level	Reading Purpose	Title of passage
Medium	Literary Texts	Pemba Sherpa
	Informational Texts	Sharks
		How Did We Learn to Fly?
Easy	Literary Texts	The Summer My Father Was Ten
-		Library Mouse
	Informational Texts	Training a Deaf Polar Bear
		Hungry Plant

Table 3: Passages included in both the Grade 4 2016 PIRLS Literacy and 2021 PIRLS assessments

4 METHODOLOGY

Pre-COVID, South Africa's performance in PIRLS since 2006 had been improving. This is evident after adjusting for inconsistencies in the 2011 results related to aligning pre-PIRLS to the PIRLS scale (Gustafsson, 2020). SEACMEQ and TIMSS results have also demonstrated improvements in educational outcomes, although slowing progress was evident from about 2011. For instance, the Grade 5 TIMMS results were not significantly different across 2015 and 2019 (Spaull, 2019; Spaull et al., 2022).¹⁹ There were various changes in the education landscape to expect a slowdown in progress such as worsening class sizes, education budget cuts and stagnant economic conditions (Spaull et al., 2022). Given past improvements in reading and the pre-COVID tapering off in progress, we can expect that in the absence of COVID-19 average reading achievement would have been similar to that observed in 2016 or even increased slightly.

On this assumption, we use the PIRLS data for 2016 and 2021 Grade 4 cohorts to compare reading achievement levels. In a natural experiment, the COVID-19 year is viewed as the treatment, exposing students to less teaching time (about half the normal instructional time, but with smaller class sizes). It is important to account for several variables, including student and school characteristics, that have not remained constant between the two years. The pandemic affected schools, home life and the economic environment. Sample alterations, especially where these can be attributed to the pandemic, need to be considered in both descriptive and econometric analyses.

¹⁹ One hypothesis for the slowdown in achievement relates to rising learner-educator ratios and class sizes since 2011.

4.1 Descriptive approach

A large part of this report relies on descriptive analysis of reading scores, and item analysis. Five plausible values of reading scores are used to calculate mean reading achievement and related standard errors for the 2016 and 2021 samples and for various sub-groups. We also identify the proportion of students reaching the International Reading Benchmarks.

In the PIRLS matrix-sampling booklet design, students are randomly allocated booklets. The students who write each passage is a random sub-set of the larger sample. Although no bias is expected at the level of passage allocation, we would expect more variation in the outcomes for each individual item and the total for all items on one passage. To investigate what changes occurred at the item and passage level between the two years, we examine three metrics: mean scores on items, the proportion of students getting zero on the item and the number of non-attempts. A non-attempt occurs where the student leaves out the item, without attempting or guessing an answer. These metrics are analysed for each item, the total score on the assessed passage and for sub-totals of the multiple-choice items and the constructed response items.

4.2 Approach to evaluating learning inequality

To compare the distribution of learning outcomes in 2016 (pre-COVID) to 2021 (post-COVID) changes within and between sub-groups are compared in both years. Three main sub-groups are identified including socio-economic status (SES), language and gender. We outline below how we have defined the SES status of the school.

We also examine changes to the distribution of scores across years, deriving various metrics – some of which are used in the income inequality literature. Measures calculated include ranges; P_X to P_Y ratios; and standard deviations (SD) (Ferreira & Gignoux, 2011; Rodriguez-Segura et al., 2021). The distributions of various sub-groups are also visualised using a transposed cumulative distribution function. Finally, we also examine changes in the percentages of students scoring at or above the high international reading benchmark as well as below the low international benchmark and a self-defined "very low" threshold as explained below.

4.2.1 Defining the socio-economic status (SES) of the school

The school socio-economic status (SES) is calculated by finding the average home SES of the students at each school. Four variables, taken from the parent questionnaire, were used to determine the home SES: the number of books in the home; the number of children's books in the home; the highest level of education and occupation of either parent. The index is loosely based on a derived home socio-economic status variable included for the first time in the 2021 PIRLS dataset. These same four variables were used to calculate this home socio-economic status variable (Mullis et al., 2023).

To create the SES index, dummy variables were generated for having 26 or more books or children's books in the household. Similarly, the highest level of education and occupation variables were assigned values of 0 to 2 on an ordinal scale. The cut-offs were based on the thresholds described in Appendix Table A1, which were used to create the home SES variable in the 2021 PIRLS dataset (Mullis et al., 2023).

Unfortunately, the number of parents that filled in all four questions in the questionnaire was low: 4 012 (31%) in 2016 and 3 453 (28%) in 2021. Response rates for each question also differed. For example, the first two questions on number of books in the home were much more frequently answered than the questions on education and occupation (see Table 4).

Question	2016	2021
Number of books at home	8 714	9 666
	68%	78%
Number of children's books at home	8 652	9 627
	68%	77%
Parent's level of education	5 799	5 194
	45%	42%
Parent's occupation	5 002	5 069
	39%	41%
Responded to all four questions	4 012	3 453
	31%	28%
Total number of parents	12 810	12 422
	100%	100%

Table 4: Number of parents that responded to SES related questions in 2016 and 2021

Source: South Africa Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets

Given the low response rate of parents, we calculate the average value of each of the variables within a school so as not to lose data points. For example, if eight parents responded to "number of books at home" but only four of those parents also answered "level of education", we use all eight available responses to calculate the average number of books at home and the four responses to proxy for the average level of parent education for that school. These school-level averages are then used to calculate an overall school SES score using principal component analysis. School SES is only calculated for schools where at least three parents answered all four questions. This is a conservative approach to minimise potential sample biases arising from missing data, as explained in Section 8.1 in the Appendix. This leaves 40 schools and 1 464 students in 2016 and 36 schools and 1 029 students in 2021 for whom we do not calculate an SES score. This is equivalent to about 12,4% of the pooled sample (see appendix Table A2). We refer to this school-level variable of average home SES status within that school as the "school SES" index.

4.2.2 High and low thresholds

The PIRLS achievement scale is linked to a set of standardised international reading benchmarks. Each benchmark corresponds to a set of skills that students should be able to display if they reach this benchmark. For example, a student reaching the low benchmark should be able to "locate, retrieve, and reproduce explicitly stated information, actions, or ideas" and "make simple, straightforward inferences about characters' actions or to provide a reason for an outcome".





Source: PIRLS 2021 International Results in Reading: Performance at International Benchmarks at https://pirls2021.org/results/international-benchmarks#benchmark-area

To contrast learning differences at the top end and bottom end of the performance distribution, we examine what proportion of students perform at or above the High International benchmark (550) and at or below 200 points in 2016 and 2021. The "very low benchmark" of 200 points is not an official benchmark (i.e. it has not undergone scale anchoring analysis) but is chosen as a convenient threshold to understand what changes occurred at the bottom end of the distribution. Too few students - almost four-fifths – fail to meet the low international benchmark, so this is not suitable for analysing changes for the majority of the distribution.

In the 2021 PIRLS report, some of the South African results are presented with reservations. The reason provided was that for more than 25% of the South African sample, scores were deemed to be too low to enable the estimation of an aggregate reading score²⁰. The percentage of students achieving below 200 points is 26.5% in 2021. Therefore, it is probable that students for whom the estimated reading score was 200 or below would have fallen into this category where it is not technically feasible to get a reliable aggregate score using item response theory (IRT).

²⁰ For example, in Exhibit 4.1 in *Section 4: Performance at International Benchmarks* states that for South Africa there are "Reservations about reliability because the percentage of students with achievement too low for estimation exceeds 25%" (Mullis et al., 2023).

5 RESULTS

The effects of the pandemic on reading achievement internationally are evident globally. The majority of countries experienced a decline in their average PIRLS score between 2016 and 2021. Whilst the IEA has warned against using the 2021 PIRLS scores for cross-country comparisons, it is worth noting that South Africa, as one of the only middle-income participants, already had a very low score relative to the average among other PIRLS country participants in 2016 (Mullis et al., 2023). South Africa also experienced a large decrease in PIRLS achievement from 2016 to 2021 of about 31 points. As discussed in Box 1, this decline represents about 50% to 60% of a year of learning (not 80% of a year of learning which has been quoted elsewhere (see Spaull, 2023)). Relative to South Africa's 2016 PIRLS standard deviation (SD) of 106.5, 31.4 points translates into 30% of a SD.²¹ This represents a significant decline in reading ability among the 2021 Grade 4 cohort compared to Grade 4s in 2016. Furthermore, in 2016, only 22% of Grade 4 students in South Africa were able to reach the low international benchmark of 400 points; this further decreased to only 19% of students in 2021 (see Figure 3).

Figure 3: Changes in the average PIRLS results for the whole of South Africa between 2016 and 2021



Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets, own calculations using plausible values for the overall reading score. Mean is student weighted. 95% Confidence intervals are shown from standard errors calculated using jackknifing performed at up to 250 sample schools with 125 zones using the repest command.

This decline was not equal across the distribution. Larger losses were experienced by the weakest readers, with students at the 25th percentile scoring about 50 points less in 2021 relative to 2016 (see Figure 4). Lower achievement in 2021 is observed for students up to about the 85th percentile. From about the 90th percentile upwards, students in 2021 performed slightly better than students in 2016, although this difference is not statistically significant. With no change or an increase in performance at the top and a large decrease

²¹ But relative to Jakubowski et al.'s (2023) within-country global average SD of 82.4, a 31 point decline is 38% of a SD.

in student performance at the bottom of the distribution, achievement gaps widened between 2016 and 2021. Socio-economic status is the major determining factor that influences where a student falls on the national distribution and the average learning loss experienced by the student as a result of COVID-19 (see Figure A1 in the Appendix for a breakdown of the distributions by School SES deciles).

Box 1: A year of learning in PIRLS

Previous studies have referred to a year of learning in PIRLS as being about 40 points (Spaull, 2023). However, as Spaull and Pretorius (2019, p153) note "the oft-cited 40-point figure for a year of learning is based on three Nordic countries". In 2006, when a nationally representative sample of South African Grade 4 and 5 students from the same schools were assessed at the same time on the same assessment, the difference between the Grade 4 and 5 average was 49 PIRLS points (Howie et al. 2008, p.19).

More recently, we find that a year of learning in South Africa is about 55 to 60 PIRLS points, reflecting the difference in average PIRLS points across Grade 4 and Grade 5 cohorts assessed in 2016. The sample of Grade 5 students in 2016 was drawn from only three language groups: Afrikaans, English and isiZulu. The difference in means between Zulu Grade 4 and 5s is 55 points, whilst the difference in means between the Grade 4 and 5 English, Afrikaans and Zulu groups together is 62 points. It is assumed that the language groups that were not tested are potentially closer to the isiZulu than English and Afrikaans groups, and as such, a year of learning is estimated to be approximately 55 to 60 PIRLS points in Grade 4 in South Africa prior to the pandemic.

If a year of learning in South Africa was in the range of 55 to 60 PIRLS points, the 31-point decline represents about 50% to 60% of a year of learning. This is slightly lower than earlier estimates, which concluded that the 31 point decline from 2016 to 2021 represented about 80% of a year of learning (Spaull, 2023).



Figure 4: Mean PIRLS reading score distribution at key percentiles in 2016 and 2021

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets, own calculations using plausible values for the overall reading score. Percentiles are student weighted.

5.1 Proportion of high and very low achievers

Examining averages alone masks changes in learning at the extremities of a distribution. We consider how the proportion of high achievers who scored 550 and above and very low achievers who scored below 200 changed from 2016 to 2021.

Whilst the number of students that scored below the low benchmark (400) increased by about 3 percentage points from 78.0% in 2016 to 80.6% in 2021, the share of students that scored below 200 points roughly doubled from 13.4% to 26.5%, as seen in Figure 5. Thus, the share of students who are struggling with foundational reading and writing skills requiring remedial support has increased substantially. By contrast, there has been a small, statistically insignificant increase of about 1 percentage point in the share of students achieving at high and advanced levels. This is indicative of widening student achievement gaps in South Africa.



Figure 5: PIRLS reading achievement benchmarks reached in 2016 and 2021

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. The "Very low" threshold is set at 200 points.

5.2 Average shifts within sub-groups: SES, language and gender

Large pre-pandemic reading achievement gaps existed in South Africa along SES, language and gender lines. For instance, the average score of students who wrote in English was about a full standard deviation (about 100 points) higher than the average for students tested in Sepedi in 2016 (see Figure 6). Children in the wealthiest 10% of schools scored almost two standard deviations higher (200 points more) than students in the poorest 10% of schools in 2016 (see Figure 7). Even if we considered children in the poorest

70% of schools, they scored one and a half to two standard deviations (~150 – 200 points) lower than those in the wealthiest school decile.

The pandemic has exacerbated these inequalities. Among English and Afrikaans students, there were no significant changes in scores from 2016 to 2021 – in fact, their performance may have slightly improved in 2021. However, the observed 18-point (still insignificant) increase in the Afrikaans group must be considered in light of sampling variations. The Afrikaans schools selected for the 2021 assessments exhibit a significantly higher socio-economic status than the group tested in 2016 (see Table A4 in the appendix).

In contrast, reading score declines were large and significant for students tested in an African language (one of the nine official languages in South Africa belonging to the Southern Bantu language group: isiNdebele, isiXhosa, isiZulu, Sepedi, Sesotho, Setswana, Siswati, Tshivenda and Xitsonga). Achievement gaps widened across language groups, which is linked strongly to a widening by school SES, leading to larger learning disparities between the rich and the poor. Figure 8 contrasts the decline in the percentage of children who are able to read (reaching the low international benchmark) in the poorest 8 school deciles against the rise in the percentage of children reading in the wealthiest 20% of schools. Compared to a child in the poorest 70% of schools, a child in the wealthiest 10% of schools was 5 times as likely to learn to read by the end of Grade 4 in 2016 but 10 times as likely to learn to read in 2021.





Source: South Africa Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets, own calculations using plausible values for the overall reading score. Means are student weighted. 95% Confidence intervals shown, from standard errors calculated using jackknifing at up to 250 sample schools with 125 zones, used repest command.

Figure 7: Mean Grade 4 PIRLS scores in 2016 and 2021 in deciles of the mean SES of the school



Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets, own calculations using plausible values for the overall reading score. Means are student weighted. 95% Confidence intervals shown, from standard errors calculated using jackknifing performed at up to 250 sample schools with 125 zones, using the repest command.



Figure 8: Proportion of students that reached the low international benchmark in 2016 and 2021 by SES of the school

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets, own calculations using plausible values for the overall reading score. Means are student weighted. 95% confidence intervals shown for 2016 only, from standard errors calculated using jackknifing performed at up to 250 sample schools with 125 zones, using the repest command. Excludes schools at which fewer than three parents responded to the four relevant questions on the home environment questionnaire.



Figure 9: Mean Grade 4 PIRLS scores by gender in 2016 and 2021

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets, own calculations using plausible values for the overall reading score. Means are student weighted. 95% Confidence intervals shown, from standard errors calculated using jackknifing performed at up to 250 sample schools with 125 zones, using the repest command.

The gender differences in reading performance were also stark in 2016, with girls scoring 52 points higher on average than boys. This gender gap has remained constant from 2016 to 2021, so there was no significant increase in gender inequality in learning across the entire population, as seen in Figure 9. However, if comparing only boys and girls tested in the nine African languages, boys experienced greater learning losses than girls by about 10 points (see Table 5). Similarly, boys in the bottom 80% of schools by socio-economic status saw their scores decrease by about 9 points more than the girls. Thus, the group that was underachieving in reading prior to the pandemic – boys in lower SES schools – also experienced the largest learning losses.

		Girls		Boys			
	2016	2021	Difference	2016	2021	Difference	
Language							
English & Afrikaans	397	404	7	346	363	17	
9 African Languages	322	277	-44	271	217	-54	
School SES deciles							
9 and 10	432	450	18	389	419	30	
1 to 8	328	289	-38	276	229	-47	

Table 5: Mean reading scores of boys and girls in 2016 and 2021 by language groups and school SES decile

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets, own calculations using plausible values for the overall reading score. Means are student weighted. The 9 African Languages are the nine official languages in South Africa belonging to the Southern Bantu language group: isiNdebele, isiXhosa, isiZulu, Sepedi, Sesotho, Setswana, Siswati, Tshivenda and Xitsonga

5.3 Between school changes

Significant differences in learning outcomes among schools are undesirable as they have the potential to reinforce larger social inequalities within community and family environments. The average PIRLS score at a school level declined substantially. This is most evident for schools with an average score below 400 points. For these schools, as seen in the distribution of Figure 10, the pandemic worsened outcomes at the school level, reflected in a sizable shift in the 2021 distribution to the left of the 2016 distribution. Specifically, there was a large decline in the percentage of students in schools averaging about 300 or 350 by two-thirds from 2016 to 2021, and the percentage of students in schools with lower average scores of 200 and 250 increased by about 150%. However, the percentage of students in schools averaging 450 points and above remained unchanged, while the percentage of students in schools averaging schools were able to maintain or even increased (almost doubling). Whilst top-performing schools were able to maintain or even improve reading levels despite the pandemic, lower-performing schools suffered large losses, increasing the inequality in reading outcomes between schools.





Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets, own calculations using plausible values for the overall reading score. A mean score was calculated for each school and then rounded to the nearest 50.

The increase in inequality between schools in non-pandemic times may reflect widening social inequalities; in this case, it also reflects differences in schools' capacities to adapt to pandemic demands. In some schools, typically those with higher average scores of 450 or more, parents or guardians may have been better positioned to act as a substitute for a teacher or to facilitate learning during school disruptions. Higher access to human, digital and physical resources (or even remote learning) may have moderated pandemic effects in higher-performing- and wealthier schools and households.

Regrettably, for the majority of students, the efficacy of their home environment and the support schools were able to provide remotely proved less effective than the standard practices employed and resources available at schools under a normal schedule. Consequently, reduced access to learning opportunities, along with the inability to access the additional support and services that schools provide, including school nutrition, resulted in large learning losses.

5.4 Within school changes

While societal equity considerations make between-school inequality undesirable, the presence of heterogeneity in learning outcomes within individual schools or classrooms also carries practical implications for teaching. A more heterogeneous class presents challenges for teachers in tailoring their lessons effectively, as they must accommodate struggling students while simultaneously covering the mandated curriculum and engaging students with higher proficiency. The surge in grade progression linked to COVID-19 alone may have contributed to greater heterogeneity in student performance within classrooms.





Source: Own calculations using the South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets

Pre-COVID, the range of Grade 4 PIRLS scores within schools was large. The average difference in scores between a child at the 10th percentile and a child at the 90th percentile in 2016 was about 200 PIRLS points (see Figure 11), which is equivalent to about three and a half years of learning (see Box 1 below). Expressed differently, on average, in a grade of

100 students, the child with the tenth highest score was achieving about three and a half grade levels above the child with the tenth lowest score.

In 2021, this gap widened to an average of about three years and ten months within a school. As a result, the average Grade 4 teacher in 2021 is teaching a class with students ranging across about 4 grade levels. This has implications for instructional practice and the type of support that can be offered to struggling students and may make classroom management more difficult.

5.5 Item level findings

Evidence of learning losses and widening inequality that has been observed at the national level using reading score estimates is further confirmed by evaluating changes in the performance on common passages. Figure 12 shows the mean percentage scores (student-weighted) obtained on common items in 2016 and 2021. The figure shows 107 common items from the seven common passages²². A clear trend is evident, where students' achievement declined or stayed roughly similar across almost all common items in 2016 and 2021. This decrease was significant for 73% of the items at the 5% level and for 67% of them at the 1% level.

Table 6 summarises the average achievement within each passage. Averages are shown for the overall marks on the items for that passage, as well as the multiple-choice items only and the constructed response items only. In all passages, there was a decline in achievement from 2016 to 2021. The decrease tends to be greater for constructed response items compared to multiple-choice items. This is expected as students may guess the correct answer on the multiple-choice items. The exceptions are Pemba Sherpa and Sharks, where in 2016, the constructed response results were already very low and much lower than the multiple-choice results.²³

²² There are 108 items in total, however, the information for item number 03 in the "Sharks" passage is missing for all students in 2021, thus it was excluded.

²³ For the Pemba Sherpa passage, this meant the multiple-choice results had greater leeway to decline than the constructed response. Sharks was already very badly answered in 2016. There would have been scope for a greater decline in the constructed response but this did not take place, potentially because the only students that answered these correctly in both years were higher achievers and their performance was less affected by COVID-19.



Figure 12: Comparison of PIRLS achievement on common items asked in 2016 and 2021

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. All items that were asked in both 2016 and 2021 in the passages: "How did we learn to fly?", "Sharks", "Pemba Sherpa", "The Summer My Father Turned 10", "Training a Deaf Polar Bear", "Library Mouse" and "Hungry Plant" are included. Each item is represented by one point in the scatter graph. The percentage score is calculated by dividing the mark achieved by the student by the maximum mark for that item. All averages are student-weighted. The results for the third item (MC) in the Sharks passage are missing for all students in the 2021 data. This item is, therefore, not included in the figure.

The difference between the average number of items that were not attempted is striking (shown in Table 6). In each common passage assessed across 2016 and 2021, the average number of comprehension items not attempted increased about 2- to 3-fold. So, for every item that a child left out and did not attempt to answer about the passage in 2016, a child in 2021 was leaving out between two and three items. There are several possible explanations for this increase in non-attempted items. Children in 2021 were more likely to be struggling with foundational reading skills such as decoding or oral reading fluency and may be getting stuck reading the passage and items that follow, unable to understand or answer (Wills et al., 2022). Second, with less time spent in the classroom, students were slower and less practised at timeously completing tasks, concentrating and time management. A combination of reduced reading speed and accuracy, reduced writing speed, and less capacity to concentrate for longer periods would compromise test-taking capacity. Therefore, it is expected that we would see more students only attempting to answer the first few items of a passage. A third possible reason is that students are simply less familiar with taking tests and assessments and answering multiple-choice questions

in particular.²⁴ Here, it is expected that we would see more students leaving out more items, systematically answering fewer of a particular type of question, taking longer to start answering and taking longer to complete all the items in a passage.

		Mean S	icore %	Average number of items not- attempted		% of students scoring zero	
Passage		2016	2021	2016	2021	2016	2021
Pemba Sh	erpa						
	Total	36%	28 %	1.08	3.18	3%	12 %
	MC	50%	39%	0.46	1.60	5%	17%
	CR	27%	22%	0.62	1.58	17%	35%
Sharks							
	Total	17%	15%	1.05	2.63	13%	25%
	MC	27%	22%	0.40	1.21	24%	38%
	CR	13%	11%	0.65	1.42	41%	54%
How Did W	Ve Learn to Fly?						
	Total	38%	30%	1.15	2.97	2%	10%
	MC	38%	33%	0.57	1.54	5%	18%
	CR	38%	29%	0.57	1.43	9%	26%
The Summ	The Summer My Father Wa						
	Total	44%	40%	0.69	1.70	3%	7%
	MC	49%	46%	0.36	0.96	5%	10%
	CR	38%	33%	0.34	0.74	14%	25%
Library Mo	ouse						
	Total	46%	39%	1.04	2.90	1%	7%
	MC	49%	42%	0.56	1.67	3%	12%
	CR	43%	36%	0.48	1.23	6%	18%
Training a	Deaf Polar Bear	•					
	Total	37 %	31%	0.77	2.18	3%	13%
	MC	45%	38%	O.18	0.98	10%	22%
	CR	33%	27%	0.47	1.20	14%	30%
Hungry Pla	ant						
	Total	44%	40%	0.82	1.68	3%	6%
	MC	44%	41%	0.59	1.27	4%	8%
	CR	44%	37%	0.23	0.41	16%	25%

Table 6: Mean results for comparable PIRLS passages across 2016 and 2021

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. All averages are student-weighted. MC include all the multiple-choice items and CR are the constructed response items. Non-attempted items are the count of non-attempted items; they are not weighted by the number of marks that the items are worth. The results for the third item (MC) in the "Sharks" passage are missing for all students in the 2021 data. This item is, therefore, not included in any of the "Sharks" totals.

²⁴ This includes knowing how to answer different types of questions. Having exposure to multiple-choice questions before would be crucial, as well as knowing test taking strategies such as guessing an answer or knowing how to manage your time during a timed test.

We also find a substantial increase in the number of students getting zero for all items on a passage or the multiple-choice or constructed response items only. The proportion of students unable to answer even a single item correctly has increased substantially. This supports the finding that a larger proportion of students are non-readers. This was observed at the national level using the PIRLS overall reading score, as shown in Figure 5, and in smaller studies on foundational reading skills (Ardington et al., 2021; Wills & van der Berg, 2022). Next, we drill down to the item level using one passage, *How did we learn to Fly?*. Since item analysis across the seven common passages reveals similar trends, we opt to show the outcomes on this single text, seen in Figure 13 to Figure 17, as an example of general trends.





School SES deciles 9 & 10





Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. Notes: All averages are student-weighted. MC is a multiple-choice item, and CR is a constructed response item. Non-attempted items are assigned a zero score.

Figure 13 shows a clear pattern in which the mean score for each item is lower in 2021 than in 2016 when considering the full sample of 'all students' that wrote. The one exception is a multiple-choice item (Item #03), where students in 2021 scored slightly higher than the students in 2016. If we look at the results of these same items but restrict the sample to students from the 9th and 10th school SES deciles, the scores in the two years are much more similar, and the 2021 score is higher for just under half the items. If, instead, only the students in school deciles 1-8 and those without a school decile classification (i.e. school SES is missing) are considered, there is a clear decline in achievement in 2021 on every item. Even item #03 shows no change. This is similar to what was seen at the national level for the overall reading score.

Large increases in the percentage of students getting zero for all of the items in the passage were shown in Table 6. This increase is primarily driven by students from poorer schools (i.e. students from school SES deciles 1 to 8 or without a school SES classification), as can be seen in Figure 14.



Figure 14: Percentage of students that scored zero for "How did we learn to Fly?" in 2016 and 2021

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. All averages are student-weighted. MC include all the multiple-choice items, and CR are all the constructed response items. Schools, where insufficient parents responded to calculate an SES decile, are included in the Decile 1 to 8 group.

Some of the increase in students getting very low scores or zero for all items on the passage in 2021 is the result of an increase in the frequency of non-attempted items. Two trends that are evident across items in the common passages are seen in Figure 15. First, the percentage of students who are not attempting items rises with each additional item on a particular passage. This is true in both 2016 and 2021. An explanation for this is that students may run out of time or energy to complete the items on the passage, especially as the difficulty level of the items typically increases slightly on items asked towards the

end. For example, the first item on this passage asked, "Who invented the first kites?", which would have required that the student "focus on and retrieve explicitly stated information" from the text. The last two items asked the students to "Put the inventions in order" and "What is the main idea of the article". These items require that the student "interpret and integrate ideas and information", which involves greater levels of comprehension and some analysis and organisation of the ideas in the text.

However, even for the first item in this example passage, non-attempts are higher in 2021. Only 1% of students did not attempt the first item in 2016, whilst 5% of students did not attempt the first item in 2021. This represents a parallel shift upwards in the slope. For some of the passages, including this example, the slope gets steeper with each successive item. This can be seen most clearly for items 12 to 17. This raises the question: a) were students unable to answer the items on this passage (for example, due to weak foundational reading skills), b) were they unsure how to go about answering questions in general (for example, because the test used a different format or testing protocol than they were accustomed to, or simply because they have had less exposure to test taking) or c) did they run out of time and did not get to the end of the items on the passage?





Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. All percentages are student-weighted. MC is a multiple-choice item, and CR is a constructed response item.

To investigate the latter, Figure 16 aims to examine whether students were able to finish all the items for the passage in time by identifying the last item that a student attempted. This is not the same as identifying how many items were attempted. For example, if a child attempted all items except numbers 2 and 9, this child is counted as having completed all items (up to the last item, number 17). If a child left out items 2, 9, 16 and 17, the last

item that the child attempted is number 15. The horizontal axis shows the last item asked for that passage that the student attempted, starting with the last item, #17. The cumulative percentage of students that got this far is shown on the vertical axis. For example, in 2021, 93% of students reached at least item number 8, compared to 100% reaching item 8 in 2016. There is a large difference between the completion rates in the two years. Whilst in 2016 about 15% of the group reached the last item, this rose to a third of students in 2021.

In 2021, about 3% of students did not even attempt to answer the very first item of the passage *How did we learn to fly?*. These students left out all 17 items. This is a step change from 2016 when a drop-out rate of 3% of students was only reached after item 11. A similar decline in non-attempt patterns is observed for the other common passages. This decline may reflect the underdevelopment of oral reading fluency skills, limiting students' ability to make meaning from the text and the questions within the allotted time for each section.



Figure 16: Last item attempted for students in the PIRLS text "How did we learn to Fly?"

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. The horizontal axis shows the last item in the passage that the student attempted, starting with the last item, #17. Student weighted.

The increase in non-responses was not solely attributed to a decline in reading fluency and comprehension. As shown in Figure 17, students with equivalent scores on constructed response items below 7 out of 11 exhibited significantly higher non-attempt rates in 2021. For instance, a child scoring 4 out of 11 in 2021 omitted slightly over one constructed response item on average, while in 2016, the non-response rate for the same score was half that amount. Notably, these groups of children demonstrated similar levels of comprehension. This suggests that the issue is not solely related to a decline in oral reading fluency and comprehension; students also seem to have missed out on acquiring a combination of other skills typically taught and practised in classroom settings, enhancing performance in the style of testing utilised in standardised assessments.





Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. Average number of non-responses are student weighted.

5.6 Regressions

The sample of students tested in 2016 and 2021 differed in substantial and important ways, including in age, gender split, student absenteeism and average class sizes. Within some of the language groups, the socio-economic status of the sample schools was also higher or lower in 2021. Some of these differences, including changes in age and gender proportions, reflect underlying changes in the demographics and characteristics of the Grade 4 student sample due to the pandemic. For example, absenteeism worsened during the pandemic. Higher absenteeism levels will directly affect learning outcomes due to reduced instructional time. However, interpreting the links between absenteeism and learning requires care as this relationship may have shifted from 2016 to 2021 as the types of students likely to be absent, as well as the reasons for absenteeism, had changed.

We investigate how these differences affect the interpretation of the overall change in average reading outcomes in the regression in Table 7. All unexplained differences between the two years are attributed to COVID-19 in the first row. The first regression shows the difference in the aggregate reading scores from 2016 to 2021. When we control for the language of the test in the second column, the difference declines by 2 percentage points, suggesting slight differences in language composition over the two years (a feature of variations as a result of school sample selection). The coefficient on COVID becomes more negative if we control for gender, age and school socio-economic

quintiles in model (5). This suggests that the changes in the sample with respect to age, gender and school socio-economic status are contributing to an underestimation of COVID-19 learning losses of up to 19%.

Variables	(1) Reading score	(2) Reading score	(3) Reading score	(4) Reading score	(5) Reading score	(6) Reading score
COVID	-31 414***	-29 330***	-29 975***	-36 601***	-38 832***	-33 914***
COVID	(6.043)	(6,089)	(5.932)	(5746)	(4 856)	(5 854)
Female	(0.0 10)	(0.000)	52.870***	48.327***	48.009***	48.146***
			(2.264)	(2,222)	(1.832)	(1.861)
Age				132.615***	109.556***	107.968***
Ŭ				(18.027)	(15.686)	(15.835)
Age squared				-6.833***	-5.727***	-5.659***
				(0.820)	(O.711)	(0.716)
School SES Q2					11.818	11.914
					(22.160)	(24.984)
School SES Q3					15.307	15.023
					(22.727)	(25.638)
School SES Q4					28.308	28.167
					(22.106)	(25.005)
School SES Q5					120.642***	119.383***
					(23.818)	(26.584)
Proportion of class						-51 547*
absent						(29.982)
						(20.002)
Constant	319.629***	392.576***	365.872***	-264.077***	-213.032**	-201.120**
	(4.419)	(10.340)	(10.781)	(99.330)	(91.753)	(93.448)
Observations	25,232	25,232	25,216	25,051	25,051	25,051
Language controls		Y	Y	Y	Y	Y

Table 7: Regression sł	nowing the	change in G	ir 4 reading scores	as a result of	COVID-19
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Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. Notes. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Regressions are run using plausible values for the overall reading score; standard errors are calculated using jack-knifing performed at up to 250 sample schools with 125 zones. Language controls are dummy variables for each of the 9 test languages. School SES quintiles are derived from group school deciles, e.g. Deciles 1 and 2 are Quintile 1. Schools, where there was insufficient information to calculate an SES score, were set to missing and included in the regression, but both SES Quintile1 and schools with missing SES values were omitted.

Interestingly, when controlling for class-level absenteeism in regression (6), the magnitude of the negative COVID coefficient declines by about 5 PIRLS points. The coefficient on the proportion of class absent is -52 PIRLS points, whilst the other coefficients remain similar. This suggests that some of the decline in performance due to COVID may be attributable to higher levels of absenteeism during the pandemic.

Class size is not included as a control in the main regressions; however, we investigate its effect on the estimates in the robustness checks. There are some concerns about how class size was measured in 2021. In 2016 it was clear what constituted a class. In the second half of 2021, this was less clear, as some schools were implementing rotational timetabling whilst other schools had returned to a timetable where students were attending school daily. It is not possible to establish from PIRLS whether a school was implementing rotational timetabling, yet this affects the interpretation of class sizes. In 2021, in response to COVID-19, reduced class sizes could be obtained while maintaining daily attendance of all students (for instance, by altering the timetable or building temporary classes. But smaller classes are also obtained under rotational attendance; if this is the case, then students get only half the instructional time. The challenge of interpreting class size is clear when correlating teacher-reported class sizes to the number of children that wrote PIRLS, adjusted for absenteeism. In 2016, the correlation is 0.80, whilst in 2021, it is 0.51.

In Table 8, the heterogeneous effects of COVID by gender, language and socio-economic status are shown. The first regression is the equivalent of regression (4) in Table 7. There are differential effects of COVID by gender once language and student age have been accounted for. Girls' scores decreased by 8 fewer PIRLS points than boys between 2016 and 2021, as seen in the coefficient on the interaction between the COVID and female dummies in regression (2). However, this coefficient is only significant at the 10% level.

The next two regressions, (3) and (4), examine how COVID differentially affected language groups, distinguishing between those students tested in one of the nine African languages²⁵ and students writing in English or Afrikaans schools (reference group). In regressions (6) to (8), the school socio-economic groups are interacted with COVID and gender. Regressions (5) and (6) estimate outcomes for students in school deciles 1 to 8²⁶ relative to a reference group of students in school deciles 9 and 10. In regressions (7) and (8), the reference group is students at schools in deciles 8, 9 and 10.

Strong differential pandemic effects by school SES bear similarity to differences observed across language groups in our results. This is seen where the magnitude and direction of the coefficients in regressions (3) and (5) and then (4) and (6) are very similar. Given the high share of English and Afrikaans schools in deciles 9 and 10, language interactions are likely detecting an income effect. In 2021, students writing in an African language scored about 61 points less than students writing in English and Afrikaans (3).

²⁵ This is the group of nine Southern Bantu languages that are official languages in South Africa: isiZulu, isiNdebele, isiXhosa, Sesotho, siSwati, Tshivenda, Xitsonga, Sepedi and Setswana.

²⁶ Schools with missing SES information, due to low parent responses, are combined with school deciles 1 to 8.

Similarly, students from schools in the bottom 8 socio-economic deciles also scored about 62 points less in 2021 relative to students in school deciles 9 and 10 (regression 5). Both effects are highly significant. The effect of COVID on the reference group in both cases changes sign, but the coefficient on COVID is not significantly different from zero in both regression (3) and (5).

We further examine pandemic effects by gender and school SES. The interactions between gender, school SES and COVID in regression (6) indicate that in school SES deciles 9 and 10, boys performed about 19 points better in 2021 compared to 2016, while girls in these schools scored around 7 points better than in 2016. These coefficients are statistically insignificant, but these are large differences in PIRLS points (about 0.1 to 0.2 of a standard deviation). Gender differences in PIRLS performance in school SES deciles 1 to 8 in 2021 are very large and highly statistically significant (p < 0.01). Boys in these schools scored almost 74 points less than boys from wealthier decile 9 and 10 schools in 2021. The interaction term for girls in school deciles 1 to 8 in 2021 is a highly significant 23 points (p < 0.01). This eliminates the 13-point female deficit and reduces the difference of 74 by 10 points but still leaves girls from poorer schools (deciles 1 to 8) scoring about 64 points lower than boys from wealthier schools (deciles 9 & 10) in 2021 - a difference as larger as 0.6 of a standard deviation.

The last two regressions, (7) and (8), look at the same trend as (5) and (6) but use the top three school SES deciles as a reference group instead of just the top two. All the effects on the COVID variable and its interactions become negative, with the exception of the interaction term COVID and females in poorer schools (deciles 1 to 7). Compared to the extremely large estimated difference of 74 PIRLS points between students in school deciles 9 to 10 and students in school deciles 1 to 8 schools, the difference is 45 points when comparing students in school deciles 8 to 10 with students in the bottom seven school deciles. This suggests a very different trend in the top 2 deciles, and to a lesser extent in the top 3, than what we see in the bottom seven deciles. This corroborates the fact that students attending wealthier schools were more effectively shielded from the adverse effects of the pandemic on learning.

Table 8: Regressions of heterogeneous COVID effects on Grade 4 PIRLS reading scores by language, SES and gender

Variables	(1) Reading score	(2) Reading score	(3) Reading score	(4) Reading score	(5) Reading score	(6) Reading score	(7) Reading score	(8) Reading score
COVID	-36.601*** (5.746)	-40.342*** (6.790)	4.799 (15.815)	7.842 (17.755)	12.759 (14.368)	19.420 (16.303)	-14.122 (12.529)	-12.307 (13.062)
COVID × Female		7.639* (4.453)		-5.777 (6.654)		-12.725 (7.838)		-3.493 (6.773)
COVID × African Language			-60.560*** (16.420)	-69.274*** (17.841)				
COVID × Female × African Language				17.599** (7.097)				
COVID × School SES Dec1to8					-62.064*** (14.943)	-73.678*** (16.370)		
COVID × Female × School SES Dec1to8						23.004*** (7.381)		
COVID × School SES Dec1to7							-37.376*** (13.930)	-44.792*** (14.283)
COVID × Female × School SES Dec1to7								15.176** (6.932)
Constant	-264.077*** (99.330)	-269.011*** (99.845)	-274.551*** (99.145)	-286.514*** (99.852)	-139.842 (89.702)	-152.870* (90.291)	-176.831* (95.537)	-186.741* (96.216)
Observations	25,051	25,051	25,051	25,051	25,051	25,051	25,051	25,051
Controls Age, Age ² , Female & Language	Y	Y	Y	Y	Y	Y	Y	Y
School SES Dec 1-8					Y	Y		
School SES Dec 1-7							Y	Y

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. Regressions are run using plausible values for the overall reading score. Standard errors are in parenthesis (*** p<0.01, ** p<0.05, * p<0.1) and are calculated using jackknifing performed at up to 250 sample schools with 125 zones. Language controls are dummy variables for each of the 9 test languages. Schools, where too few parents responded with information to calculate an SES score, were set to missing but included in the regression, but both SES Deciles 1&2 and schools with missing SES values were set as reference categories. African languages are the 9 Southern Bantu languages that are an official language in South Africa: isiZulu, isiNdebele, isiXhosa, Sesotho, siSwati, Tshivenda, Xitsonga, Sepedi and Setswana.

6 CONCLUSION

The PIRLS 2021 reading comprehension assessment is the only nationally representative dataset available to understand how COVID-19 impacted learning in South Africa. The PIRLS results confirm earlier findings of large learning losses in South Africa in language and reading (Ardington et al., 2021; Van der Berg et al., 2022; Wills & Van der Berg, 2022). Furthermore, agreeing with evidence from the Western Cape demonstrating unequal COVID-19 impacts on learning (Van der Berg et al., 2022), our comparative analysis of PIRLS 2016 vs 2021 reveals differential pandemic effects by socio-economic status (SES), language and even gender.

South African learning losses in PIRLS from 2016 to 2021 were concentrated at the bottom end of the performance distribution. There was a sharp increase in the share of Grade 4 students in 2021 who were unable to read for meaning and unable to answer any basic question asked about a reading text. This is most likely the consequence of students having little opportunity to advance with their basic reading skills, such as decoding and fluency, in Grade 3 in 2020 (Wills & Van der Berg, 2022).

Learning inequalities also increased by socio-economic status (SES). Economically disadvantaged students attending the poorest seven deciles of schools were disproportionately negatively affected by the pandemic relative to students in the wealthiest three school deciles. Within this student group from lower SES schools, boys, who were already under-performing relative to their female peers, experienced larger declines in learning. A similar result is obtained if, instead of SES, the language of the test is used, with students at schools who wrote the test in an African language experiencing larger decreases in performance relative to students at English and Afrikaans schools.

After a pre-pandemic period of declining inequality between schools (Gustafsson & Taylor, 2022), the pandemic augmented learning inequality between schools. Heterogeneity within schools also increased from 2016 to 2021. Consequently, teachers must cater to a wider range of abilities within a single class. This makes effective teaching more difficult and may complicate recovery strategies.

Item analysis of reading comprehension assessments, common across PIRLS 2016 and 2021, reveals that students appear to be taking longer to complete tasks. This reflects a combination of low reading fluency, underdeveloped comprehension skills, and less practice with test taking, writing quickly or concentrating for long periods of time.

Although PIRLS confirms large losses, this does not mean that the entire schooling system is behind to the same extent or that this implies a permanent setback to system progress. The 2021 Grade 4 cohort was deeply impacted by COVID-19 disruptions in 2020 in a foundational year, Grade 3, possibly more so than students in later grades. Learning recovery is also possible, as was demonstrated in India (Singh et al., 2022). Without any nationally standardised data to systematically track learning trajectories, however, we will

not know how much recovery has occurred or the extent to which learning backlogs will persist or accumulate.

Nevertheless, it will be instructive to track the 2021 Grade 4 cohort. Provided that they don't drop out of school, these students will reach Grade 12 in 2029. Of the cohort of students in Grade 1 in 2020, the first set of students will only reach Grade 12 in 2031. Larger pandemic effects at the Grade 12 level, reflected in the National Senior Certificate results, may only be seen in later years (closer to 2030). To date, there has been little evidence of a notable deterioration in National Senior Certificate Results (Wills & Van der Berg, 2022).

Three key levers are recommended for accelerating learning recovery: curriculum consolidation, extending instructional time and improving learning efficiencies (UNESCO et al., 2021). Unfortunately, limited action was taken to initiate a recovery plan in eight of nine South African provinces. The Western Cape was the exception. Time and resources were dedicated in a clear policy response to implement a recovery plan. A recovery plan should include measures to maximise the use of existing instructional time while reprioritising time to more foundational subjects (e.g. mathematics and language) by reducing instructional loads given to non-core topics or subjects. Another lever for learning support lies in the effective recruitment and training of Teaching Assistants employed through the Presidential Youth Employment Initiative (PYEI). Evidence suggests that such teacher assistants can be effectively deployed to assist struggling students with reading and numeracy in South Africa (Ardington & Henry, 2021). Lastly, continued curriculum adjustment after the completion of the Recovery Annual Teaching Plans (ATPs) may be beneficial.

This paper has demonstrated that a learning and reading crisis has deepened in South Africa among cohorts affected by COVID-19 disruptions to schooling. Large-scale remedial support, particularly in the most vulnerable school contexts and for boys, is needed to give children a chance to catch up on lost development. Currently, the majority of Grade 4s are struggling to make meaning from what they are reading, pointing to underdeveloped foundational reading skills. Losses in reading are also likely to correlate to losses in foundational numeracy skills. The need to prioritise large-scale reading and numeracy programmes has never been as pertinent.

7 REFERENCES

Ardington, C., & Henry, J. (2021). *Funda Wande Limpopo Evaluation: Midline Report.* SALDRU.

https://fundawande.org/img/cms/news/Limpopo%20TA%20Evaluation%20202 1.pdf

- Ardington, C., Wills, G., & Kotze, J. (2021). COVID-19 learning losses: Early grade reading in South Africa. *International Journal of Educational Development*, *86*, 102480. https://doi.org/10.1016/j.ijedudev.2021.102480
- Betthäuser, B. A., Bach-Mortensen, A. M., & Engzell, P. (2023). A systematic review and meta-analysis of the evidence on learning during the COVID-19 pandemic. *Nature Human Behaviour*, 7(3), 375–385. https://doi.org/10.1038/s41562-022-01506-4
- Birkelund, J. F., & Karlson, K. B. (2023). No evidence of a major learning slide 14 months into the COVID-19 pandemic in Denmark. *European Societies*, *25*(3), 468–488. https://doi.org/10.1080/14616696.2022.2129085
- Bisgard, J., Roper, M., Taimo, L., Boddé-Kekana, T., Dixon, H., Williams, B., Wills, G., Hofmeyr, H., Bandeira, M., Paul, J.-L., & Kirkbride, E. (2022). *Consolidated Report on COVID-19 Research—Final*. USAID. https://pdf.usaid.gov/pdf_docs/PA00ZBHD.pdf
- Contini, D., Di Tommaso, M. L., Muratori, C., Piazzalunga, D., & Schiavon, L. (2022). *The COVID-19 Pandemic and School Closure: Learning Loss in Mathematics in Primary Education* (IZA DP 14785; Discussion Paper Series). https://docs.iza.org/dp14785.pdf
- Department of Basic Education. (2020a). *Circular S2 of 2020: Release of the Revised Annual Teaching Plans (ATPs) for Grade 7 and Grade 12 respectively* (Circular S2 of 2020).

https://www.education.gov.za/Portals/0/Documents/Recovery%20plan%20pag e/Links%20for%20schools/circular-s2-2020-curriculum-recovery.pdf?ver=2020-06-15-091313-790

- Department of Basic Education. (2020b). *Circular S13 of 2020: Release of the Curriculum Recovery Annual Teaching Plans for 2021* (Circular S13 of 2020). https://www.education.gov.za/Curriculum/Circulars/tabid/587/Default.aspx
- Notice 302 of 2020, Pub. L. No. Disaster Management Act, 2002, 43372 Disaster Management Act, 2002 (2020). https://www.gov.za/sites/default/files/gcis_document/202005/43372gen302. pdf
- Department of Basic Education. (2021a). *National Assessment Circular No. 3 of 2021:* Special Mark Adjustment/Condonation Dispensation for Learners In Grades 4–9 (Circular No. 3 of 2021).
- Department of Basic Education. (2022a). *National Assessment Circular No. 5 of 2022:* Special Mark Adjustment/Condonation Dispensation for Learners In Grades 4–9 (Assessment Circular No. 2 of 2022).
- Department of Basic Education. (2022b). *The COVID-19 pandemic, enrolments, dropping out and attendance explained*. Department of Basic Education. https://www.education.gov.za/Resources/Reports.aspx
- Department of Basic Education. (2023a). *Grade promotion, repetition and dropping out 2018 to 2021* (Data Report). Department of Basic Education. https://www.education.gov.za/LinkClick.aspx?fileticket=llofwGUQtBo%3d&tabid=9 2&portalid=0&mid=4362&forcedownload=true
- Department of Basic Education. (2023b). *PIRLS 2021: South African Preliminary Highlights Report.* Department of Basic Education. https://www.up.ac.za/media/shared/164/ZP_Files/2023/piirls-2021_highlightsreport.zp235559.pdf

- Department of Basic Education. (2021b, May 29). Basic Education on return of all learners to primary schools [Media Statements]. *South African Government*. https://www.gov.za/speeches/basic-education-issues-directions-%C2%AOdatereturn-all-learners-primary-schools-29-may-2021
- Ferreira, F. H. G., & Gignoux, J. (2011). *The Measurement of Educational Inequality: Achievement and Opportunity* (Discussion Paper No. 6161). IZA.
- Gustafsson, M. (2020). A revised PIRLS 2011 to 2016 trend for South Africa and the importance of analysing the underlying microdata (Working Paper WP02/2020; Stellenbosch Economic Working Papers). University of Stellenbosch. www.ekon.sun.ac.za/wpapers/2020/wp022020
- Gustafsson, M., & Taylor, S. (2022). *What lies behind South Africa's improvements in PIRLS? An Oaxaca-Blinder analysis of the 2011 and 2016 data* (Working Paper WP02/2022). https://resep.sun.ac.za/wp-

content/uploads/2022/07/wp022022.pdf

- Hevia, F. J., Vergara-Lope, S., Velásquez-Durán, A., & Calderón, D. (2022). Estimation of the fundamental learning loss and learning poverty related to COVID-19 pandemic in Mexico. *International Journal of Educational Development*, *88*, 102515. https://doi.org/10.1016/j.ijedudev.2021.102515
- Hoadley, U. (2023). *COVID-19 and the South African curriculum policy response* (COVID Generation) [Research Note]. RESEP. https://resep.sun.ac.za/wpcontent/uploads/2023/05/Hoadley_2023_COVID-19_curriculum_policy_response_SA_15May2023.pdf
- Howie, S.J., Venter, E., Van Staden, S., Zimmerman, L., Long, C., Du Toit, C. Scherman, V. & Archer, E. (2008). Progress in International Reading Literacy Study 2006. University of Pretoria, Centre for Evaluation and Assessment.
- Hofmeyr, H. (2022). Why do girls do better? Unpacking South Africa's gender gap in PIRLS and TIMSS. *International Journal of Educational Development*, *94*, 102648. https://doi.org/10.1016/j.ijedudev.2022.102648
- Jakubowski, M., Gajderowicz, T., & Patrinos, H. A. (2023). Global learning loss in student achievement: First estimates using comparable reading scores. *Economics Letters*, *232*, 111313. https://doi.org/10.1016/j.econlet.2023.111313
- Kubheka, T. (2021, January 15). Dept confirms reopening of schools postponed by two weeks. *EW/N*. https://ewn.co.za/2021/01/15/dept-confirms-reopening-ofschools-postponed-by-two-weeks
- Kuhfeld, M., Soland, J., & Lewis, K. (2022). Test Score Patterns Across Three COVID-19-Impacted School Years. *Educational Researcher*, *51*(7), 500–506. https://doi.org/10.3102/0013189X221109178
- Lichand, G., & Alberto Doria, C. (2022). The Lasting Impacts of Remote Learning in the Absence of Remedial Policies: Evidence from Brazil. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4209299
- Moscoviz, L., & Evans, D. K. (2022). *Learning Loss and Student Dropouts during the COVID-19 Pandemic: A Review of the Evidence Two Years after Schools Shut Down* (Working Paper 609; p. 28). Center for Global Development. https://www.cgdev.org/sites/default/files/learning-loss-and-student-dropoutsduring-covid-19-pandemic-review-evidence-two-years.pdf
- Mullis, I. V. S., Martin, M. O., Foy, P., & Hooper, M. (2017). *PIRLS 2016 International Results in Reading*. Boston College, TIMSS & PIRLS International Study Center. http://timssandpirls.bc.edu/pirls2016/international-results/
- Mullis, I. V. S., von Davier, M., Foy, P., Fishbein, B., Reynolds, K. A., & Wry, E. (2023). *PIRLS 2021 International Results in Reading*. Boston College, TIMSS & PIRLS International Study Center. https://pirls2021.org/wp-content/uploads/2022/files/0_About-PIRLS-2021.pdf

- OECD. (2019). *PISA 2018 Results (Volume II): Where All Students Can Succeed*. OECD. https://doi.org/10.1787/b5fd1b8f-en
- Patrinos, H. A., Vegas, E., & Carter-Rau, R. (2022). *An Analysis of COVID-19 Student Learning Loss*. The World Bank. https://doi.org/10.1596/1813-9450-10033
- Rodriguez-Segura, D., Campton, C., Crouch, L., & Slade, T. S. (2021). Looking beyond changes in averages in evaluating foundational learning: Some inequality measures. *International Journal of Educational Development*, *84*, 102411. https://doi.org/10.1016/j.ijedudev.2021.102411
- SAnews.gov.za. (2020, March 15). Coronavirus outbreak declared a national disaster. *SANews*. https://www.sanews.gov.za/south-africa/coronavirus-outbreakdeclared-national-disaster
- Shepherd, D., & Mohohlwane, N. (2021). *The impact of COVID-19 in education more than a year of disruption* (Working Paper 11; NiDS-CRAM). https://doi.org/10.21203/rs.3.rs-568605/v1
- Singh, A., Romero, M., & Muralidharan, K. (2022). *Covid-19 Learning Loss and Recovery: Panel Data Evidence from India* (Working Paper 30552; NBER Working Paper Series). National Bureau of Economic Research. https://www.nber.org/system/files/working_papers/w30552/w30552.pdf
- Spaull, N. (2019). Chapter 1 Equity: A Price Too High to Pay? In N. Spaull & J. D. Jansen (Eds.), South African schooling: The enigma of inequality: A study of the present situation and future possibilities. Springer.
- Spaull, N. (2023). PIRLS 2021—Overview of Key Findings [Memo released on 16 May 2023].
- Spaull, N., Courtney, P., & Qvist, J. (2022). Mathematical stunting in South Africa: An analysis of Grade 5 mathematics outcomes in TIMSS 2015 and 2019. In H. Venkat & N. Roberts (Eds.), *Early Grade Mathematics in South Africa*. Oxford University Press Southern Africa.
- Spaull, N. & Pretorius, E. (2019) Still falling at the first hurdle: Examining early grade reading in South Africa. In: Spaull, N. & Jansen, J. (eds) South African Schooling: The Enigma of Inequality. Switzerland, Springer.
- Spaull, N., & Kotze, J. (2015). Starting behind and staying behind in South Africa. *International Journal of Educational Development*, *41*, 13–24. https://doi.org/10.1016/j.ijedudev.2015.01.002
- Spaull, N., & Makaluza, N. (2019). Girls Do Better: The pro-female gender gap in learning outcomes in South Africa 1995–2018. *Agenda*, *33*(4), 11–28. https://doi.org/10.1080/10130950.2019.1672568
- Statistics South Africa. (2022). Education Series Volume VIII: COVID-19 and barriers to participation in education in South Africa, 2020 (92-01–08; Education Series, p. 71). Statistics South Africa. https://www.statssa.gov.za/publications/Report-92-01-08/Report-92-01-082020.pdf
- UNESCO. (2022). UNESCO global dataset on the duration of school closure. UNESCO. https://en.unesco.org/sites/default/files/duration_of_school_closures_due_to_c ovid-19_mar2O-jun22.pdf
- UNESCO, World Bank, & United Nations Children's Fund. (2021). *The State of the Global Education Crisis: A Path to Recovery.* The World Bank, UNESCO and UNICEF. https://doi.org/10.54675/JLUG7649
- Uwezo Uganda. (2021). Are our Children Learning? Illuminating the Covid-19 Learning Losses and Gains in Uganda. (Uwezo National Learning Assessment Report 2021). Uwezo Uganda. https://uwezouganda.org/wpcontent/uploads/2023/05/Uwezo-2021-National_Assessment-Report_FINAL.pdf
- Van Broekhuizen, H., & Spaull, N. (2017). *The 'Martha Effect': The compounding female advantage in South African higher education* (Working Paper WP14/2017;

Stellenbosch Economic Working Papers). University of Stellenbosch. https://resep.sun.ac.za/wp-content/uploads/2018/07/wp142017.pdf

- Van Der Berg, S., Burger, C., Burger, R., De Vos, M., Du Rand, G., Gustafsson, M., Moses, E., Shepherd, D. L., Spaull, N., Taylor, S., Van Broekhuizen, H., & Von Fintel, D. (2011). Low Quality Education as a Poverty Trap. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2973766
- Van der Berg, S., & Gustafsson, M. (2019). Chapter 2: Educational Outcomes in Postapartheid South Africa: Signs of Progress Despite Great Inequality. In N. Spaull & J. D. Jansen (Eds.), South African schooling: The enigma of inequality: A study of the present situation and future possibilities. Springer.
- Van der Berg, S., Hoadley, U., Galant, J., van Wyk, C., & Böhmer, B. (2022). *Learning Losses From COVID-19 in the Western Cape: Evidence From Systemic Tests.* RESEP. https://www.ssrn.com/abstract=4212977
- Van Staden, S. & Gustafsson, M. (2022). What a decade of PIRLS results reveal about early grade reading in South Africa: 2006, 2011, 2016. In: Spaull, N. & Pretorius, E. (eds) Early Grade Reading in South Africa. Cape Town, Oxford University Press.
- Western Cape Education Department. (2023, June 2). *The Western Cape is getting #BackonTrack! | Western Cape Education Department*. Western Cape Education Department. https://wcedonline.westerncape.gov.za/news/western-capegetting-backontrack
- Western Cape Ministry of Education. (2023, March 16). *2022 systemic test results show interventions are working*. Western Cape Government. https://www.westerncape.gov.za/news/2022-systemic-test-results-showinterventions-are-working
- Wills, G., Ardington, C., & Sebaeng, M. L. (2022). Foundational skills in home language reading in South Africa. Empirical evidence from 2015-2021. In N. Spaull & E. Pretorius (Eds.), *Early grade reading in South Africa*. Oxford University Press Southern Africa.
- Wills, G., & Van der Berg, S. (2022). *COVID-19 Disruptions and Learning in South Africa: Two Years of Evidence*. University of Stellenbosch. https://resep.sun.ac.za/wpcontent/uploads/2022/11/FINAL-ReSEP-Impact_of_Learning_Losses-INK04.pdf
- Wolf, S., Aurino, E., Suntheimer, N. M., Tsinigo, E., Behrman, J. R., Avornyo, E., Jordan, J., Samanhyia, S., & Aber, J. (2021). *Learning in the Time of a Pandemic and Implications for Returning to School: Effects of COVID-19 in Ghana.* https://www.semanticscholar.org/paper/Learning-in-the-Time-of-a-Pandemicand-Implications-Wolf-Aurino/804683653d885806eb8111af561d911f87f4ec08
- Zuze, T. L., & Reddy, V. (2014). School resources and the gender reading literacy gap in South African schools. *International Journal of Educational Development*, *36*, 100– 107. https://doi.org/10.1016/j.ijedudev.2013.10.002

8 APPENDIX

8.1 Socio-economic status questions in PIRLS

Table A 1 illustrates the cut-off points used to create lower, middle and higher categories for four home SES variables, as described in the PIRLS 2021 International Results in Reading Report. These same cut-offs are used to create the ordinal and dummy variables averaged at the school level to generate the school-level average home SES (school SES) score.

Table A 1: Cut-off points for the four variables used in the school-level home SES score



Source: Exhibit 5.1: Home socio-economic status on p. 88 in Section 5: Home Environment Support of the PIRLS 2021 International Results in Reading (Mullis et al., 2023)

Table A 2 shows that in 2016, there were a substantial number of schools, 33, where not a single parent answered all four questions, whereas this was the case in only 9 schools in 2021. Schools without a single complete parent response in both years also had lower average reading scores. As such, by excluding these schools, we are inadvertently selecting better performing, potentially wealthier schools, which affects the comparability of the sample in the two years, as 31 schools would be excluded for the 2016 dataset and only 6 for 2021. Apart from schools where no parents responded, the non-responses in 2016 appear to be a little more random than those in 2021, where there is a strong correlation between parent non-response at the school level and lower reading outcomes.

To avoid this lack of comparability across years and to ensure that the average within a school is not dependent on only one or two parents, we conservatively restrict the SES calculation to only those schools where at least three parents answered all four questions. This ensures that we are not oversampling wealthier or better-performing schools in 2016. This leaves 40 schools and 1 464 students in 2016 and 36 schools and 1 029 students in 2021 for whom we do not calculate an SES score. This is equivalent to about 12,4% of the pooled sample.

		Number	of schools	Mean read in the so	ing score chools
		2016	2021	2016	2021
At least one parent within the school answered each of the					
four questions		31	6	303	214
	0	33	9	303	216
	1	4	9	326	230
Number of parents	2	3	18	323	246
In the school that	3	4	9	328	270
auestions	4	5	16	302	269
questions	5	9	20	278	267
	6 +	235	240	324	296
	Total	293	321	320	288

Table A 2: Response rates of parents on home environment questions within schools

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets.

8.2 Correlation between school SES and student-reported assets

A student asset index was also calculated, although this is a less comparable measure over the two years. There is also more missing data, and it is less robust due to selfreporting by the students. It was calculated based on student self-reports about whether they had the following items at home: More than 25 books; a home computer; a desk to study; an own room; an internet connection and a daily newspaper. We use this asset index as a check to confirm that there is a correlation between the two wealth measures.

Table A 3 clearly shows that for higher school SES deciles, students report higher levels of asset ownership. As would be expected, students in schools with a higher socio-economic status report higher levels of household asset ownership.

School SES Deciles	2016	2021
1	-0.50	-0.41
2	-0.25	-0.28
3	-0.31	-0.12
4	-0.25	-0.07
5	-0.11	0.00
6	-0.14	-0.07
7	0.10	-0.17
8	0.01	0.12
9	0.29	0.33
10	1.02	0.97

Table A 3: Mean Student Asset Index Score for the different School SES deciles in 2016 and 2021

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets.

8.3 School SES status in 2016 and 2021 by language of the test

Table A 4 shows the mean of the student-weighted pooled school SES score²⁷. It is clear that there is a fair bit of variation in school SES between years. The difference between the years is insignificant only for the English group.

We would expect a fair bit of variation, given that the school SES score is calculated at the school level and the number of schools that are sampled for each language is relatively small. There are a total of 293 and 321 schools in the sample in 2016 and 2021, respectively, stratified by language. The smallest school sample is only 7 isiNdebele schools in 2016, whilst the isiZulu group has the largest number of schools, 48, in 2021. Given the small number of schools within each language group, some variation in group composition is expected between years.

However, two differences are notable. The mean pooled SES index score for the students at Afrikaans school increases from 0.50 to 1.48 by one whole standard deviation. This indicates that there was a large difference in the wealth levels of the schools in the two assessment years. The set of schools that were selected in 2021 was of a much higher socio-economic standard, on average than those chosen in 2016. A total of 38 Afrikaans schools were selected in 2016 and 22 in 2021, so there were also much fewer schools that were assessed in 2021. The other language groups that also show a relatively large change are Siswati and to a lesser extent, Sepedi. In both cases, the sample of schools selected were wealthier on average in 2016 and in 2021, particularly the Siswati group, where the difference is half a standard deviation.

²⁷ Pooled SES index is used for direct comparability across years.

Language of Assessment	2016	2021	Difference ('21-'16		
1. English	0.97	0.98	0.01		
2. Afrikaans	0.50	1.48	0.98 ***		
3. isiNdebele	-0.22	-0.35	-0.13 ***		
4. isiXhosa	-0.50	-0.39	O.11 ***		
5. isiZulu	-0.33	-0.47	-0.14 ***		
6. Sepedi	-O.11	-0.49	-0.38 ***		
7. Sesotho	-0.37	-0.15	0.23 ***		
8. Setswana	-0.28	-0.33	-0.05 ***		
9. Siswati	0.24	-0.28	-0.51 ***		
10. Tshivenda	-0.25	-0.31	-0.06 **		
11. Xitsonga	0.06	-0.20	-0.26 ***		
Total	0.07	0.11			

Table A 4: Mean Pooled School SES in 2016 and 2021 by test language, student-weighted

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. Pooled school SES score is student-weighted in each of the two years. Statistically significantly different at *** p<0.01, ** p<0.05, * p<0.1.

8.4 Reading score distribution of different school SES groups in 2016 and 2021

In Figure A1, we show the student-weighted percentile distribution of the students attending schools in the top 2 deciles (deciles 7 &8) and the bottom 6 deciles. Schools for which there is no SES information are included in the bottom 6 deciles of schools.

Students attending schools in SES deciles 9 and 10 performed well above those in the bottom 8 deciles in both years. At every percentile, the average reading score is higher in 2021 for decile 9 & 10 schools, although these differences are statistically insignificant at the 5% level. There is little difference in reading performance, apart from the top and bottom 10%, between students in the 7th & 8th school SES deciles and the bottom 6 and missing school SES deciles in 2016.

Student achievement in schools in deciles 1 to 6 (and missing SES schools) is much lower in 2021 than in 2016. However, the curves cross for students in deciles 7 and 8. The top-achieving quarter for students achieved higher scores in 2021 than the top-achieving quarter of students in 2016, whereas the remaining 75% of the distribution performed worse in 2021.



Figure A 1: Mean PIRLS reading score distribution at key percentiles for different school SES deciles

8.5 Differences in PIRLS reading score by school SES, language and gender

The reference Table A5 provides a breakdown of differences in the PIRLS average reading scores between 2016 and 2021 by gender for language and SES groups. The sub-samples included are the ten school SES deciles, as well as the schools for which the school SES index is missing. All of the different SES splits referred to in this paper are included: Deciles 1-6 and 7-10; Deciles 1-7 and 8 to 10; and Deciles 1-8 and 9 & 10. The SES splits are reported with and without the schools that have missing deciles. In addition, the average student score for the 11 assessment languages is shown and the averages for the two West Germanic languages (English and Afrikaans) and the nine Southern Bantu (African) languages (isiZulu, isiNdebele, isiXhosa, Sesotho, siSwati, Tshivenda, Xitsonga, Sepedi and Setswana).

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets, own calculations using plausible values for the overall reading score. Standard errors are calculated using jackknifing performed at up to 250 samples schools with 125 zones. Schools where there was insufficient information to calculate a SES score were set to missing and included with deciles 1 to 6.

Table A 5: The average PIRLS reading in 2016 and 2021 by language, school SES and gender

		Girls			Boys	S		All	
	2016	2021	Diff. ('21-'19)	2016	2021	Diff. ('21-'19)	2016	2021	Diff. ('21-'19)
Whole Sample	347	317	-30	295	260	-34	320	288	-31
School SES deciles									
Decile 1	280	277	-3	206	205	-1	241	236	-5
Decile 2	345	278	-67	269	233	-35	301	254	-48
Decile 3	328	270	-58	283	209	-74	305	238	-67
Decile 4	335	291	-43	267	231	-37	295	259	-37
Decile 5	323	260	-63	274	197	-78	296	229	-67
Decile 6	335	296	-38	293	234	-59	313	266	-47
Decile 7	324	299	-25	279	239	-40	301	271	-30
Decile 8	337	317	-19	289	262	-27	314	290	-24
Decile 9	399	413	14	349	367	18	373	391	18
Decile 10	470	501	32	438	485	48	454	493	40
Decile – Missing SES	333	262	-71	276	205	-71	304	234	-71
Decile 7-10	375	373	-2	332	329	-3	354	352	-2
Decile 1-6	326	279	-47	273	219	-54	297	247	-50
Decile 1-6 & Missing	328	277	-52	274	217	-57	299	246	-54
Decile 8-10	392	388	-4	350	346	-5	371	367	-4
Decile 1-7	326	282	-44	274	221	-53	298	250	-48
Decile 1-7 & Missing	328	279	-49	274	219	-55	300	248	-51
Decile 9&10	432	450	18	389	419	30	410	435	25
Decile 1-8	328	289	-38	276	229	-47	301	259	-42
Decile 1-8 & Missing	329	287	-42	276	227	-49	301	256	-45
Assessment languages	5								
English	398	403	4	345	361	17	372	382	10
Afrikaans	394	407	13	350	366	17	369	387	18
isiNdebele	335	290	-46	304	219	-85	319	255	-64
isiXhosa	312	288	-24	259	219	-40	283	254	-30
isiZulu	330	296	-34	280	243	-37	303	267	-36
Sepedi	305	257	-48	249	181	-69	276	216	-60
Sesotho	342	284	-58	300	234	-66	319	258	-61
Setswana	314	238	-76	274	185	-89	293	211	-82
siSwati	339	283	-56	288	229	-59	313	257	-56
Tshivenda	323	283	-40	276	225	-52	298	255	-43
Xitsonga	333	257	-75	270	194	-76	301	223	-78
English & Afrikaans	397	404	7	346	363	17	371	384	12
9 African* Languages	322	277	-44	271	217	-54	295	247	-49

Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. Schools with insufficient information to calculate an SES score were set to missing. Diff ('21-'19) is the difference in the scores between 2016 and 2021. * Nine official languages of South Africa that belong to the Southern Bantu language group: isiZulu, isiNdebele, isiXhosa, Sesotho, siSwati, Tshivenda, Xitsonga, Sepedi and Setswana.

8.6 Comparing non-attempted answers for constructed response and multiple-choice items

An additional example of the percentage of non-responses is show here for the passage "Library Mouse". Because there is a lot of alternating between constructed response and multiple-choice in this passage. In Figure A 2, there is a clear pattern in 2021 in which multiple-choice items had worse response rates. The trend of students not attempting to answer specific items is directionally similar in 2016 and 2021, however, there is an exaggerated difference between constructed response and multiple-choice items, where students were much more likely to leave out multiple-choice items than constructed response items in 2021.

A student that had not repeated a year would have spent almost half of their schooling career under pandemic conditions. It therefore seems highly plausible that the cohort of Grade 4's in 2021 had less exposure to multiple-choice questions or test taking in general, which may have slightly skewed the results downward in 2021. Such, an unfamiliarity with formal assessments and multiple-choice questions is relatively easily remedied, but this is much less likely to have been a factor for older students.





Source: South African Grade 4 PIRLS Literacy 2016 and PIRLS 2021 datasets. All proportions are student weighted. MC is a multiple-choice item and CR is a constructed response item. CR items have been highlighted in grey.

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