SACMEQ
Southern and Eastern Africa Consortium for Monitoring Educational Quality

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Primary School Performance in Botswana, Mozambique, Namibia, and South Africa

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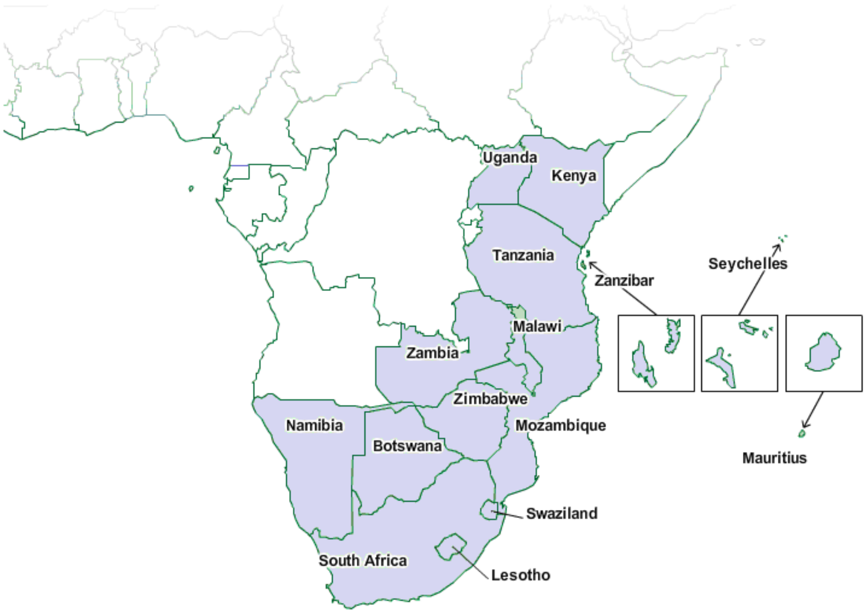

SACMEQ's research and training activities have been generously supported for over a decade by the Netherlands Government

Botswana Kenya Lesotho Malawi Mauritius Mozambique Namibia Seychelles South Africa Swaziland Tanzania Uganda Zambia Zanzibar Zimbabwe

Contents

Introduction

In the modern discourse surrounding socio-economic development in Africa, there are few policy-makers - and even fewer researchers - who do not believe that education is a fundamental precondition for progress and growth. While there may be some debate over the benefits of tertiary education, there is unequivocal consensus that the basic skills of numeracy and literacy are essential for dignified employment and meaningful participation in society. Following from the global acceptance of this tenet, the Education For All (EFA) initiative was created as a vehicle to facilitate and monitor the expansion of primary education in developing countries. The commitments to universal primary education that were outlined at education conferences in Jomtien, Thailand in 1990, and reiterated in Dakar, Senegal 2000, have been met with widespread approval both within developing countries, and by external stakeholders.

However, a sequential analysis of the access-to-education literature, and subsequent policy dialogues, shows an important development in the thinking of educational researchers. What started out as an almost single-minded focus on access - 'Education For All', has slowly developed into a more nuanced concept of *meaningful* access - i.e. *quality* education for all. It is now widely accepted that the ability of a country to educate its youth cannot be measured by access to schooling or enrolment rates alone, but rather by its ability to impart to students the knowledge and skills necessary to function as a literate and numerate member of the broader society. While access is most certainly a necessary condition for this type of education, it is by no means a sufficient one.

Despite this shift in consensus from a sole focus on access, to one that includes a measure of what students actually learn (quality), there remains a dearth of appropriate data with which one can measure changes in educational quality. Carnoy *et al* (2011, p. 20) lament this lack of data in their recent report:

> "Despite widespread acceptance of the notion that improving student performance may have a high economic and social payoff, policy analysts in all countries have surprisingly little hard data on which to base educational strategies for raising achievement."

It is within this context that the Southern and East African Consortium for Monitoring Educational Quality (SACMEQ) was created. Its aim is to facilitate the expansion of quality education in Sub-Saharan Africa by providing the necessary data to monitor educational quality, and by improving the research capacity and technical skills of educational planners. The large, and technically rigorous, surveys conducted by the SACMEQ team provide researchers and educational planners with an accurate measure of the quality of primary education in each of the 14 participating countries[1].

In addition to the benefits of being able to measure and monitor the quality of education *within* a country, the SACMEQ data allows researchers to also compare the quality of education *between* countries. Since every Grade 6 student in each of the 14 participating countries writes the same numeracy and literacy test (albeit in some cases in different languages), and completes the same survey questionnaire, we are able to compare student performance and other measures of educational quality across countries and across time. Prior to the implementation of the SACMEQ surveys, this was not possible. One could not compare the performance of primary school children in Kenya with those in South Africa, or Mozambican Grade 6 students with those from Swaziland, for example. To date, the SACMEQ data provides the only reliable means of comparing primary school quality across SACMEQ-participating countries[2].

The purpose of this report is to exploit the cross-national comparability of the SACMEQ data, and provide a comparison of primary school performance among four southern African countries: Botswana, Mozambique, Namibia and South Africa. While the choice of which countries to include is somewhat arbitrary, for this study it was not feasible to compare all SACMEQ countries and to provide sufficient detail for each country. Consequently, only four SACMEQ countries were chosen. However, the four countries that were selected are, in at least three ways, logical comparators: 1) they are in close geographical proximity to each other, 2) two of the countries have similar resources (South Africa and Botswana), and 3) Two of the countries have small populations (Botswana and Namibia), while the other two have large populations (Mozambique and South Africa).

The report is split into four main sections:

Section 1 – Country Profiles: contextualises the country-specific learning environment which students inhabit, and includes (for each country) a discussion of the school system, the SACMEQ III study, and basic country-specific descriptive statistics.

Section 2 – Cross-national Comparison Issues: highlights three of the main issues surrounding cross-national comparisons: 1) population size, 2) resource differentials, and 3) enrolment and drop-out rate differentials.

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[1] The countries that participated in the third SACMEQ survey were: Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania (Mainland), Tanzania (Zanzibar), Uganda, Zambia, and Zimbabwe

[2] One exception is the Trends in International Mathematics and Science Study (TIMSS) which could be used to assess primary school quality; however, of the SACMEQ participating countries, only South Africa and Botswana took part in TIMSS.

Section 3 – Student Performance: compares student maths and reading performance by province/region[3], school location and socio-economic quintile, as well as the distribution of functional illiteracy and functional innumeracy across these three categories.

Section 4 – Additional Aspects of Schooling: provides basic descriptive statistics on selected measures of educational quality, including those relating to *opportunity to learn* (teacher absenteeism), *pedagogical factors influencing performance* (teacher content knowledge, textbook access, and grade repetition), and other *enabling factors* (preschool education, school feeding programs and child nutrition).

Section 1 - Country Profiles

When making cross-national comparisons in education research, it is imperative that one appreciates the many differences between countries. Education is a social process, embedded within a national context which is influenced by the historical, political, cultural, social, economic and geographic factors of that specific country. Without an adequate understanding of this context one can often draw misleading conclusions about the success or failure - or more accurately - the improvement or deterioration, of an education system. Simply calculating and comparing the mean literacy or numeracy scores for different countries takes no cognisance of any of the abovementioned factors. Such a simplistic analysis favours countries with smaller populations, larger economies, and smaller land-masses, while at the same time, it under-appreciates the difficulties of providing education to large populations, spread over large land-masses and with fewer resources.

The four countries selected for this analysis (Botswana, Mozambique, Namibia and South Africa) provide a textbook example of such cross-national differences. Although they are geographically in close proximity to one other, their historical, economic and demographic differences are large. For example, Botswana's Gross National Product (GNP) per capita is 17 times larger than that of Mozambique's, and double that of Namibia's. South Africa's population is 23 times larger than that of Namibia's, and 25 times larger than Botswana's. Similarly large differences can be found when one observes the cross-national differences in adult literacy, public expenditure on primary education per pupil, and survival rates to Grade 5 (Table 1), all of which directly impact student performance.

[3] Although different countries have different names for their administrative zones, to avoid confusion this report uses 'province' and 'region' interchangeably.

Table 1 Cross-national country overview (statistics)

Country	Total population (mil)	Adult literacy rate	Net Enrolment Rate (2008)	GNP/cap PPP US$ (2008)	Public Current expenditure on primary education per pupil (unit cost) 2007 – [PPP constant 2006 US$]	Survival rate to Grade 5: school year ending 2007
Botswana	1.92	83%	87%[4]	13100	1228[5]	89%[3]
Mozambique	22.38	54%	80%	770	79[2]	60%
Namibia	2.13	88%	89%	6270	668	87%[3]
South Africa	49.67	89%	87%[6]	9780	1225	98%[7]
Source	(UNESCO, 2011)	(UNESCO, 2011)	(UNESCO, 2011)	(UNESCO, 2011)	(UIS, 2009)	(UNESCO, 2011)

The non-quantifiable differences between the four countries are similarly large. For example, apartheid in South Africa and the consequent institutionalisation of inequality have had a lasting impact on education in the country. Similar arguments can be made for the civil war in Mozambique, and the high income inequality in Namibia. The different histories, cultures and societies of each of these four countries have had, and will continue to have, a profound impact on their respective education systems. These too must be taken into account when comparing educational performance across the four countries.

Notwithstanding the above precautions, cross-national comparisons can provide valuable insights into educational performance in each of these very different countries. These studies provide us with data on the relative performance of students and their teachers. While participating countries may have differing educational objectives, and differing methods of reaching those objectives, there are some points of overlap on which all policy-makers would agree unequivocally. Firstly, and most importantly, all students should be functionally literate and functionally numerate by the 6^{th} Grade of primary school (approximately 13 years old). That is to say that they should be able to read a short and simple text and extract meaning from it, as well as be entirely comfortable with arithmetic operations, and be able to use these to make related judgements and interpretations. Secondly, all schools and teachers should be equipped with the necessary basic resources to achieve the first goal of functional literacy and functional numeracy (e.g. books to read, and workbooks to write in).

In order to provide some contextual information regarding the primary schooling systems in each of these countries four country-specific profiles have been included below. Their aim is twofold:

[4] 2006 data
[5] 2005 data
[6] 2007 data
[7] 2007 data from DBE (2011, p. 25) since it was not available in UNESCO (2010).

1. They illustrate the provincial distribution of both socio-economic status and school location, and thus contextualise the learning environment which students inhabit.
2. It shows the distribution of student performance across the various provinces and between the five socio-economic quintiles within each country.

Researchers and policy-makers who are unfamiliar with the provincial-level distinctions within and between these four countries should find these profiles helpful.

1.1) Botswana Profile

School system - The primary school system in Botswana can be sub-divided into two phases: *lower primary* (Standards 1 to 4), and *upper primary* (Standards 5 to 7) with students entering lower primary at 5 or 6 years old. There is a national examination at the end of each of these phases: the Standard 4 Attainment Test at the end of lower primary, and the Primary School Leaving Examination (PSLE) at the end of upper primary. Passing the Attainment Test is a prerequisite for students to proceed to upper primary, while the PSLE is primarily a diagnostic tool and is not a prerequisite for proceeding to secondary school (Monyaku & Mereki, 2011). Primary education in Botswana is free, and has been since the removal of primary school fees in 1980 (Zuze, 2010). Primary education is not compulsory. The two official languages of Botswana are: 1) Setswana, which is the most widely spoken language in the country, and 2) English, which is used for official purposes. English is the official language of communication and instruction for Standard 6 in Botswana.

SACMEQ III - For the purposes of the SACMEQ III survey, officials used the existing six administrative regions, and added Gaborone (the capital city) as a seventh, separate, region. Therefore the seven regions were: Central North, Central South, North, South, South Central, West, and Gaborone. Since 2009, the country now uses 10 education regions in an effort to decentralise the management of education (Monyaku & Mereki, 2011). The Botswana SACMEQ III study covered 3868 Grade 6 students, 386 teachers, and 160 schools.

Basic descriptives - The stacked bar charts of Figures B1[8] and B2 (following pages) show the regional distributions of socio-economic status[9] and school location. Clearly Gaborone and the North region

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[8] For ease of identification, the graphs within the country reports that refer to one country are labelled using the first letter of that country's name, thus Figure B1 refers to Botswana Figure 1, Figure M3 to Mozambique Figure 3 etc.

[9] In SACMEQ III, as is the case with most surveys which target children, it is not possible to get an accurate representation of the monetary value of family income. Consequently, socio-economic status (SES) was

have the highest concentrations of students from upper quintiles and the lowest concentrations of students from rural areas. This is to be expected given that Gaborone is the capital city of Botswana and that most schools in the North region are situated in Francistown and its surrounds. By contrast, the West and South regions have a high proportion of schools located in rural areas, and a large number of students coming from disadvantaged backgrounds. One must be cognisant of these geographical and socio-economic differences between the regions when assessing student performance by region.

Figures B3 and B4 show the distributions of Reading and Mathematics performance split by socio-economic[10] quintile, where quintile 1 contains the poorest 20% of students, quintile 2 the second poorest 20% and so on. In reading, and to a slightly lesser extent in maths, we can see that students from wealthier homes perform better than those from poorer homes.

Figure B5 plots the average student reading and mathematics score for each of the regions, and Botswana as a whole. The diagonal line shows where the reading and mathematics scores are equal to each other. Since all of Botswana's seven regions lie above this line, we can see that Botswana students do better in reading than they do in mathematics, at least as measured by the SACMEQ tests and based on SACMEQ performance levels in these two tests. Furthermore, we can see that all regions except the South performed better than the SACMEQ average for maths (510) and that all regions except the South and West regions performed better than the SACMEQ average for reading (512) – both shown by dotted lines in Figure B5. Each scatterplot observation has been weighted (i.e. the size of the bubble) according to the Standard 6 enrolments in that region. Although there are not any large discrepancies in student populations across the 7 regions, the North and West regions have slightly lower Standard 6 enrolments than the other five regions.

One noticeable feature of Figure B5 is the extent that Gaborone outperforms the other regions in both reading and mathematics. While this is partially to be expected given that Gaborone is the capital city and has the largest concentration of wealthy students, there are three other factors worth noting: **1**) Gaborone is a city while all the other SACMEQ zones are administrative regions (similar to provinces). **2**) 28.9% of Gaborone's primary schools are private schools compared to the national average of 7.5% (Monyaku & Mereki, 2011). **3**) There are only 45 schools (public and private) in Gaborone, compared with an average of 123 in the other six regions.

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inferred from a series of possession questions - students were asked whether or not each of 31 items was found in the place where they stayed during the school week. These 31 possessions were used in a Multiple Correspondence Analysis (MCA) to form the SES index. Spaull (2011, p. 6) provides the full list of possessions used.

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Figure B1

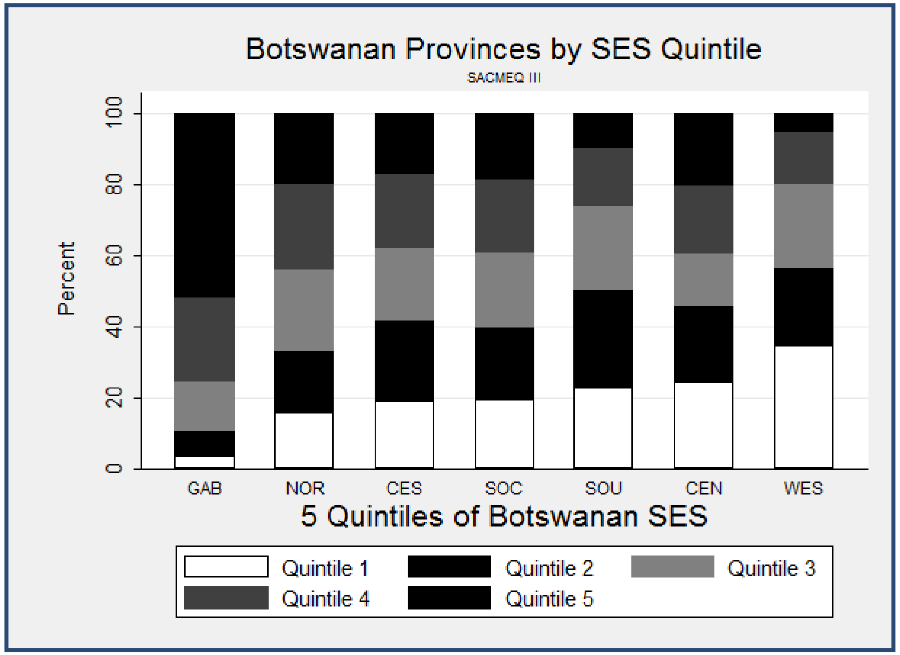
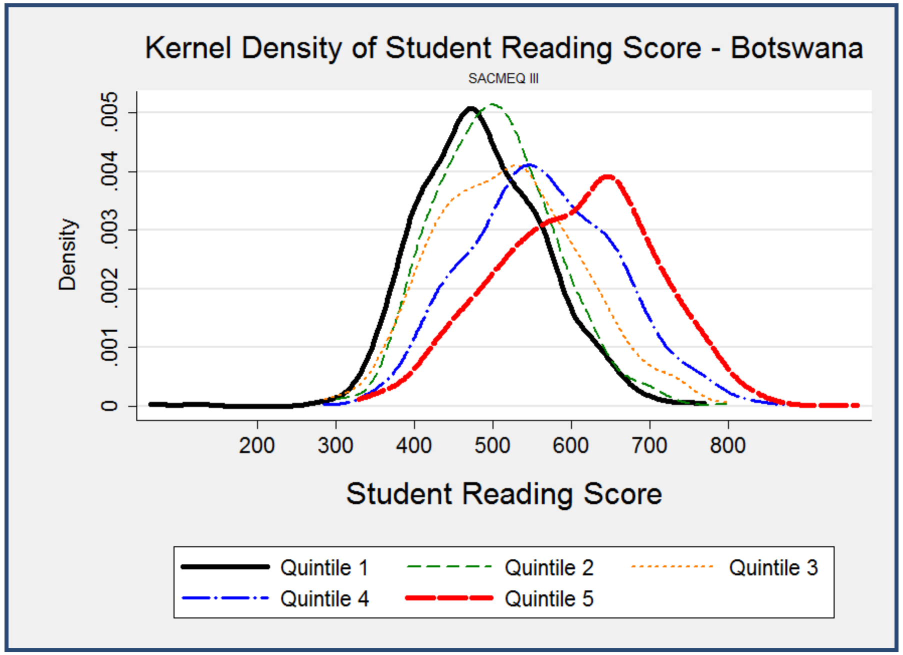


Figure B3



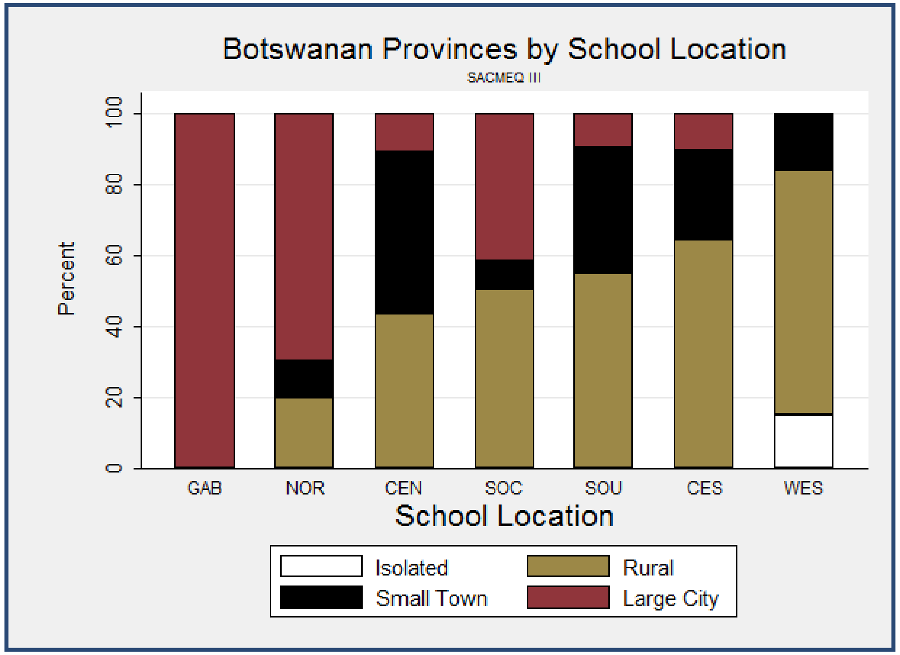


Figure B2

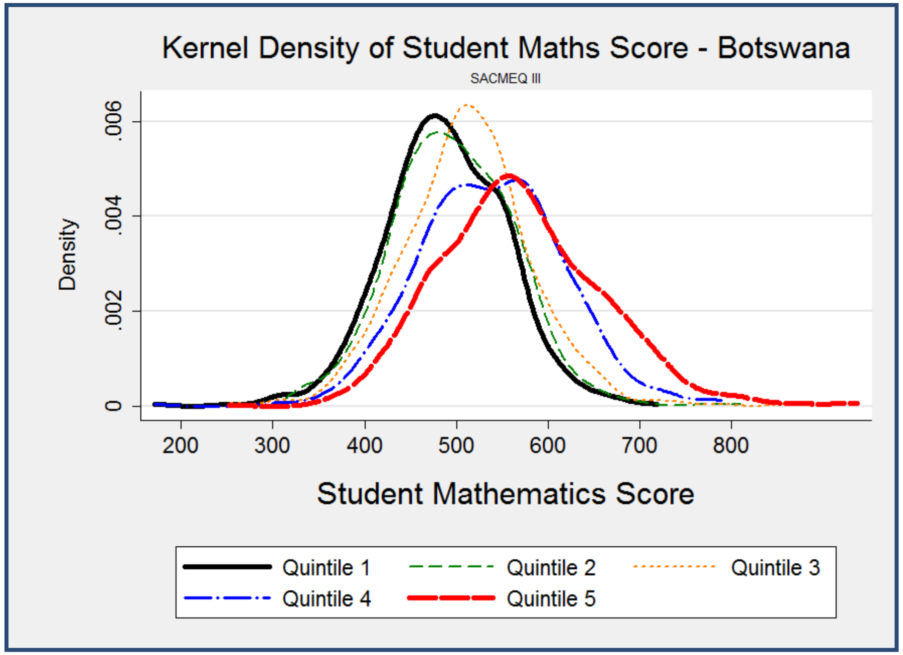
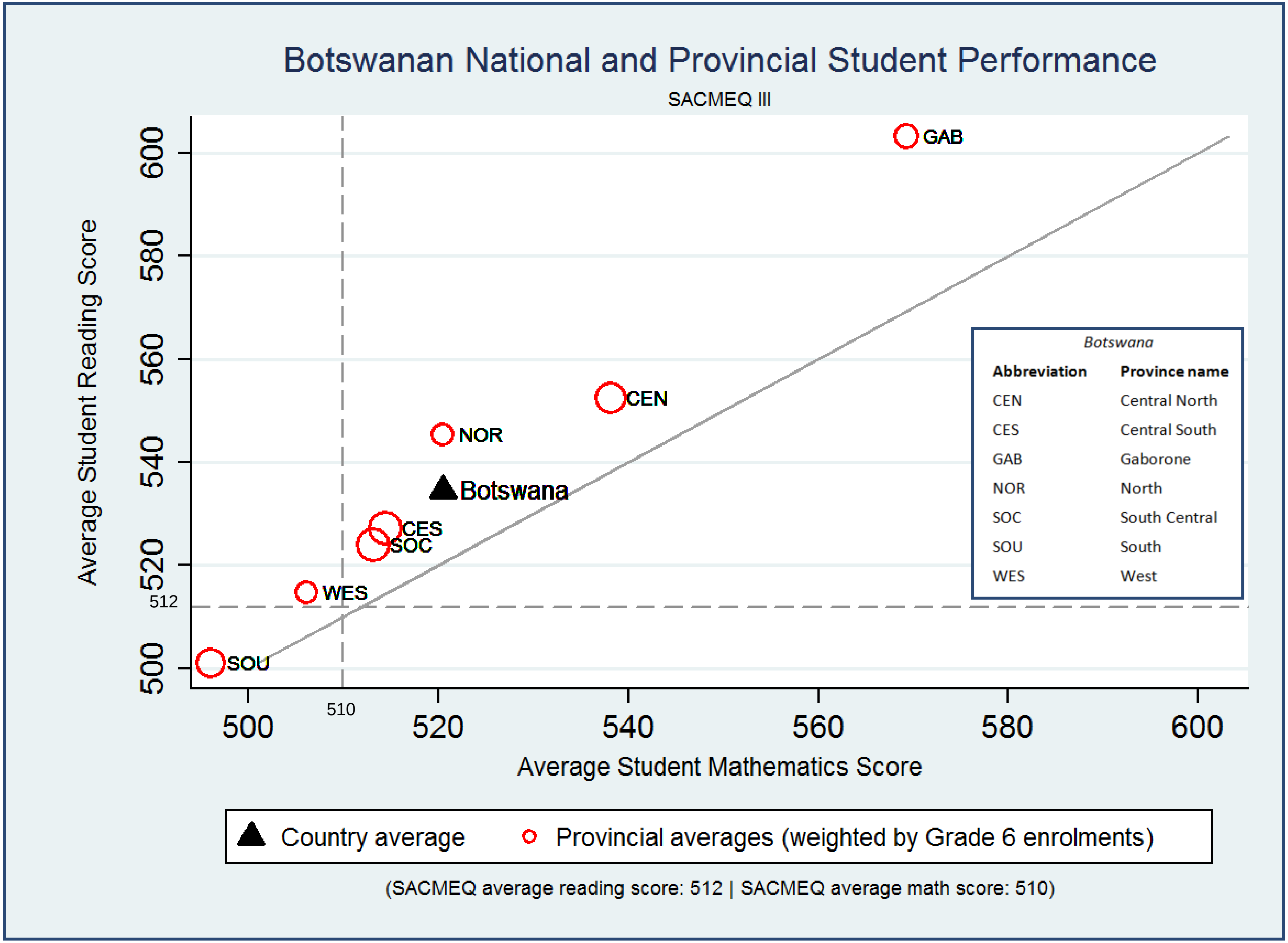


Figure B4

Figure B5



Botswanan National and Provincial Student Performance
SACMEQ III
Average Student Reading Score
600
580
560
540
520
512
500
Average Student Mathematics Score
500
510
520
540
560
580
600
GAB
CEN
NOR
Botswana
CES
SOC
WES
SOU
Botswana
Abbreviation
Province name
CEN
Central North
CES
Central South
GAB
Gaborone
NOR
North
SOC
South Central
SOU
South
WES
West
Country average
Provincial averages (weighted by Grade 6 enrolments)
(SACMEQ average reading score: 512 | SACMEQ average math score: 510)

1.2) Mozambique Profile

School system - Over the period 2000 (SACMEQ II) to 2007 (SACMEQ III), Mozambique has embarked on a rapid expansion of access to primary schooling. In the year 2000, 218 594 students were enrolled in upper primary (Grade 6 and 7) compared to 633 674 in 2007, representing an expansion of 290% in less than a decade (MEC, 2009). When one compares SACMEQ II (2000) and SACMEQ III (2007), it is of fundamental importance that this drastic increase in enrolment is taken into account.

It is logical to assume that those children who were excluded from primary education in 2000 are more likely to be found in rural areas, to come from economically poor backgrounds, and, as a result, to perform worse in reading and mathematics. Since SACMEQ samples schools, and not households, it implicitly excludes children who are not enrolled in school. Consequently, SACMEQ II provides an overestimation of the achievement levels of the average Mozambican child, as well as the resources available to him or her. Due to the drastic expansion of primary schooling between 2000 and 2007, the children who were previously excluded from schooling now formed part of the primary school population, and thus were included in the sample for SACMEQ III. As a result, the *true* performance of Mozambique is likely to be significantly lower than was reflected in SACMEQ II.

Following on from the above discussion, one must be cautious when evaluating the improvement or deterioration in the quality of primary education in Mozambique over this period. For example, is the drop in average maths and reading scores between SACMEQ II and III due to deterioration in the quality of education in the country, or because we are now also measuring those students (poorer and weaker) who were previously excluded? Separating the effects of increased enrolments from those of a change in education quality is difficult, but necessary.

One feature of the Mozambican primary education system that exists due to the rapid expansion of primary school enrolments is that many schools operate more than one shift in a day. Due to a shortage of school places, most schools will teach one batch of students in the morning and another in the afternoon. Portuguese is both the official language of the country and the medium of instruction within schools[11].

SACMEQ III - For the purposes of the SACMEQ III project, the survey was stratified according to the existing 11 provinces, which are: Cabo Delgado, Niassa, Nampula, Tete, Zambézia, Manica, Sofala,

[11] Since the implementation of the new curriculum in 2004, students are meant to be able to learn in their mother tongue for the first three years of primary school whereafter they switch to Portuguese. However, as of 2007, less than 1% of students in the beginning grades of primary school were taught in their mother tongue (Passos, Nahara, Magaia, & Lauchande, 2011).

Inhambane, Gaza, Maputo Province, and Maputo City (Cidade). The SACMEQ III study in Mozambique covered 3360 Grade 6 students, 865 teachers, and 183 schools. The SACMEQ tests were conducted in Portuguese.

Basic descriptives - Figure M1 below shows the distribution of socio-economic status across the 11 Mozambican provinces. The majority of quintile 1 and 2 (poor) students are situated in one of only four provinces (Tete, Niassa, Cabo Delgado, and Zambézia), and the majority of quintile 4 and 5 (wealthy) students are found in either Maputo Province, Maputo City, Inhambane, or Gaza. Furthermore, the poorer four provinces are all located in the north of the country while the richer four provinces are all located in the south of the country[12]. It is perhaps predictable then that these southern provinces perform noticeably better than the other 7 provinces in both reading and maths, and that the poorer northern provinces perform worse than the other provinces (Figure M5).

A closer inspection of Figure M5 shows that almost all Mozambican provinces perform better in mathematics than in reading when compared to SACMEQ-wide performance levels in these two tests (i.e. below the diagonal line). This is a peculiar result since the majority of the other three countries' provinces perform better in reading than in maths. In both reading and maths, all provinces, with the exception of Maputo City, perform worse than the SACMEQ average for these subjects – i.e. below the dotted lines.

Figure M3 shows that students from quintile 4 and 5 perform moderately better in reading than those from quintiles 1, 2 and 3. However, the difference in mathematics performance across the five quintiles is barely noticeable (Figure M4). Again, this result is at odds with the trends in mathematics performance for the other three countries, where the wealthiest quintile performs noticeably better than the poorest quintile.

[12] Provincial maps of Mozambique, Namibia and South Africa can be found in Appendix C.

Figure M1

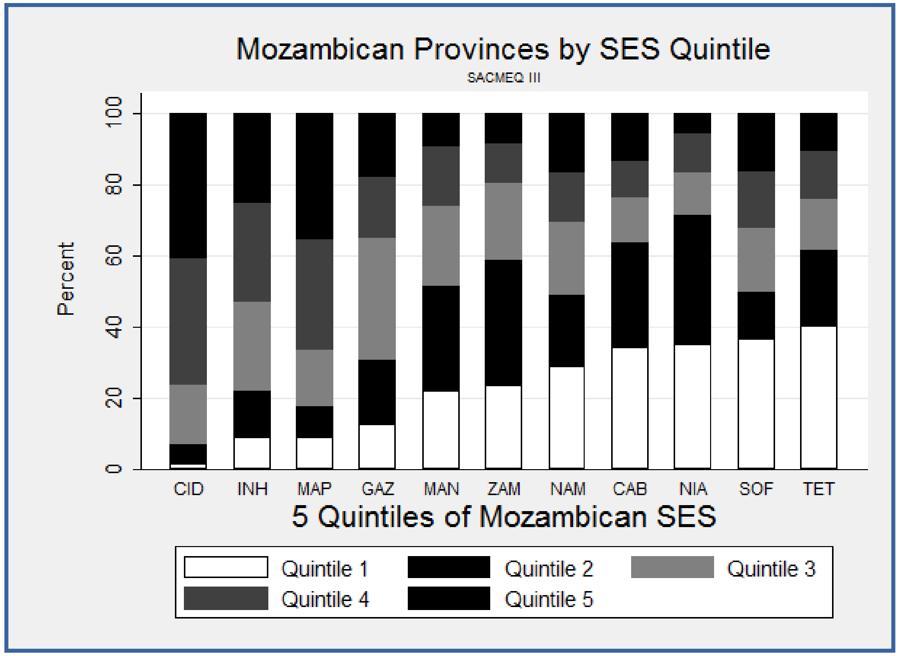
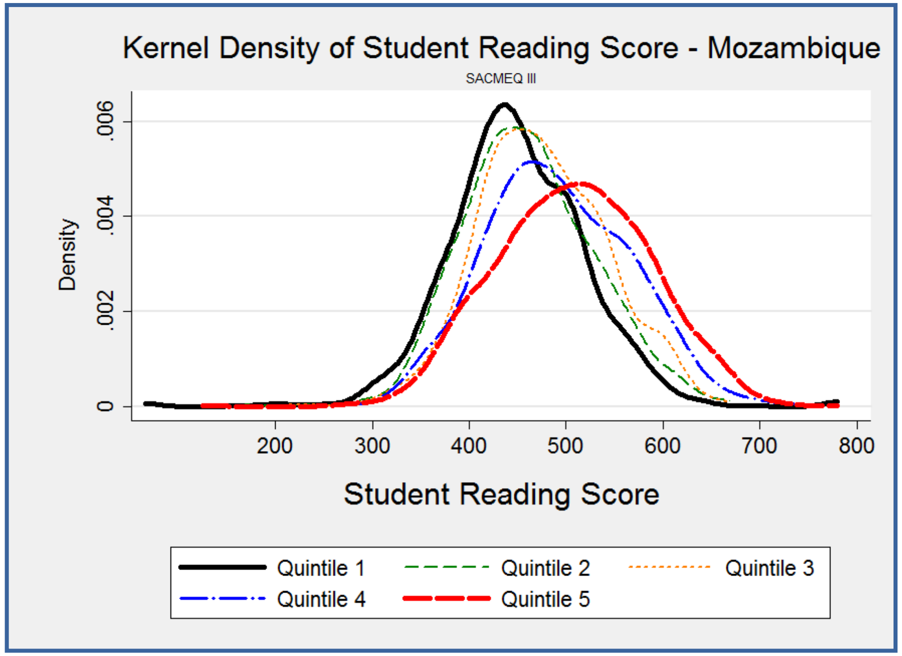


Figure M3



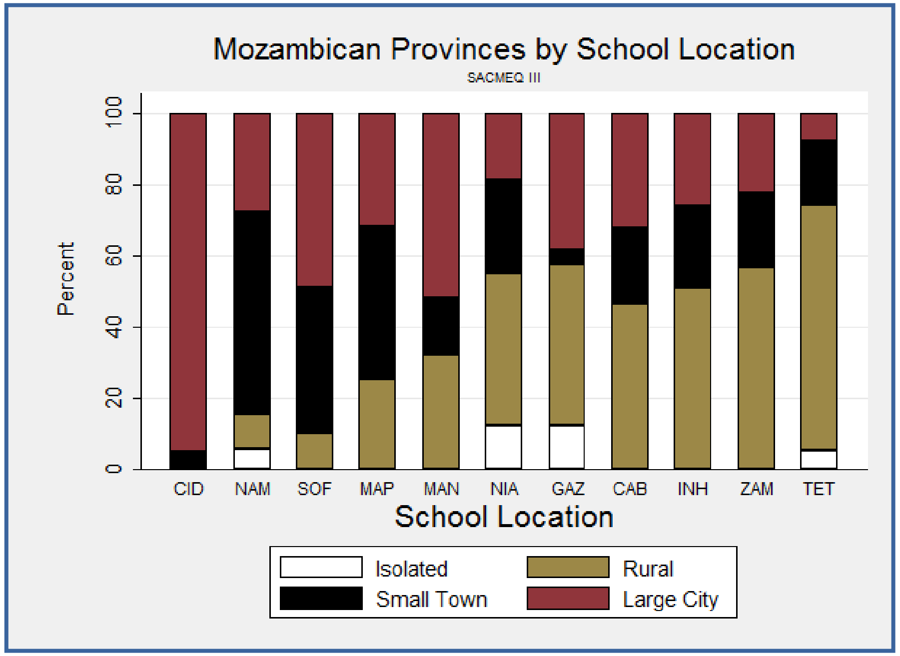


Figure M2

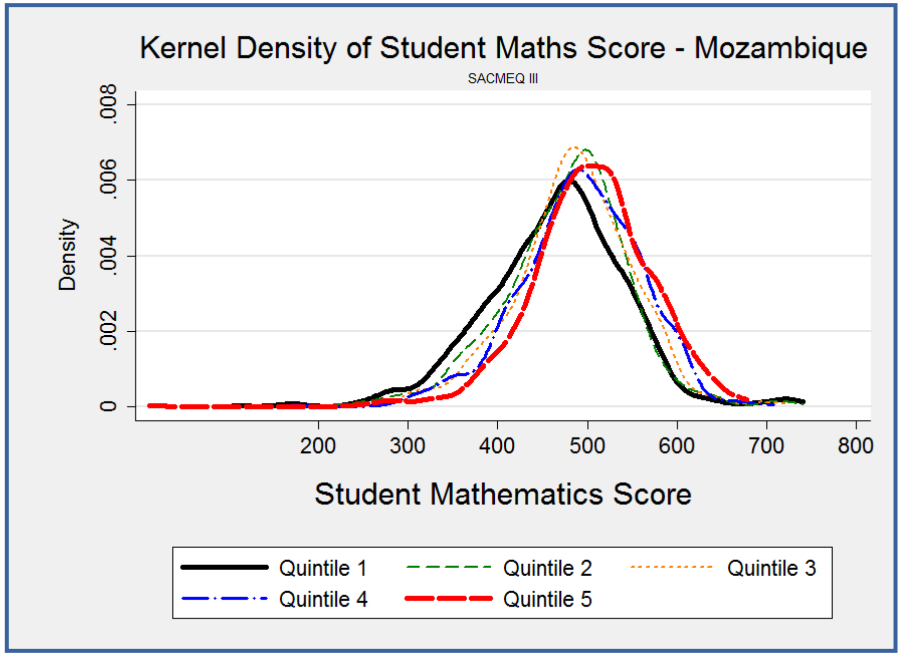
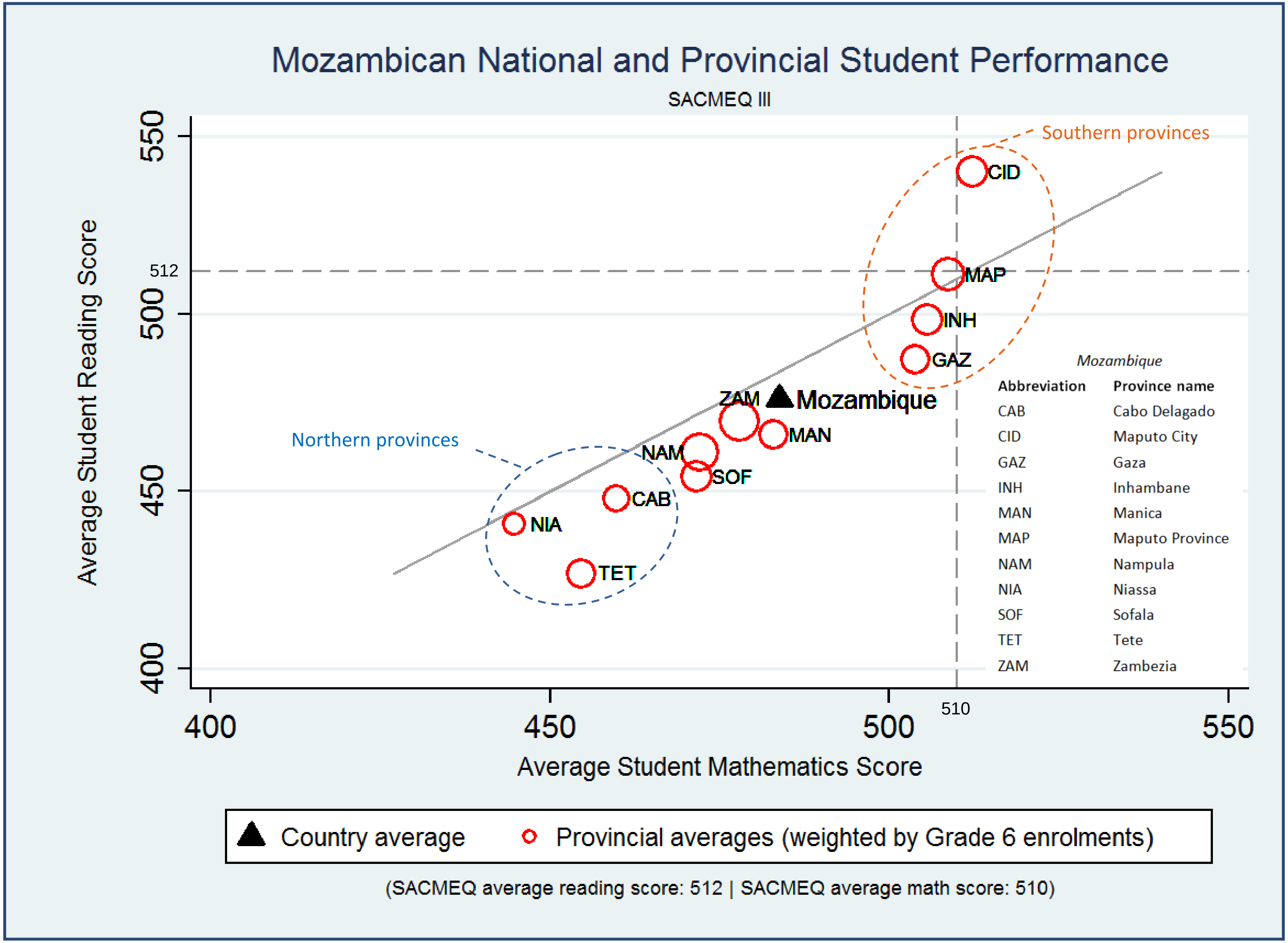


Figure M4

Figure M5



Mozambican National and Provincial Student Performance
SACMEQ III
Average Student Reading Score
550
512
500
450
400
Average Student Mathematics Score
400
450
500
510
550
Southern provinces
Northern provinces
CID
MAP
INH
GAZ
ZAM
Mozambique
MAN
NAM
SOF
CAB
NIA
TET
Mozambique
Abbreviation
Province name
CAB
Cabo Delagado
CID
Maputo City
GAZ
Gaza
INH
Inhambane
MAN
Manica
MAP
Maputo Province
NAM
Nampula
NIA
Niassa
SOF
Sofala
TET
Tete
ZAM
Zambezia
Country average
Provincial averages (weighted by Grade 6 enrolments)
(SACMEQ average reading score: 512 | SACMEQ average math score: 510)

1.3) Namibia Profile

School system – Primary education in Namibia is split into two phases: five years of *lower primary* which consists of Grade 0 (pre-primary) to Grade 4, followed by 3 years of *upper primary* (Grades 5 - 7). The medium of instruction for lower primary is the student's mother tongue, however, from Grade 4 onwards all students are instructed in English. In 2000, the government introduced the national Grade 7 examinations for Mathematics, English and Science, which all students are required to take (SACMEQ, 2011). Primary education in Namibia is free and compulsory.

SACMEQ III - For the purposes of the SACMEQ III survey, officials used the 13 existing designations for educational management in the country. These are: Caprivi, Erongo, Hardap, Karas, Kavango, Khomas, Kunene, Ohangwena, Omaheke, Omusati, Oshikoto, Otjozondjupa, and Oshana. The Namibia SACMEQ III study covered 6398 Grade 6 students, 827 teachers, and 267 schools.

Basic descriptives – In accordance with our initial expectations, those provinces which are mostly rural (Figure N2 - Omusati, Ohangwena, Oshikoto and Kavango) are also where the majority of quintile one and two students are found (Figure N1). All four of these provinces are situated in the north of the country, and three of the four border Angola. They are also some of the most densely populated provinces in the country, and the worst performing provinces (Figure N5). In contrast, the majority of schools in the Erongo and Khomas provinces are found in large cities and are populated by wealthier students. This is unsurprising given that the capital city Windhoek is situated in Khomas, and the two other major cities, Swakopmund and Walvis Bay, are found in Erongo.

The distribution of student performance in reading (Figure N3) and maths (Figure N4) show that wealthier students perform better than poorer students, particularly so for reading. Figure N3 shows that there is much larger variation in student reading performance within the wealthiest quintile (quintile 5) compared to the other four quintiles. The reading distribution of the fifth socio-economic quintile of students is somewhat removed from the other four quintiles exhibiting a similar situation to that found in South African reading performance (Figure S3). In all likelihood, this is driven by the high levels of inequality in both of these countries. Figure N4 shows the mathematics distribution of each of the five socioeconomic quintiles. While there is some progression in performance as one moves from lower to higher quintiles, it is far less pronounced than in the reading distributions.

Figure N5 shows that all Namibian provinces perform better in reading than in maths. Of the 13 provinces, only Erongo, Khomas and Karas perform better than the SACMEQ average for both reading and mathematics, with Otjozondjupa performing better than the SACMEQ average for reading only.

Figure N1

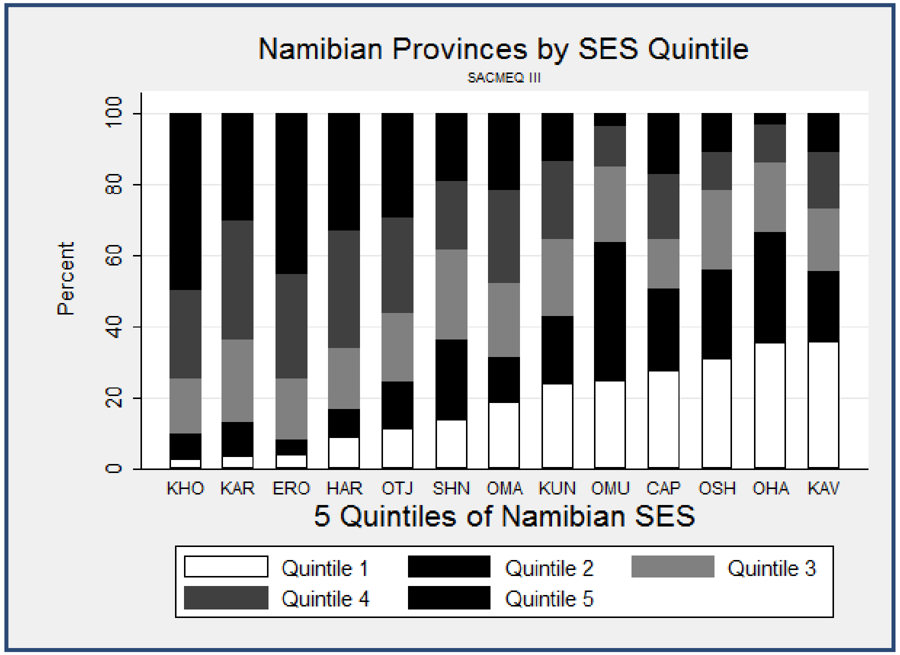
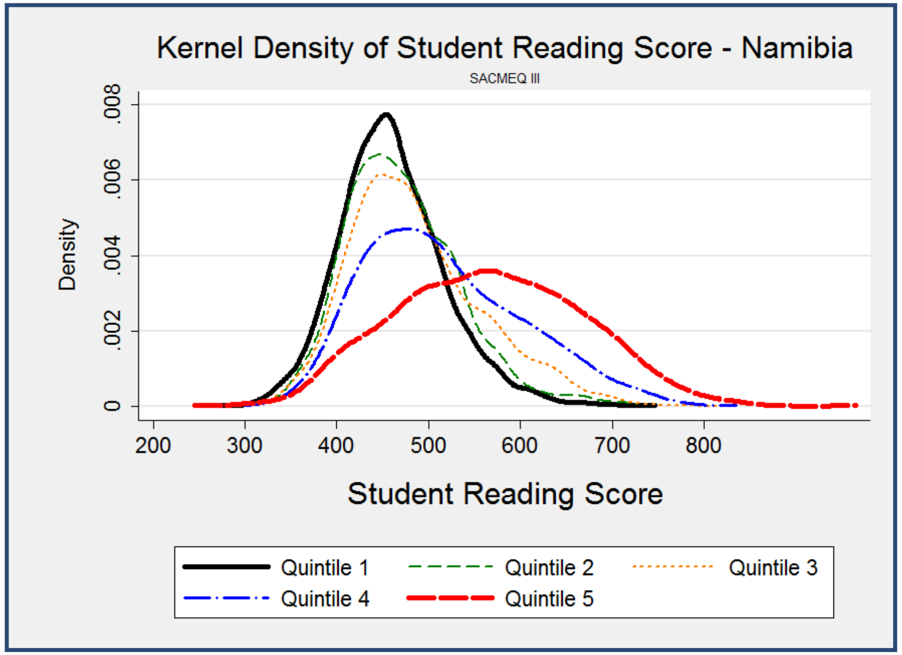


Figure N3



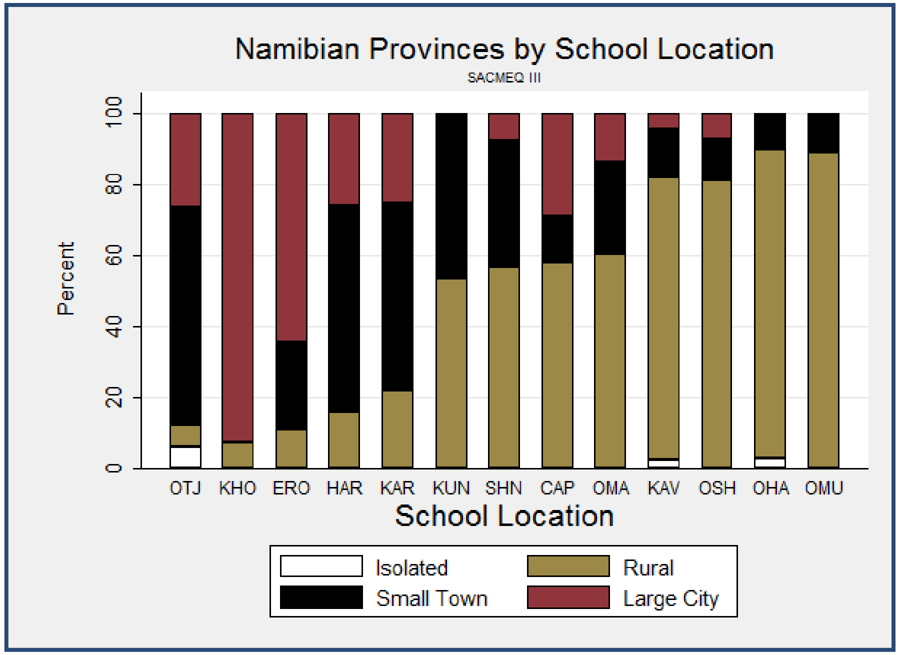


Figure N2

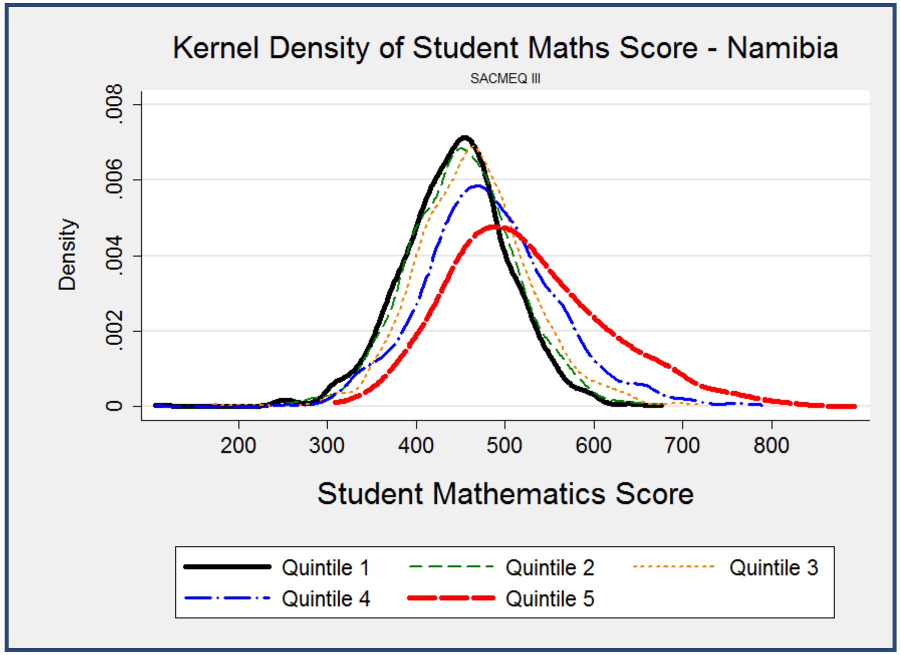
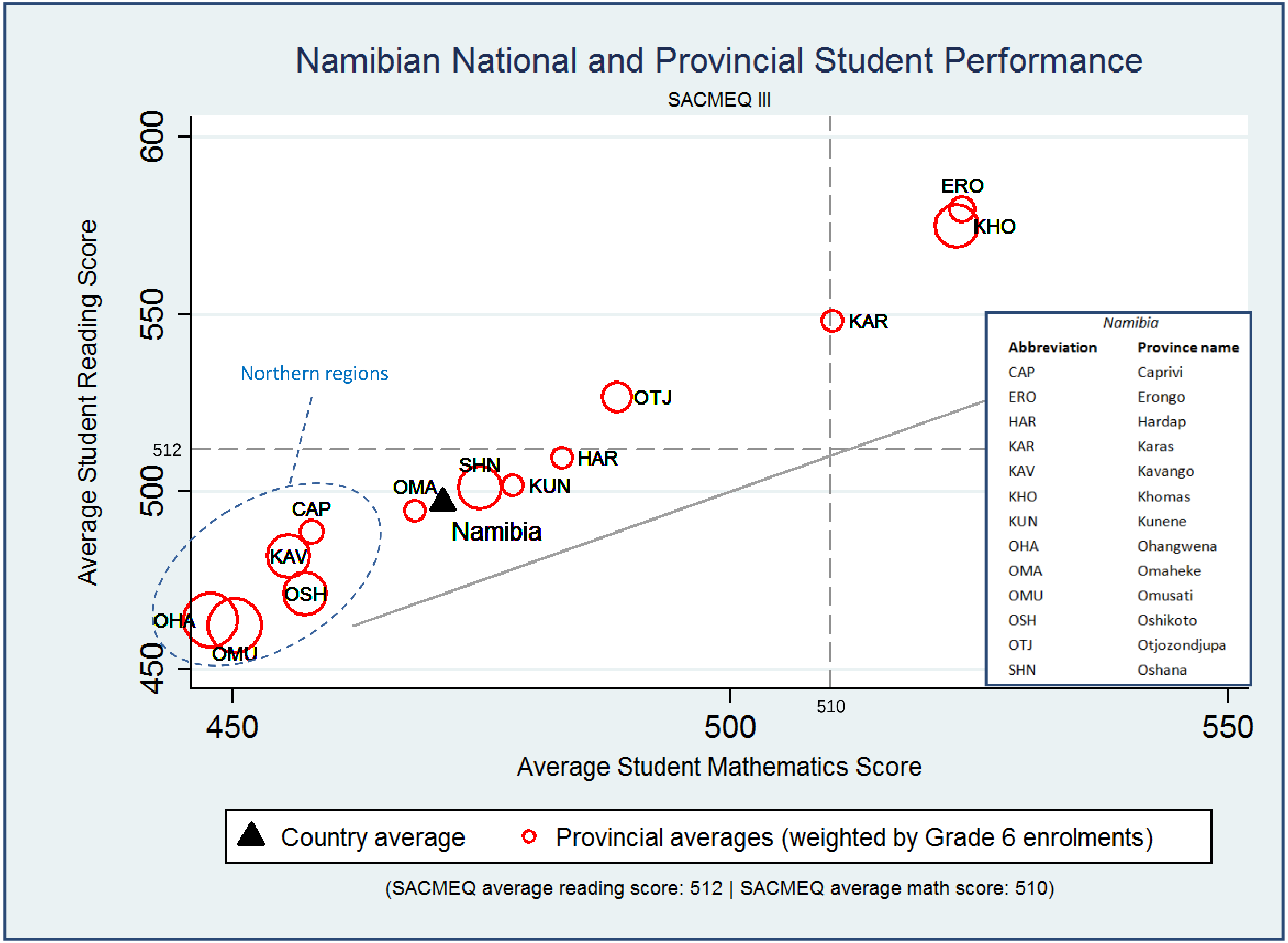


Figure N4

Figure N5



Namibian National and Provincial Student Performance
SACMEQ III
Average Student Reading Score
600
550
512
500
450
Average Student Mathematics Score
450
500
510
550
Northern regions
ERO
KHO
KAR
OTJ
HAR
SHN
KUN
OMA
Namibia
CAP
KAV
OSH
OHA
OMU
Namibia
Abbreviation Province name
CAP Caprivi
ERO Erongo
HAR Hardap
KAR Karas
KAV Kavango
KHO Khomas
KUN Kunene
OHA Ohangwena
OMA Omaheke
OMU Omusati
OSH Oshikoto
OTJ Otjozondjupa
SHN Oshana
Country average
Provincial averages (weighted by Grade 6 enrolments)
(SACMEQ average reading score: 512 | SACMEQ average math score: 510)

1.4) South Africa Profile

School system – The South African education system is split into primary school (Grades 1-7) and secondary school (Grades 8-12). Although there are 11 official languages in South Africa, English is used as the language of commerce, and, in addition to Afrikaans, is the main medium of instruction in the country. Students learn in their mother-tongue for the first three years of primary school (Grades 1 - 3), where after they switch to either English or Afrikaans for the remainder of their schooling career (Grades 4 - 12).

SACMEQ – The SACMEQ III study in South Africa used the nine provinces as strata. These are: Eastern Cape, Freestate, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West, and Western Cape. SACMEQ III was the first time teachers were tested in addition to students. Although most other SACMEQ countries wrote the teacher tests in SACMEQ II (in addition to SACMEQ III), due to teacher union objections, South African teachers did not write the teacher tests in SACMEQ II. The South Africa SACMEQ III study covered 9071 Grade 6 students, 1163 teachers, and 392 schools. Spaull (2011) provides a descriptive and multivariate analysis of the SACMEQ III South Africa study.

Basic descriptives – From Figure S1 one can see that wealth is not distributed evenly across the nine South African provinces. The majority of quintile 1 and 2 students can be found in Limpopo, KwaZulu-Natal and the Eastern Cape, while Gauteng and the Western Cape have the greatest concentration of quintile 4 and 5 students. This is not surprising since these two provinces are the commercial hubs of South Africa, with two of largest cities in the country: Johannesburg in Gauteng and Cape Town in the Western Cape. Since there is a strong correlation between poverty and school location, it is not surprising that the three poorest provinces mentioned above have the greatest number of schools situated in rural areas. By contrast, the wealthier and more urban provinces of the Western Cape and Gauteng have fewer rural schools.

The stark inequalities in educational performance can be seen most dramatically in Figure S3. The wealthiest quintile of students far outperform the lower four quintiles, to the extent that one might think that this graph were depicting two educational systems and not one. A similar, although less stark, picture emerges in student mathematics performance (Figure S4). In both of these figures, it is worth noting the homogeneity amongst the lowest three quintiles – the differences in performance across these quintiles is barely noticeable, especially for mathematics.

With the exception of the wealthiest two provinces (Gauteng and the Western Cape), all other provinces perform worse than the SACMEQ average for both reading and mathematics (Figure S5).

This is surprising given that South Africa's economy is by far the largest amongst the SACMEQ countries and it is one of the richest in per capita terms. The variation in student enrolments across the nine provinces is also important to consider, with KwaZulu-Natal having the largest share of grade 6 students, and the Northern Cape having the smallest share. To place these figures in perspective, there are more grade 6 students enrolled in KwaZulu-Natal than in the whole of Botswana.

Figure S1

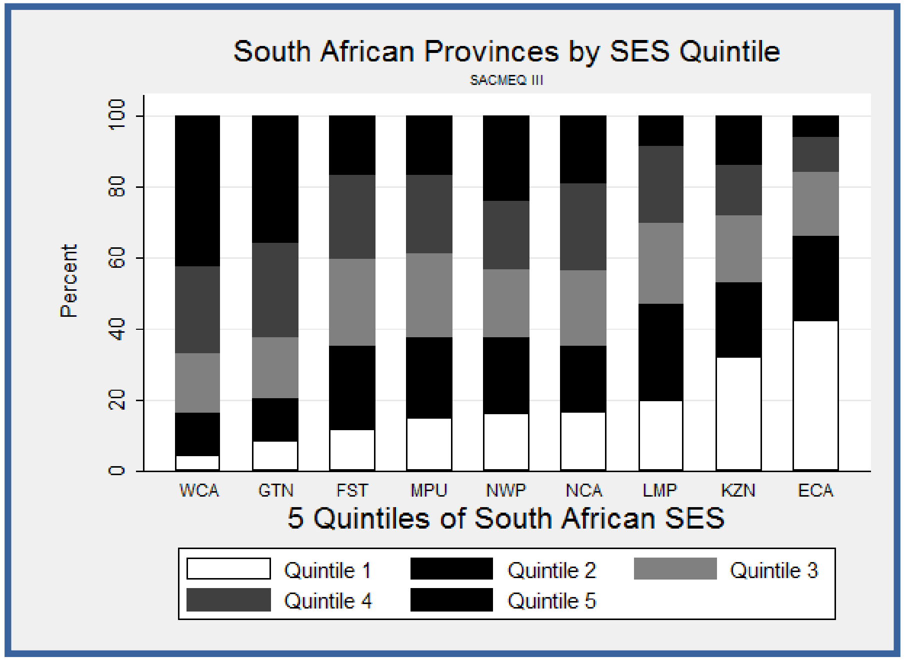
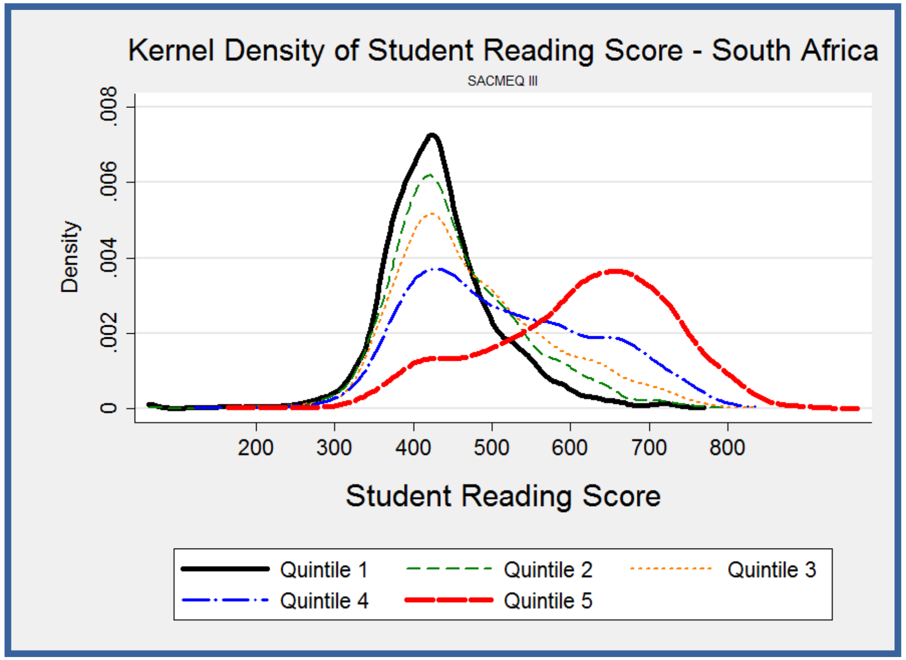


Figure S3



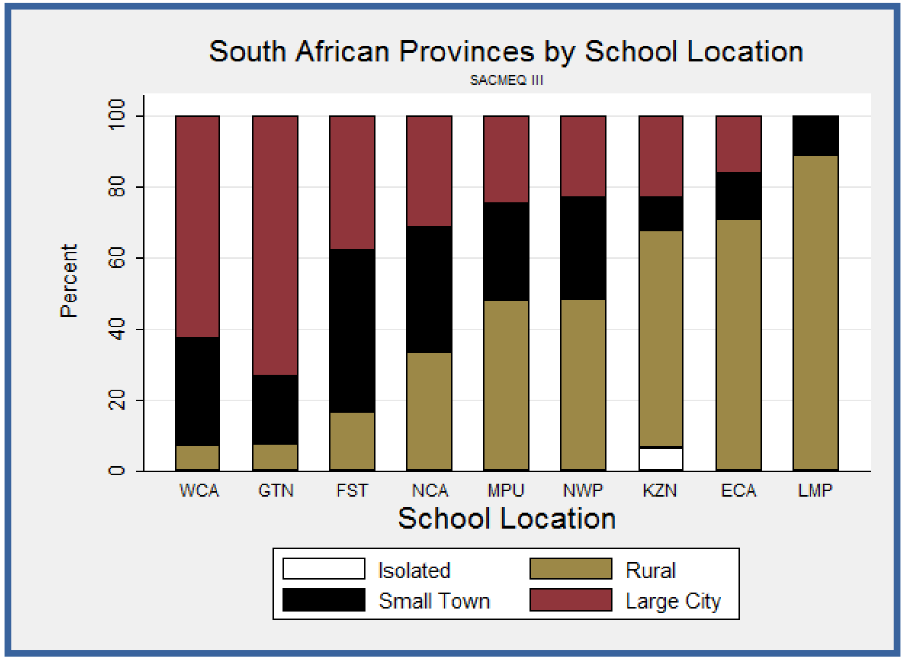


Figure S2

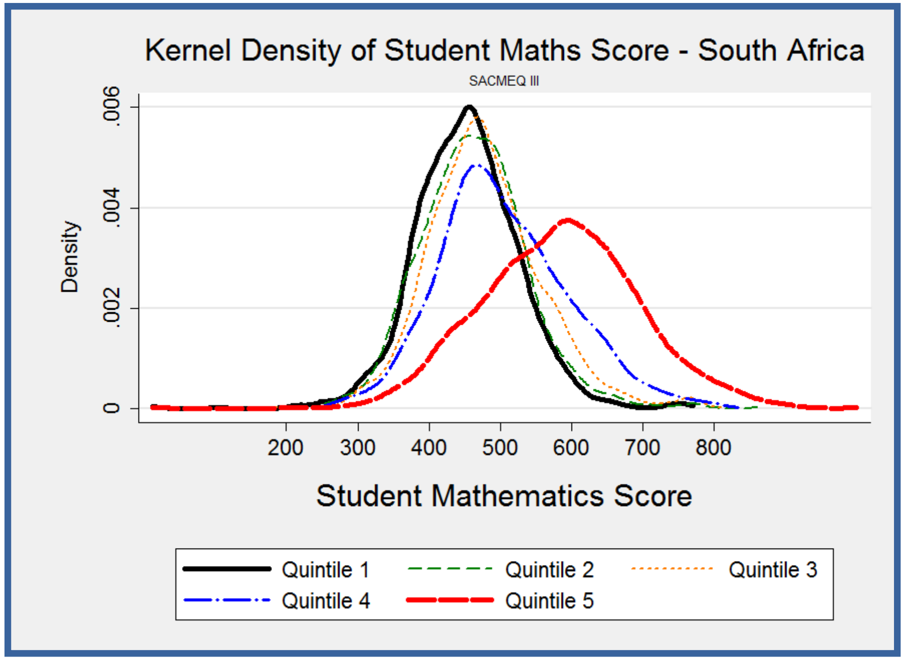
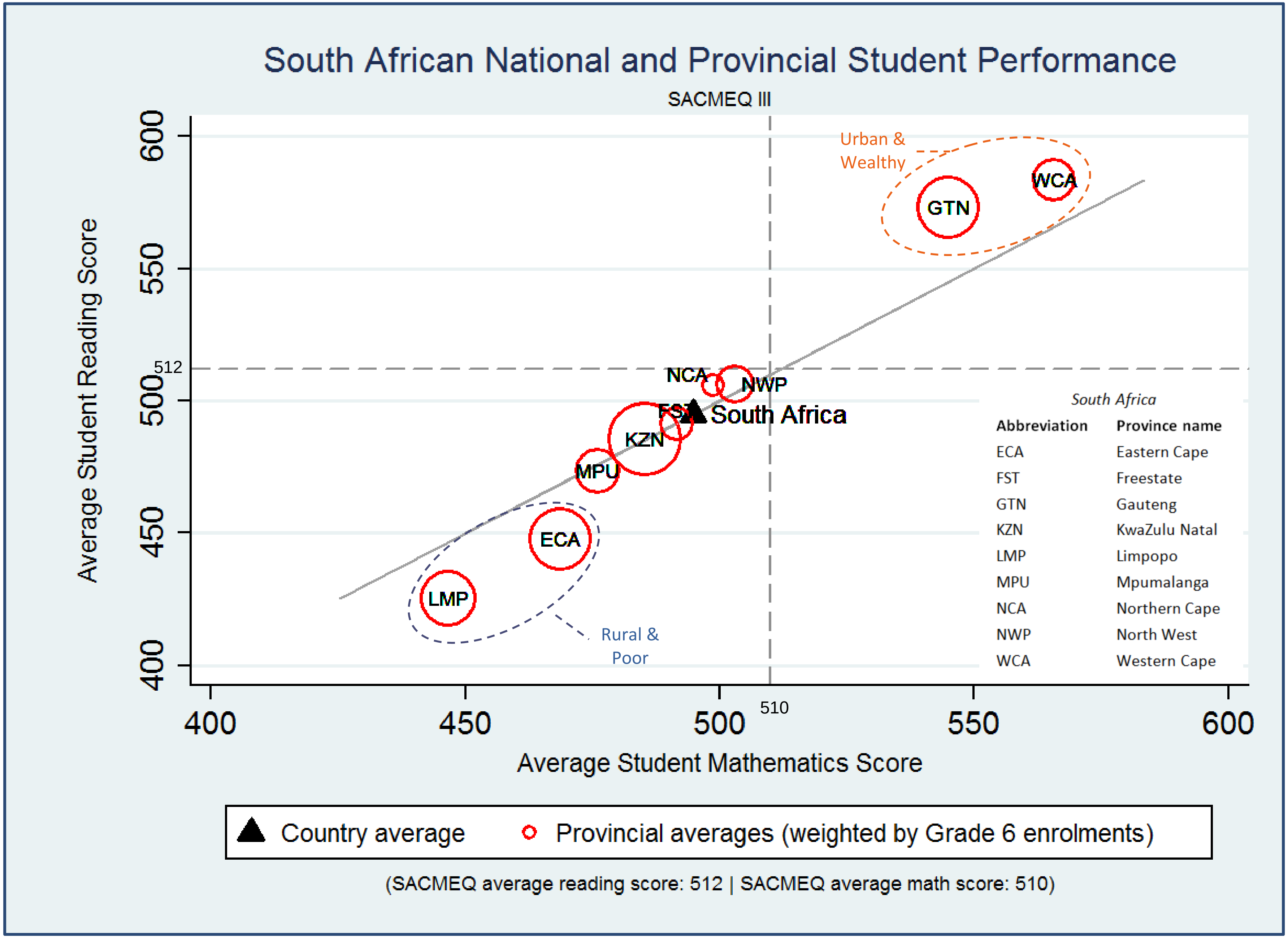


Figure S4

Figure S5



South African National and Provincial Student Performance
SACMEQ III
Average Student Reading Score
600
550
512
500
450
400
Average Student Mathematics Score
400
450
500
510
550
600
Urban & Wealthy
Rural & Poor
GTN
WCA
NCA
NWP
FST
South Africa
KZN
MPU
ECA
LMP
South Africa
Abbreviation Province name
ECA Eastern Cape
FST Freestate
GTN Gauteng
KZN KwaZulu Natal
LMP Limpopo
MPU Mpumalanga
NCA Northern Cape
NWP North West
WCA Western Cape
Country average
Provincial averages (weighted by Grade 6 enrolments)
(SACMEQ average reading score: 512 | SACMEQ average math score: 510)

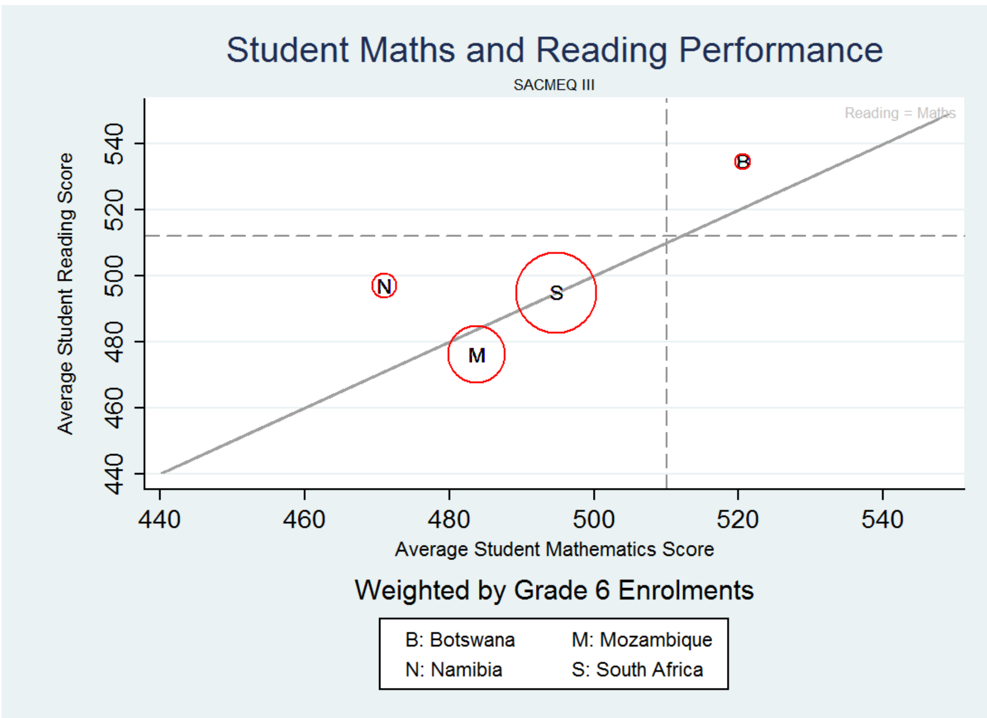
Section 2 - Cross-national Comparison Issues

The preceding analysis has focused on intra-national variation in school location, socio-economic status and student performance. However, it is of some interest to place these countries and provinces in regional context. For example, there may be lessons to learn from successful or unsuccessful policies that have been implemented in neighbouring countries. Before one can make a legitimate comparison between these four countries, three contextual factors must be fully appreciated: population magnitudes, resource differentials, as well as enrolment and dropout rates.

2.1) Population Size

Following form the premise that a larger country, with more people, is more difficult to administrate than a smaller one, with fewer people, the Grade 6 enrolments for each of the four countries are presented in Figure 1 below. While Botswana and Namibia are mostly comparable, with relatively small Grade 6 populations of approximately 41,665[13] and 48,251 respectively, much larger Grade 6 populations occur in Mozambique (319,243) and South Africa (928,486).

Figure 1

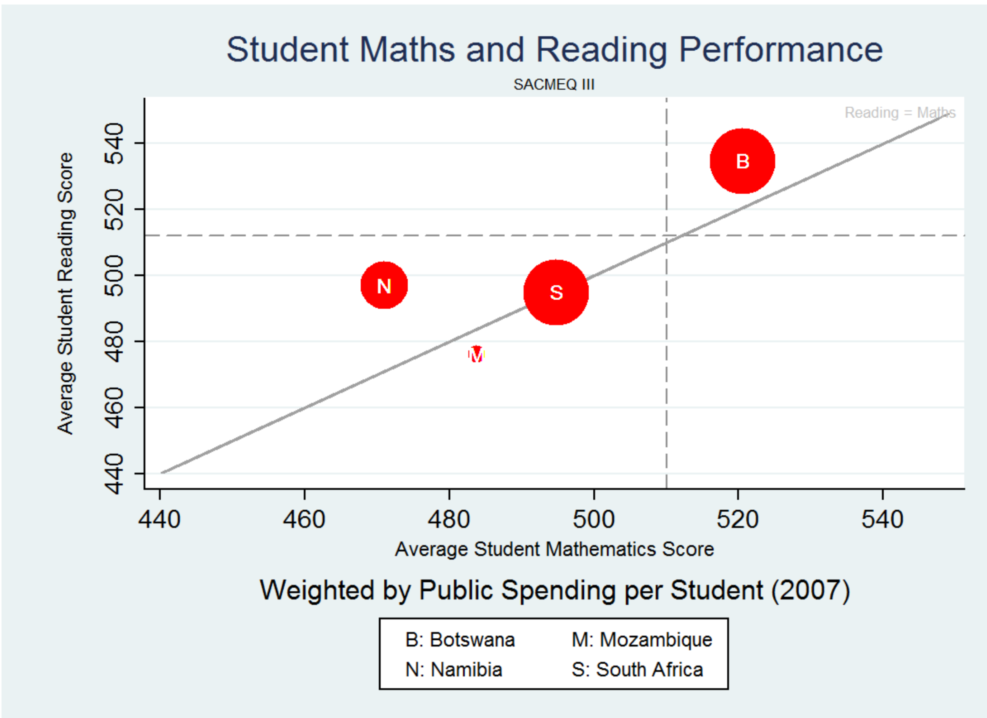


[13] These figures use SACMEQ's raising factor weight variable (*rf2*) and may differ slightly from official figures. However, the broad trends in enrolments so derived between the four countries do not differ substantially.

2.2) Resource Differentials

In addition to large enrolment differentials between the four countries, there is also a stark difference in available resources in each of the four countries - both in terms of Gross Domestic Product (GDP) per capita, and public current expenditure on primary education per pupil (Table 1). Figure 2 below shows the average maths and reading performance for each country, with each bubble being weighted by the public per pupil spending in that country. While both Botswana and South Africa are well-resourced countries, only Botswana performs better than all three other countries; it is not clear why South Africa, an equally well-resourced country, performs so much worse than Botswana. What is particularly noticeable from Figure 2 below is that Mozambican schools are significantly under-resourced relative to the other three countries. The amount of money spent on the average Mozambican child in primary school per year is only 6.4% ($79) of what is spent on the average Batswana or South African child (approximately $1200), and 11.8% of what is spent on the average Namibian child ($668). It is without question that these resource differentials are an important factor in explaining student performance. However, the *extent* to which resources impact performance remains to be seen, as the South Africa – Botswana example above has highlighted.

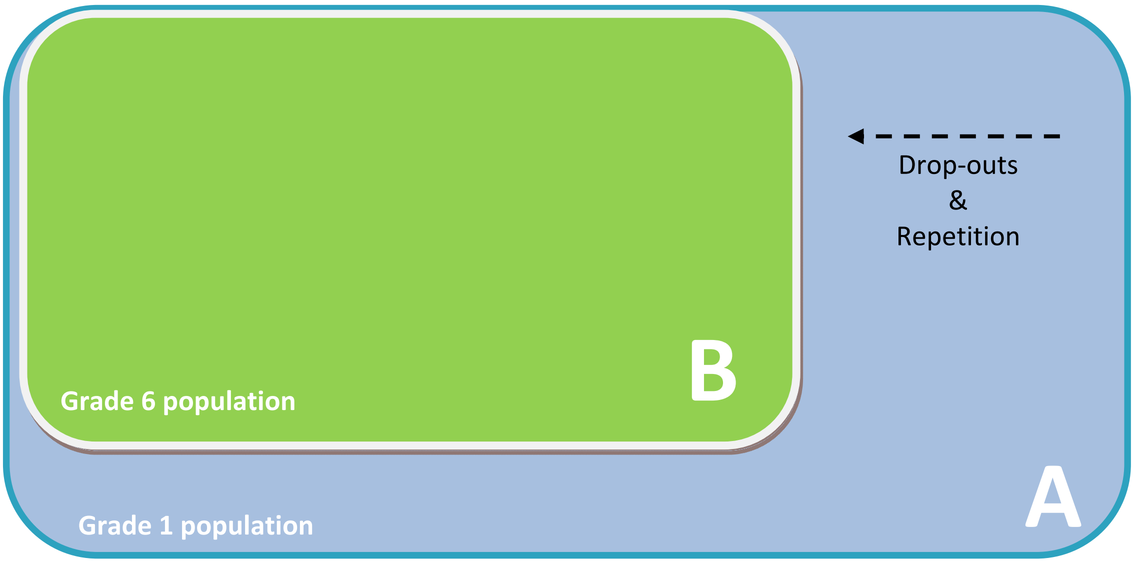
Figure 2

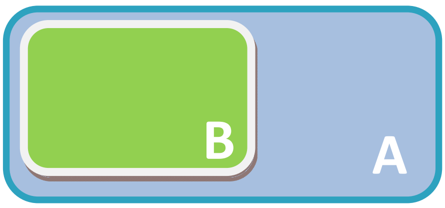


Another distinction that must be emphasised is the matter of internal efficiency. Comparing dollars spent is a very crude measure of tangible benefits to children, and does not take into account the bureaucratic efficiency of the country, the extent of corruption, or even what the money is being spent on. While increasing resources is not always possible, it is possible to streamline the administrative process, and to ensure that existing funds are used where the return is greatest.

2.3) Enrolment and Dropout Rates

One of the major issues that must be addressed when making cross-country comparisons is that of differing rates of enrolment and dropout. Both of these concepts help to explain which students actually make it into the grade being analysed – in this case Grade 6. Although there have been marked improvements in access to education for all of the four countries under review, most notably in Mozambique, there are still large differences in retention and dropout. Since the vast majority of children in each of these four countries *start* school (i.e. they are enrolled in Grade 1), we will focus on the effects of dropout and temporarily ignore initial access. If we assume that all students start Grade 1, the only factor that prevents a student reaching Grade 6 is repeated failure or dropout. The diagrams below show this concept clearly. It is important to realise that the group of students in Grade 6 are a select sub-group who were firstly enrolled in school, and secondly, passed all the previous grades (i.e. did not drop out).





Scenario 1

- High dropout/repetition

Scenario 2

- Low dropout/repetition

Two scenarios are presented in the above schematic, showing the results of high and low dropout and repetition[14]. Scenario 1 is characterised by high dropout and repetition which means that many students never make it to Grade 6. In scenario 2, very few students drop out before Grade 6 and thus most progress to Grade 6. Although students in both scenarios have access to schooling (here narrowly defined as available space in a school), Scenario 2 students remain in school and progress through the grades. This distinction between access and meaningful progression is highlighted by Motala *et al.* (2009, p. 251):

> "Expanded access has little import unless it includes regular attendance, enables progression through grades at appropriate ages, and provides meaningful learning, achievement and completion."

Based on the plausible assumption that students who drop out are, on average, the weakest-performing students in the school, it is not unreasonable to conclude that the students who progress to Grade 6 (area B in the above schematic) are better performing students than those who drop out (area A - B in the schematic). This may seem obvious, but the distinction is important when understanding the effect of high drop-out rates on educational performance. A similar case can be made to suggest that students who never enrol in school would perform worse than average if they did enrol. This could be due to poverty, lower parental education, and the fact that these students are more likely to live in rural or isolated areas – all factors associated with below-average performance.

It is instructive to compare two hypothetical countries – Scenario 1 Country and Scenario 2 Country - that are identical in every way except that Country 1 has a much higher dropout rate than Country 2. If both countries participated in SACMEQ, Country 1 would seem to do much better than Country 2 on the test scores simply because many of its weaker performing students would have dropped out of the schooling system and could thus never be selected to write the SACMEQ numeracy and literacy tests. This is known as sample selection bias since there was a process involved which selected some individuals (students who passed) into the sample, and eliminated others from the sample (students who failed or never enrolled in the first place). The target population for SACMEQ is the total number of students enrolled in Grade 6 in that country.

Applying the above logic to the four countries under review shows that Mozambique is a Scenario 1 country, i.e. it has high repetition/dropout and a low survival rate to the end of primary school. By contrast, the other three countries are all characterised by low repetition and dropout rates, and

[14] Although there is clearly a difference between dropout and repetition, for the purposes of understanding who is in the Grade 6 SACMEQ sample, it is irrelevant if the student dropped out in Grade 4 or is currently repeating Grade 5 (for example) – in both instances the student did not make it into Grade 6.

thus high survival rates to Grade 6. Therefore, since many Mozambican children drop-out of school prior to Grade 6, the SACMEQ results for Mozambique are likely to be an overestimation of what the average 14 year old Mozambican child can actually do in terms of literacy and numeracy.

After discussing the performance levels of the four countries below, an attempt is made in Section 3.2 to correct for these differences and provide an indication of what the relative performance would look like in the event that we sampled all age-appropriate students (dropouts and non dropouts) and not just those that make it into Grade 6.

Section 3 - Student Performance

One of the best measures of comparing cross-national educational quality is student test scores. By measuring what students have actually learnt, rather than simply attendance or grade-progression, one is better able to understand the extent of performance and underperformance in an education system relative to other systems. Ross *et al* (2005, Ch2) provide a comprehensive overview of the SACMEQ II study including the conduct of the study and those elements pertaining to the creation of the SACMEQ numeracy and literacy tests. The SACMEQ III numeracy and literacy tests were the same as those used in the SACMEQ II study. For the sake of brevity, only the essential details of the SACMEQ II test construction process are replicated here:

- On the *definition* of numeracy and literacy: reading literacy was defined as " the ability to understand and use those written language forms required by society and/or valued by the individual." While mathematics literacy was defined as "the capacity to understand and apply mathematical procedures and make related judgements as an individual and as a member of the wider society" (Ross, et al., 2005, p. 74 & 78).
- On the creation of the *reading* test, "there was an initial detailed curriculum analysis undertaken across all countries in order to define – after exhaustive discussion of the most important skills contained within the reading curricula at Grade 6 level – the reading skills that were considered by all countries to be the most important" (Ross, et al., 2005, p. 74).
- On the creation of the *mathematics* test, the SACMEQ team decided to use the International Association for the Evaluation of Educational Achievement (IEA) mathematics domains and modify this "in order to bring it into alignment with what was actually being taught in SACMEQ classrooms in Southern and Eastern Africa" (Ross, et al., 2005, p. 78).

Thus the SACMEQ tests were curriculum-specific and comprised those items that were commonly agreed upon by all SACMEQ National Research Coordinators (NRC's). Student performance on these tests can be seen in one of two ways: firstly, one can analyse the actual reading or mathematics score and calculate mean scores for different sub-groups (Tables 2 and 3 below), or secondly, one can use the 8 competency levels that SACMEQ has created to assess what competencies different groups have acquired (see Appendix B for a full discussion of the SACMEQ competency levels).

Figure 3 and Figure 4 below show the distribution of student reading and mathematics scores for each of the four countries. The distributions show that Batswana students performed better than the other three countries' students, most notably in reading. There was also a greater degree of similarity between all four countries in mathematics performance than in reading performance. Most of the countries follow a normal distribution, with the exception of South African reading scores. Here the distribution is skewed to the right. One possible explanation for this is the highly unequal education system in South Africa which produces a bi-modal distribution when split according to the wealthiest 20% of students as compared to the poorest 80% of students. This can also be seen in Figure S3 in the preceding country profiles. A similar trend, although less pronounced, can be seen in the Namibian reading distribution. Again, Figure N3 sheds some light on the possible reason for this, i.e. high educational inequality means that some wealthy students perform significantly better than the majority of students causing a fat right tail in the distribution.

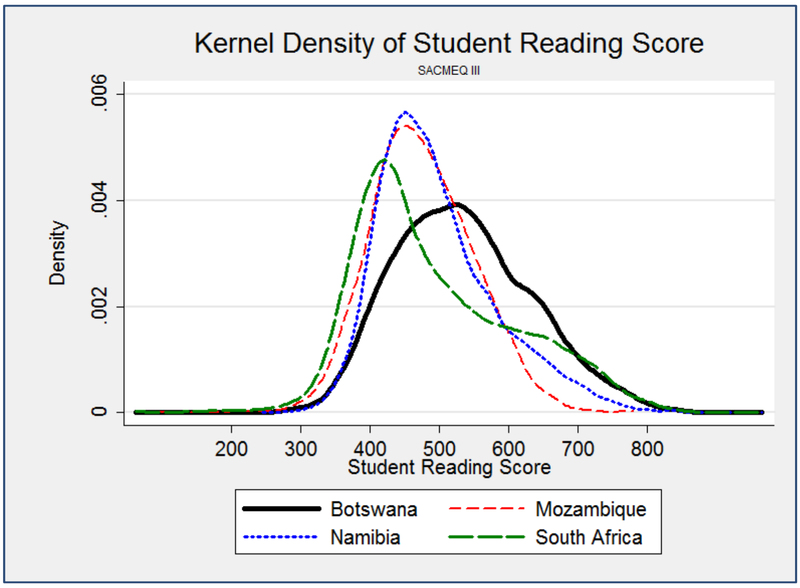


Figure 3 [15]

[15] All kernel density curves presented in this paper use the Gaussian kernel function with no additional smoothing unless otherwise stated.

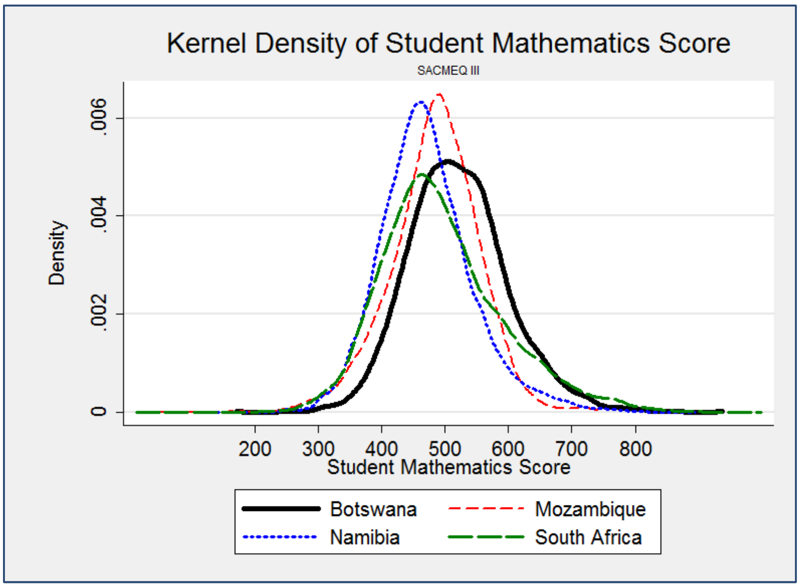


Figure 4

While the above distributions are helpful in that they convey the relative position of each country, they still shroud the sometimes severe inequalities within countries. In order to provide a visual indication of the relative performance of each province within the four countries, Figures B5, M5, N5, and S5 were combined to produce Figure 5 below. This shows the national and provincial averages for both reading and mathematics for all four countries. Regarding the configuration of the graph, the y-axis shows the average reading score, while the x-axis shows the average maths score. Consequently, if an observation lies to the left of the diagonal line this means that that observation has a higher reading score than maths score, and vice versa. The vertical and horizontal dotted lines indicate the SACMEQ averages for reading (510) and mathematics (512).

Five observations are worth noting from Figure 5:

1. The country averages for Namibia, South Africa, and Mozambique for both reading and mathematics are below the SACMEQ averages. Botswana, by contrast, performs marginally better than the SACMEQ average for both reading and mathematics.
2. All Namibian and Botswanan provinces perform relatively better in reading than in mathematics.
3. Nine of the eleven Mozambican provinces performed better in mathematics than in reading.
4. South Africa has both the second-best[16] performing province (Western Cape), and the worst performing province (Limpopo) of all 40 provinces – i.e. this provides some evidence that South Africa has the greatest variation/inequality in student performance of all four countries.
5. Botswana has the least variation in student performance of all four countries.

[16] Gaborone is the best performing region.

Table 3 and 4 below provide the mean reading and maths scores for each of the four countries including the means by province, socio-economic quintile and school location. The standard errors are also reported for each estimate. The process of reporting the mean value of each variable by province, location or quintile, should be thought of as taking many two dimensional slices of a multi dimensional object. Only when these two dimensional slices are seen together (i.e. the intersection of the slices), is there an accurate representation of the underlying data. Seen independently of each other, or without sufficient contextual information, these mean scores can be misleading. The country profiles have shown that there is significant overlap between socio-economic status, province, and school location.

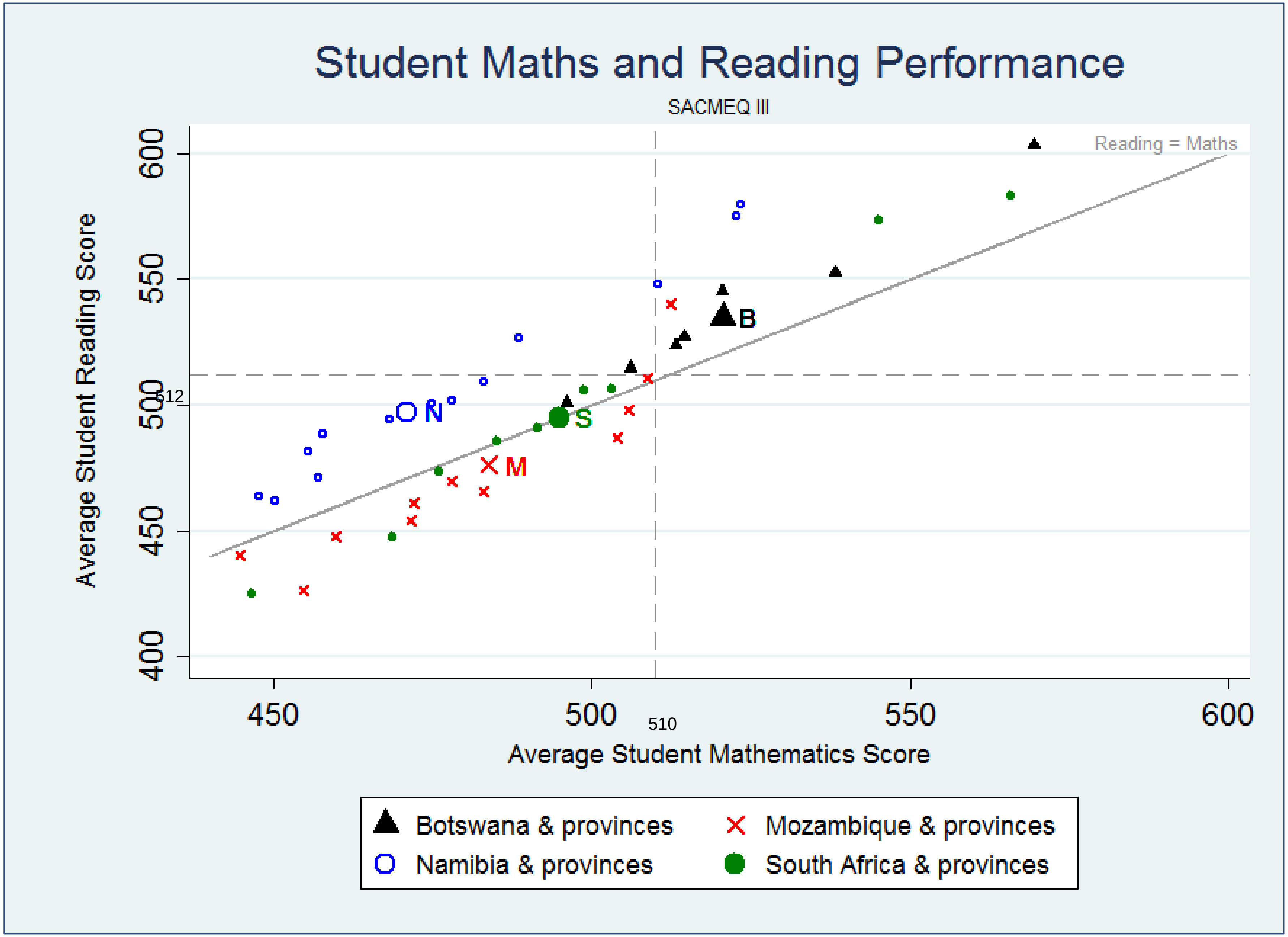

Student Maths and Reading Performance
SACMEQ III
Reading = Maths
Average Student Reading Score
Average Student Mathematics Score
400
450
500
550
600
512
510
B
N
S
M
Botswana & provinces
Mozambique & provinces
Namibia & provinces
South Africa & provinces

Figure 5

Table 2: Reading Performance by Sub-groups

Botswana			Mozambique			Namibia			South Africa		
Reading	**534.6**	4.6	**Reading**	**476**	2.8	**Reading**	**496.9**	3.0	**Reading**	**495.0**	4.5

Reading Performance by Province

Province	Mean	SE	Province	Mean	SE	Province	Mean	SE	Province	Mean	SE
CEN	552.4	13.8	CAB	447.8	6.3	CAP	488.5	15.9	ECA	447.8	10.1
CES	527.1	10.2	CID	540.2	13.1	ERO	579.5	15.0	FST	491.1	12.5
GAB	603.2	15.3	GAZ	487.1	9.9	HAR	509.4	18.3	GTN	573.1	14.4
NOR	545.3	8.5	INH	498.3	9.8	KAR	548.0	15.8	KZN	485.6	10.6
SOC	523.9	12.3	MAN	465.8	7.5	KAV	481.7	10.1	LMP	425.3	7.7
SOU	501.0	8.9	MAP	511.1	7.9	KHO	574.9	12.5	MPU	473.6	11.1
WES	514.8	5.8	NAM	461.0	7.8	KUN	501.6	15.8	NCA	505.6	12.6
			NIA	440.7	4.0	OHA	463.5	5.2	NWP	506.3	14.2
			SOF	454.2	7.7	OMA	494.5	9.0	WCA	583.4	11.1
			TET	426.9	5.5	OMU	462.1	4.7			
			ZAM	469.6	7.6	OSH	471.1	10.5			
						OTJ	526.5	9.9			
						SHN	500.9	10.5			

Reading Performance by Socioeconomic Quintiles

Quintile	Mean	SE	Quintile	Mean	SE	Quintile	Mean	SE	Quintile	Mean	SE
1	485.2	4.5	1	449.7	4.1	1	460.4	2.7	1	433.4	3.8
2	503.1	3.6	2	461.7	3.7	2	471.5	2.8	2	453.8	3.7
3	520.4	4.6	3	475.4	3.8	3	486.5	3.2	3	476.2	4.1
4	562.7	5.2	4	491.0	4.6	4	515.8	4.4	4	514.5	6.5
5	604.9	8.6	5	507.8	5.0	5	566.9	7.5	5	609.8	6.5

Reading Performance by School Location

Location	Mean	SE	Location	Mean	SE	Location	Mean	SE	Location	Mean	SE
Rural	508.1	4.9	Rural	457.7	3.8	Rural	464.4	2.5	Rural	440.8	4.6
Urban	559.5	7.1	Urban	486.7	3.9	Urban	547.5	5.7	Urban	549.2	7.0

Table 3: Mathematics Performance by Sub-groups

Botswana			Mozambique			Namibia			South Africa		
Maths	534.6	4.6	Maths	476.0	2.8	Maths	496.9	3.0	Maths	494.9	4.5

Reading Performance by Province

Province	Mean	SE	Province	Mean	SE	Province	Mean	SE	Province	Mean	SE
CEN	538.1	11.0	CAB	459.7	4.8	CAP	457.9	10.4	ECA	468.8	10.3
CES	514.5	7.5	CID	512.2	7.2	ERO	523.3	12.2	FST	491.6	10.1
GAB	569.3	13.0	GAZ	503.9	13.2	HAR	483.1	13.2	GTN	545.0	12.0
NOR	520.5	7.1	INH	505.7	5.6	KAR	510.3	14.9	KZN	485.2	8.2
SOC	513.2	9.4	MAN	482.9	8.8	KAV	455.6	7.6	LMP	446.7	5.3
SOU	496.1	4.9	MAP	508.8	5.4	KHO	522.7	11.6	MPU	476.1	8.2
WES	506.1	5.4	NAM	472.1	6.0	KUN	478.2	13.7	NCA	498.7	10.8
			NIA	444.7	2.7	OHA	447.8	4.9	NWP	503.1	13.1
			SOF	471.5	6.4	OMA	468.3	6.2	WCA	565.7	12.0
			TET	454.6	5.9	OMU	450.2	4.0			
			ZAM	477.9	6.8	OSH	457.2	9.3			
						OTJ	488.6	8.1			
						SHN	474.8	9.0			

Reading Performance by Socioeconomic Quintiles

Quintile	Mean	SE	Quintile	Mean	SE	Quintile	Mean	SE	Quintile	Mean	SE
1	488.6	3.6	1	465.4	4.5	1	444.7	2.9	1	453.0	4.2
2	497.2	3.1	2	476.4	3.7	2	452.1	2.6	2	462.7	3.3
3	511.8	3.2	3	484.8	3.4	3	464.4	2.6	3	479.1	3.4
4	538.0	3.9	4	491.8	3.6	4	482.6	3.7	4	504.7	5.1
5	569.0	8.3	5	503.8	3.4	5	523.4	6.9	5	584.1	6.5

Reading Performance by School Location

Location	Mean	SE	Location	Mean	SE	Location	Mean	SE	Location	Mean	SE
Rural	501.1	3.3	Rural	477.6	4.5	Rural	448.5	2.2	Rural	456.7	4.0
Urban	538.8	5.7	Urban	487.5	2.8	Urban	506.1	4.7	Urban	533.2	5.9

3.1) Student Competency Levels: Numeracy and Literacy

In addition to the raw student scores, SACMEQ calculated competency levels for reading and mathematics. By arranging test items in order of difficulty and then grouping these items by common themes, the SACMEQ team was able to construct eight levels of reading competency and eight levels of mathematics competency (SACMEQ, SACMEQ III Project Results: Pupil Achievement Levels in Reading and Mathematics, 2010). These range from Level 1 items which require only the most basic skills to answer correctly (such as *Pre numeracy* and *Pre literacy*), to Level 8 items which are more challenging and complex, and require higher order thinking and reasoning processes (such as *Critical reading* and *Abstract problem solving*).

In order to classify test items, it was necessary for the SACMEQ team to decide which skills were required to answer the various questions. Following this, the team had to group these skills into meaningful themes, which constitute the eight competency levels, and provide an overview of the skills required to successfully answer test items in that category. As one might expect, reaching consensus on exactly what thought-processes were involved in correctly answering a particular test item is notoriously difficult. In conjunction with national curriculum experts, the SACMEQ team agreed on eight competency levels for mathematics, and eight for reading (SACMEQ, SACMEQ III Project Results: Pupil Achievement Levels in Reading and Mathematics, 2010). These were given meaningful names and descriptions in order to explain the underlying thought processes that were involved. A summary of the different skills associated with each competency level is provided in Appendix B.

By decomposing the test items according to the competencies required to answer them successfully, one is better able to understand student performance. Furthermore, the differences in the abilities of various types of students become more evident when they are presented as competencies acquired rather than simply test score achieved. As SACMEQ (2010, p. 5) identifies, "The eight competency levels provide a more concrete analysis of *what pupils and teachers can actually do, and they also suggest instructional strategies relevant to pupils who are learning at each level of competence.*"

One distinction that is of particular importance to policy-makers and researchers alike is the incidence of functional illiteracy and functional innumeracy across the four countries. Functional literacy and functional numeracy are used to indicate whether an individual has acquired sufficient numeracy and literacy skills such that he or she is able to satisfactorily *use* those skills in everyday life. It is of little use if children can write down and read a memorised paragraph if they do not understand what they are reading or writing. Similarly, if a child cannot relate basic arithmetic skills into real world situations, it is questionable whether that child has actually acquired those skills.

For the purposes of this paper, if students have not reached level 3 in either reading ('basic reading') or mathematics ('basic numeracy') they are deemed functionally illiterate and functionally innumerate respectively. By this definition, if a student is functionally illiterate they cannot read a short and simple text and extract meaning; and if a student is functionally innumerate they cannot translate graphical information into fractions or interpret common everyday units of measurement. Shabalala (2005, p. 222) uses the same threshold of the bottom two SACMEQ levels and deems students below this threshold as 'non-readers' and 'non-numerate' students.

Figure 6 and Figure 7 below show the breakdown of competency levels in each country[17] for reading and mathematics respectively. It soon becomes clear that all four countries have more students reaching higher reading levels than higher mathematics levels, with a considerable proportion of all countries in the lower mathematics levels. The red-outlined subsections show that proportion of students who are functionally illiterate or innumerate in each country (i.e. below level 3). One finding that is somewhat surprising is that South Africa has the second highest proportion of students in the higher reading levels (level 6, 7, and 8) as well as the highest proportion of students in the lowest two levels. This is yet another manifestation of the highly unequal education system prevalent in South Africa. South Africa also has the highest proportion of functionally illiterate students (27.26%), while Namibia has the highest proportion of functionally innumerate students (47.69%).

[17] *Appendix B – Student Performance* provides a graphical breakdown of competency levels by *province* for each of the four countries. For those interested in the exact proportions in each category, as well as the respective standard errors, these are reported in full in SACMEQ (2010).

Figure 6

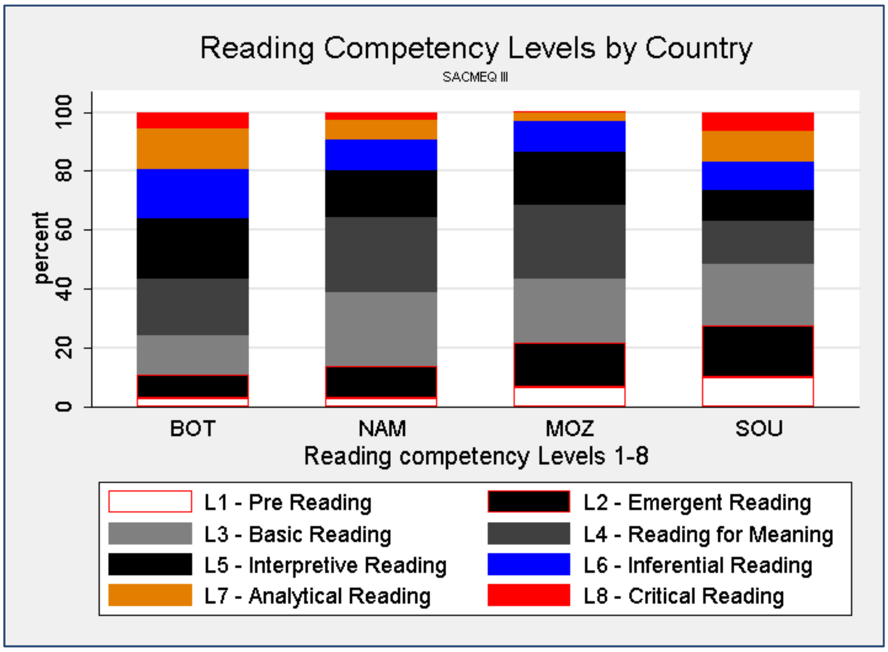
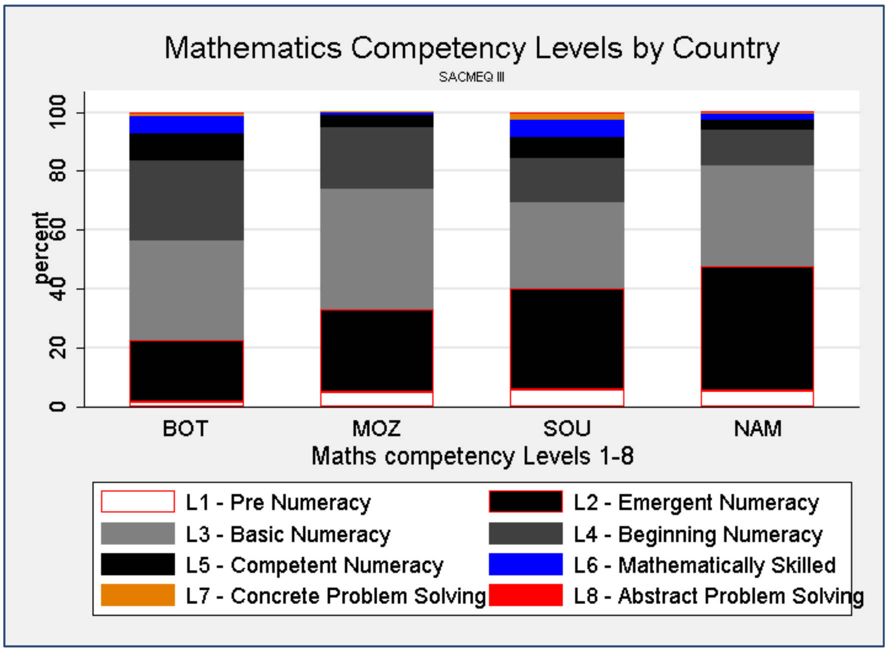


Figure 7



While a closer inspection of the higher order competencies may be fruitful, a more pressing need is an in-depth analysis of those students who are failing to master even the most basic reading and mathematics skills. These functionally illiterate and innumerate students make up a significant proportion of students in South Africa and Mozambique (for reading) and South Africa and Namibia (for mathematics).

Table 5 and 6 below show the proportions of functionally illiterate and innumerate students in each of the various provincial, socio-economic and geographical sub-groups.

Functional Literacy - There is an alarmingly high percentage of functionally illiterate students in the Eastern Cape (39%), Limpopo (49%), Mpumalanga (28%), and KwaZulu-Natal (28%) provinces in South Africa, as well as Cabo Delgado (30%), Manica (29%), Niassa (37%), Sofala (29%) and Tete (45%) provinces in Mozambique. In each of these provinces, the number of functionally illiterate students ranges from approximately one in three students to one in two students. Figure 9 to Figure 15 illustrate the prevalence of functional illiteracy and innumeracy in each of the 40 provinces. The country-specific variation in functional illiteracy by socio-economic quintile is most visible between Mozambique and South Africa. There are five times as many functionally illiterate students in the poorest quintile (41%) in South Africa as there are in the wealthiest quintile (7%); in comparison to Mozambique where there are only twice as many functionally illiterate students in the poorest quintile (32%) as compared to the wealthiest quintile (14%). Across all countries there are significantly more functionally illiterate students in rural areas than in urban areas, as one might expect.

Functional Numeracy - The prevalence of functional innumeracy is egregiously high in all countries, most notably in Namibia. In the majority of provinces in Mozambique, Namibia and South Africa, more than one in three students are functionally innumerate. More than half of all rural students in South Africa and Namibia are functionally innumerate, as are more than half of all Quintile 1 and 2 students in these two countries. Almost half of Namibian Grade 6 students (47.69%) are classified as functionally innumerate, as compared to 40% in South Africa, 33% in Mozambique, and 22% in Botswana. In the province of Niassa in Mozambique, more than half the students (54%) are functionally innumerate, while in Namibia there are four provinces which exceed 50% functional innumeracy: Kavango (55%), Ohangwena (60%), Omusati (58%), and Oshikoto (57%). In South Africa, there were only two provinces where there were more functionally *innumerate* students than functionally *numerate* students: Eastern Cape (50%) and Limpopo (61%).

Urban-Rural differentials - Interestingly, if one compares the difference in functional illiteracy/innumeracy prevalence between urban and rural schools for Botswana, South Africa and Namibia[18], Botswana has the lowest differential for innumeracy (11%) and illiteracy (6%) compared to South Africa and Namibia (Table 4). This could possibly be explained by Botswana's policy of

[18] Given the large sample selection issues involved in Mozambican schooling, the large rural-urban differential is likely to distort the true rural-urban performance statistics. For example, in Mozambique, the net attendance rate differential is 23% (DHS, 2005, p. 26) compared to 1.2 % in Namibia (DHS, 2008, p. 13), 6% in South Africa (UNICEF, 2008, p. 4), and 7% in Botswana (UNICEF, 2008b, p. 4).

teacher allocation where teachers are relocated to areas across the country. Indeed promotion within the Botswana education system is often linked to relocation, sometimes to rural areas (Dunne, et al., 2005, p. 19).

Table 4

	Urban-Rural functional illiteracy differential	**Urban-Rural functional innumeracy differential**
Botswana	6.01 %	11.39 %
Mozambique*	7.94%	7.29%
Namibia	11.61 %	30.48 %
South Africa	27.84 %	30.07 %

*See footnote on previous page.

Table 5: Functional Illiteracy Prevalence by Sub-groups (red if >20%)

Botswana			Mozambique			Namibia			South Africa		
Botswana	10.62 %	0.77	Mozambique	21.51 %	1.13	Namibia	13.63 %	0.76	South Africa	27.26 %	1.19

Functional Illiteracy Prevalence by Province

Province	Mean	SE	Province	Mean	SE	Province	Mean	SE	Province	Mean	SE
CEN	8.15	1.68	CAB	**30.04**	4.29	CAP	15.77	4.42	ECA	**38.61**	3.83
CES	11.08	2.03	CID	4.75	1.79	ERO	5.37	2.07	FST	**22.33**	2.95
GAB	2.98	0.95	GAZ	14.46	3.36	HAR	18.35	5.60	GTN	11.62	2.36
NOR	7.67	1.38	INH	12.43	2.89	KAR	10.68	2.92	KZN	**28.34**	2.55
SOC	12.03	2.04	MAN	**28.63**	3.80	KAV	14.14	2.45	LMP	**48.98**	3.79
SOU	17.11	2.20	MAP	7.13	1.63	KHO	5.41	1.54	MPU	**28.39**	3.57
WES	11.06	1.87	NAM	**26.73**	4.29	KUN	11.57	2.59	NCA	**21.39**	3.12
			NIA	**36.62**	4.09	OHA	17.16	1.72	NWP	**21.93**	3.18
			SOF	**28.94**	3.72	OMA	11.90	2.71	WCA	5.08	1.50
			TET	**44.60**	4.28	OMU	18.63	2.27			
			ZAM	19.33	3.68	OSH	18.01	2.80			
						OTJ	4.92	1.68			
						SHN	11.29	2.55			

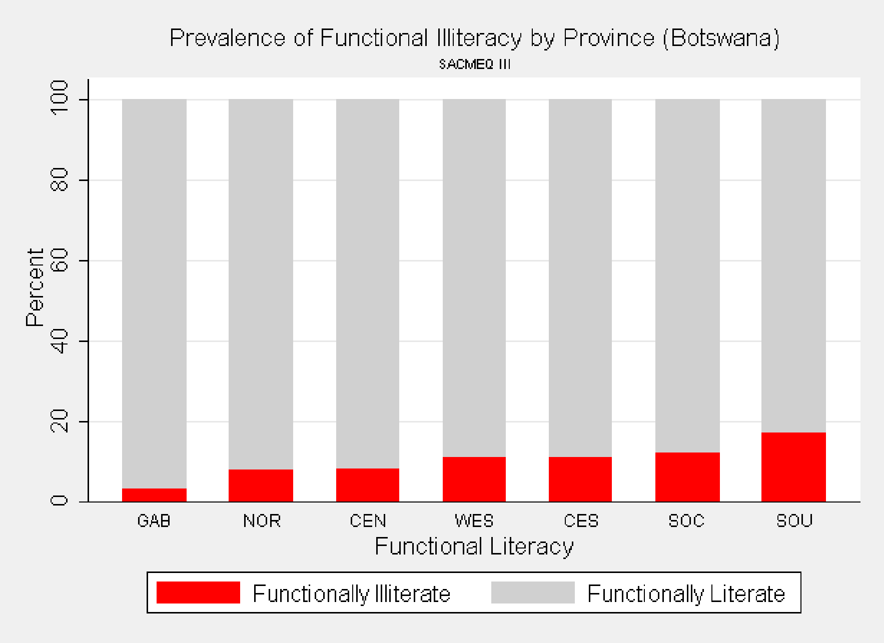
Functional Illiteracy Prevalence by Socioeconomic Quintiles

Quintile	Mean	SE	Quintile	Mean	SE	Quintile	Mean	SE	Quintile	Mean	SE
1	19.83	1.83	1	**31.67**	2.46	1	19.35	1.57	1	**41.36**	2.06
2	12.53	1.27	2	**25.93**	2.08	2	16.25	1.29	2	**34.12**	1.94
3	12.58	1.25	3	17.62	1.95	3	14.18	1.29	3	**29.21**	1.68
4	5.20	0.84	4	16.32	1.82	4	9.56	1.06	4	**21.40**	1.50
5	2.60	0.66	5	14.27	1.67	5	6.71	1.18	5	7.43	0.99

Functional Illiteracy Prevalence by School Location

Location	Mean	SE	Location	Mean	SE	Location	Mean	SE	Location	Mean	SE
Rural	13.72	1.21	Rural	**26.53**	2.11	Rural	18.18	1.04	Rural	41.17	1.79
Urban	7.71	0.93	Urban	18.59	1.42	Urban	6.57	0.81	Urban	13.33	1.23

Figure 9



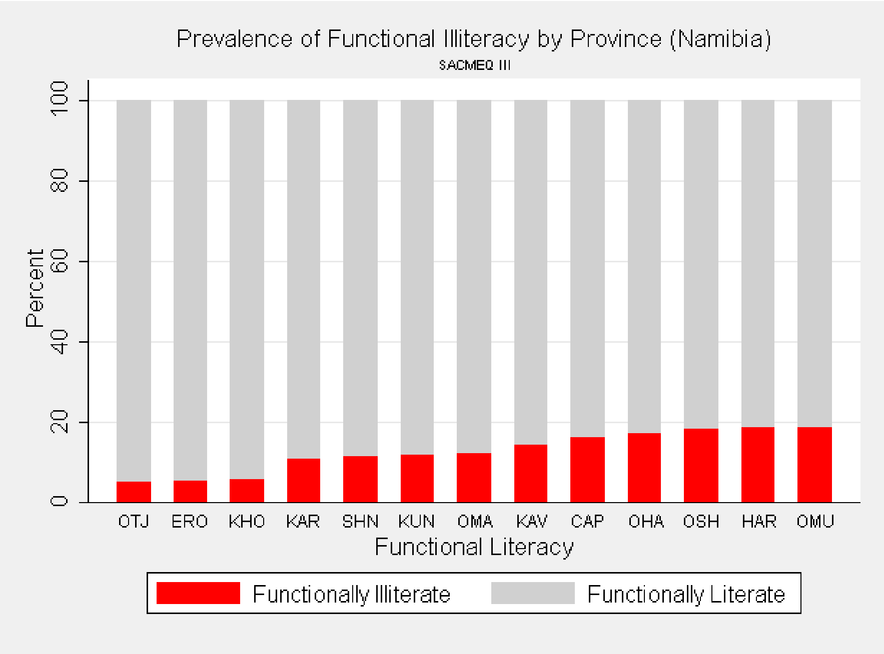
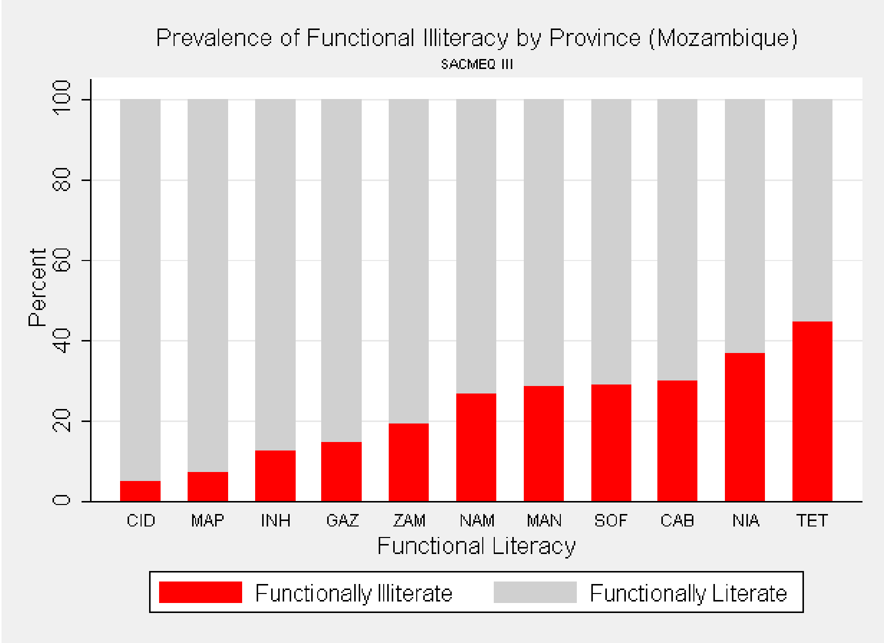


Figure 11

Figure 8



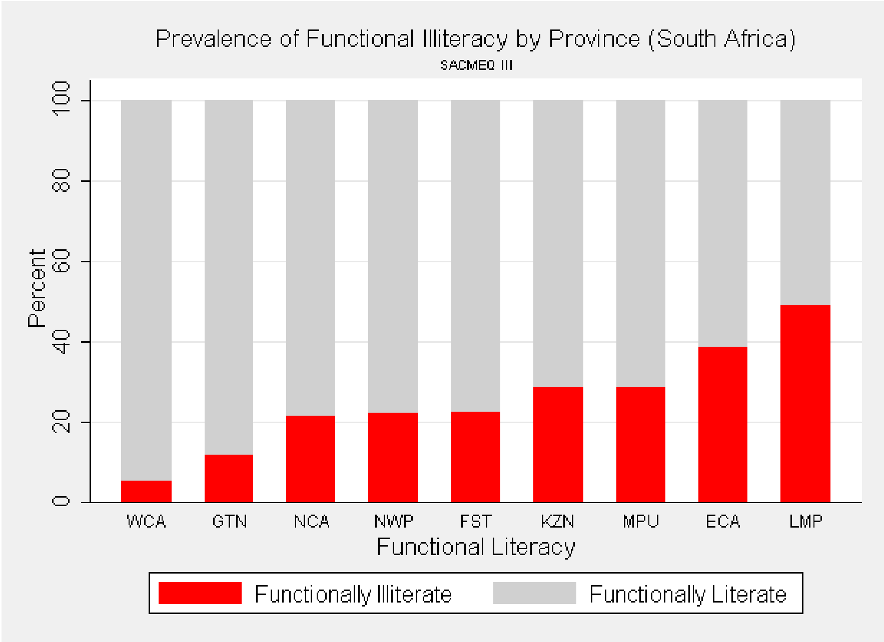


Figure 10

Table 6: Functional Innumeracy Prevalence by Sub-groups (red if >30%)

Botswana			Mozambique			Namibia			South Africa		
Botswana	22.48 %	1.13	Mozambique	32.73 %	1.26	Namibia	47.69 %	1.35	South Africa	40.17 %	1.38

Reading Performance by Province

Province	Mean	SE	Province	Mean	SE	Province	Mean	SE	Province	Mean	SE
CEN	19.59	2.77	CAB	**46.68**	3.18	CAP	**54.43**	6.24			
CES	23.55	2.99	CID	17.98	3.79	ERO	24.82	4.51	ECA	**50.34**	4.41
GAB	9.78	2.51	GAZ	26.94	4.37	HAR	**43.21**	6.81	FST	**38.13**	3.60
NOR	20.39	3.06	INH	21.16	3.39	KAR	26.58	4.09	GTN	20.59	3.21
SOC	24.42	2.89	MAN	**35.76**	3.86	KAV	**54.53**	5.70	KZN	**43.96**	3.42
SOU	**31.19**	2.74	MAP	16.91	3.42	KHO	21.64	4.00	LMP	**60.64**	2.51
WES	22.26	2.53	NAM	**34.80**	3.84	KUN	**45.25**	5.75	MPU	**43.86**	3.52
			NIA	**53.67**	2.83	OHA	**60.20**	3.54	NCA	**37.13**	3.36
			SOF	**37.77**	3.92	OMA	**44.69**	4.00	NWP	**38.13**	3.88
			TET	**48.37**	3.21	OMU	**58.04**	2.93	WCA	15.07	2.58
			ZAM	**37.16**	4.38	OSH	**56.70**	4.00			
						OTJ	**34.75**	4.21			
						SHN	**44.97**	4.83			

Reading Performance by Socioeconomic Quintiles

Quintile	Mean	SE	Quintile	Mean	SE	Quintile	Mean	SE	Quintile	Mean	SE
1	**33.56**	2.40	1	**43.30**	2.32	1	**61.13**	2.24	1	**56.28**	2.41
2	**30.13**	2.06	2	**36.42**	2.15	2	**56.89**	2.00	2	**50.37**	1.87
3	22.51	1.76	3	**30.72**	2.02	3	**48.88**	2.00	3	**42.88**	1.61
4	15.81	1.50	4	28.99	2.20	4	**40.18**	2.16	4	**34.59**	1.81
5	9.80	1.49	5	22.43	2.05	5	25.60	1.98	5	13.32	1.35

Reading Performance by School Location

Location	Mean	SE	Location	Mean	SE	Location	Mean	SE	Location	Mean	SE
Rural	28.36	1.59	Rural	**37.33**	2.26	Rural	**59.63**	1.58	Rural	**55.17**	1.87
Urban	16.97	1.47	Urban	**30.04**	1.64	Urban	29.15	1.87	Urban	25.10	1.72

Figure 13

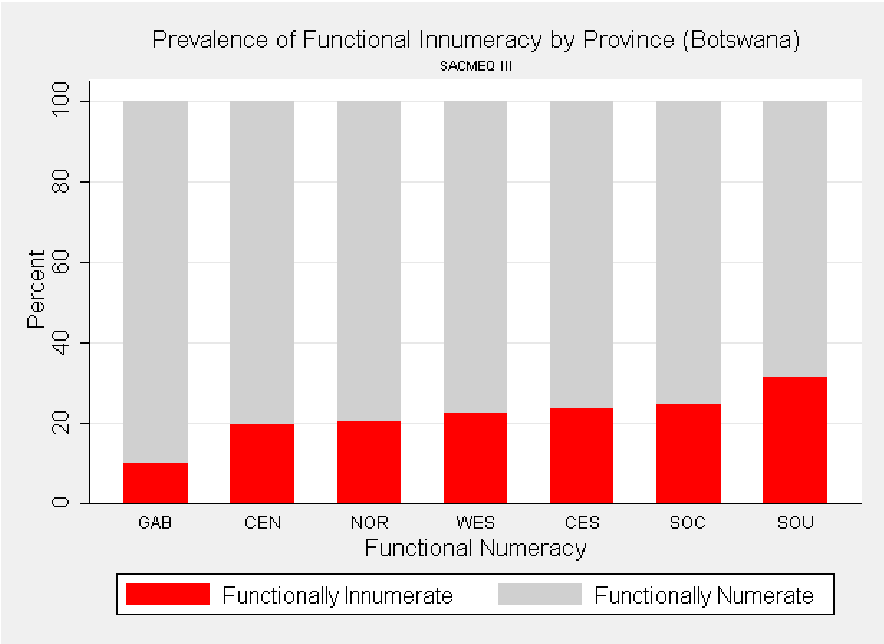
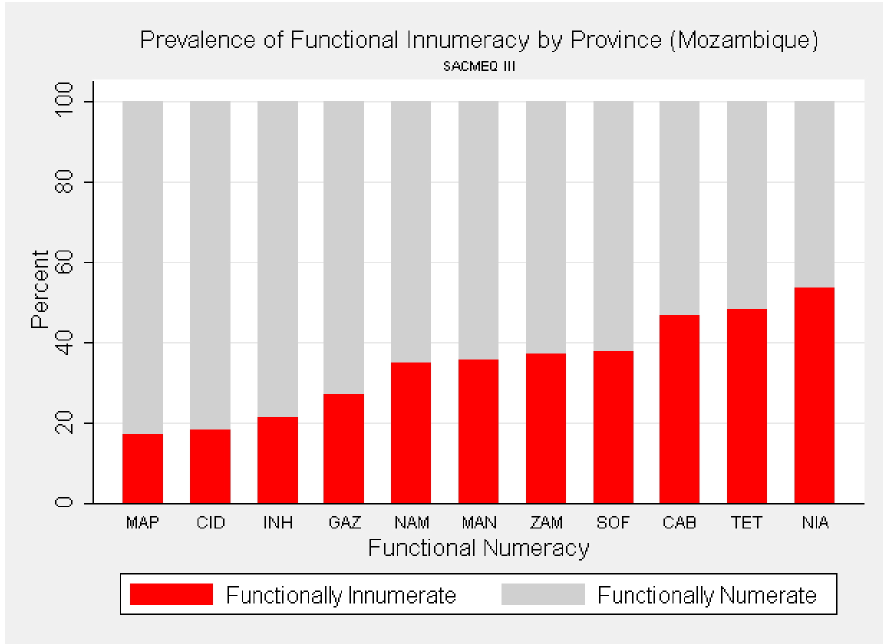


Figure 12



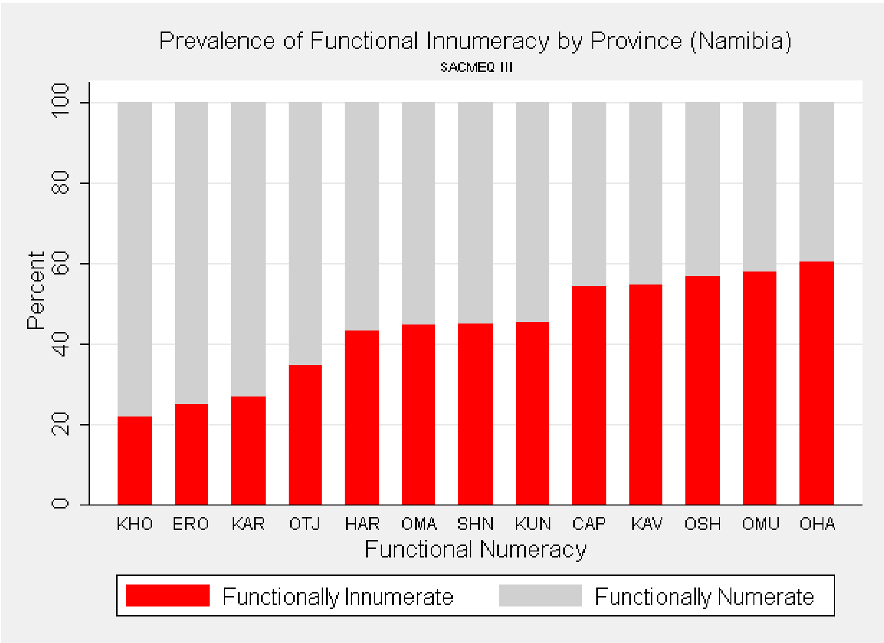


Figure 15

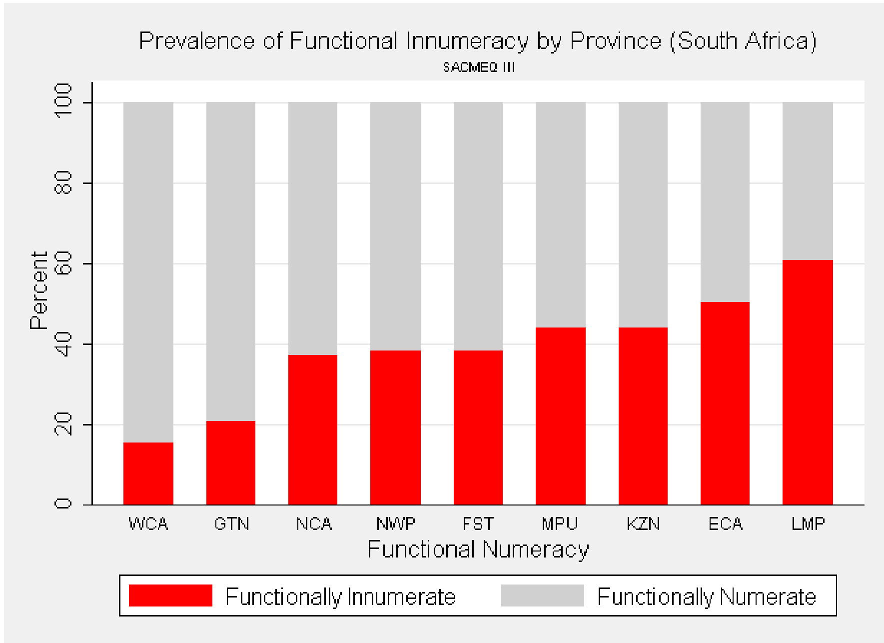


Figure 14

3.2) Adjusting for Dropout Rates

Following the earlier discussion of survival rate differentials between the four countries, it is helpful to place the above results in perspective. All of the proportions of functionally innumerate and illiterate students reported above are *for those students who are enrolled in Grade 6.* However, many students do not make it to Grade 6, due to excessive repetition and/or dropout. If we assume that those students who drop-out prior to Grade 6 are functionally illiterate and functionally innumerate (which is not a strong assumption), the distributions of functional illiteracy and innumeracy change substantially, most notably for Mozambique.

Observing the survival rates presented in Table 1, it is clear that South Africa, Namibia and Botswana all have high survival rates (around 90%[19]), while Mozambique has a low survival rate (60%). Figure 16 below shows a stylised version of the dropout and surviving portions of total enrolments for each of the four countries.

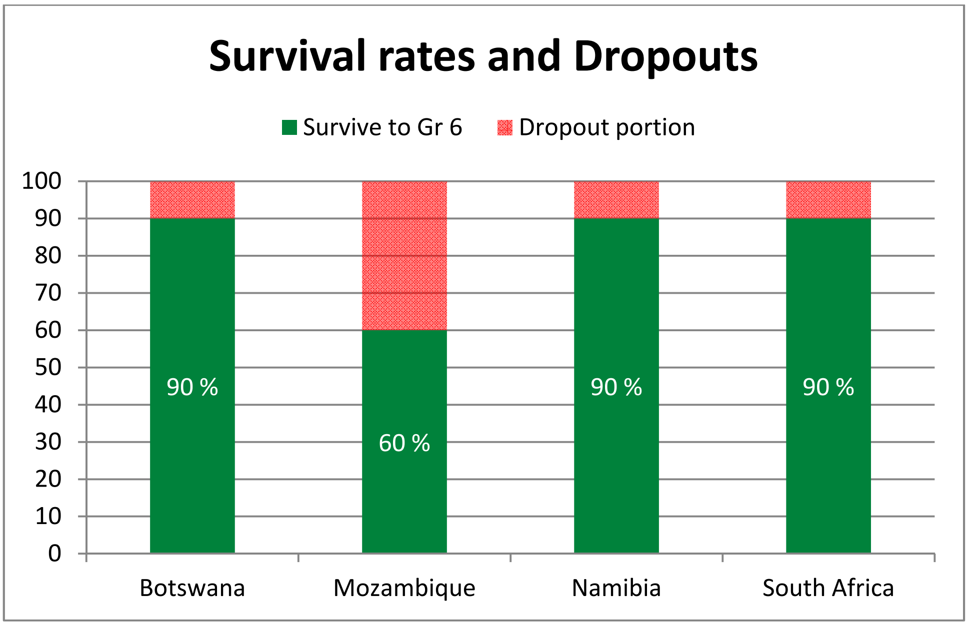


Figure 16

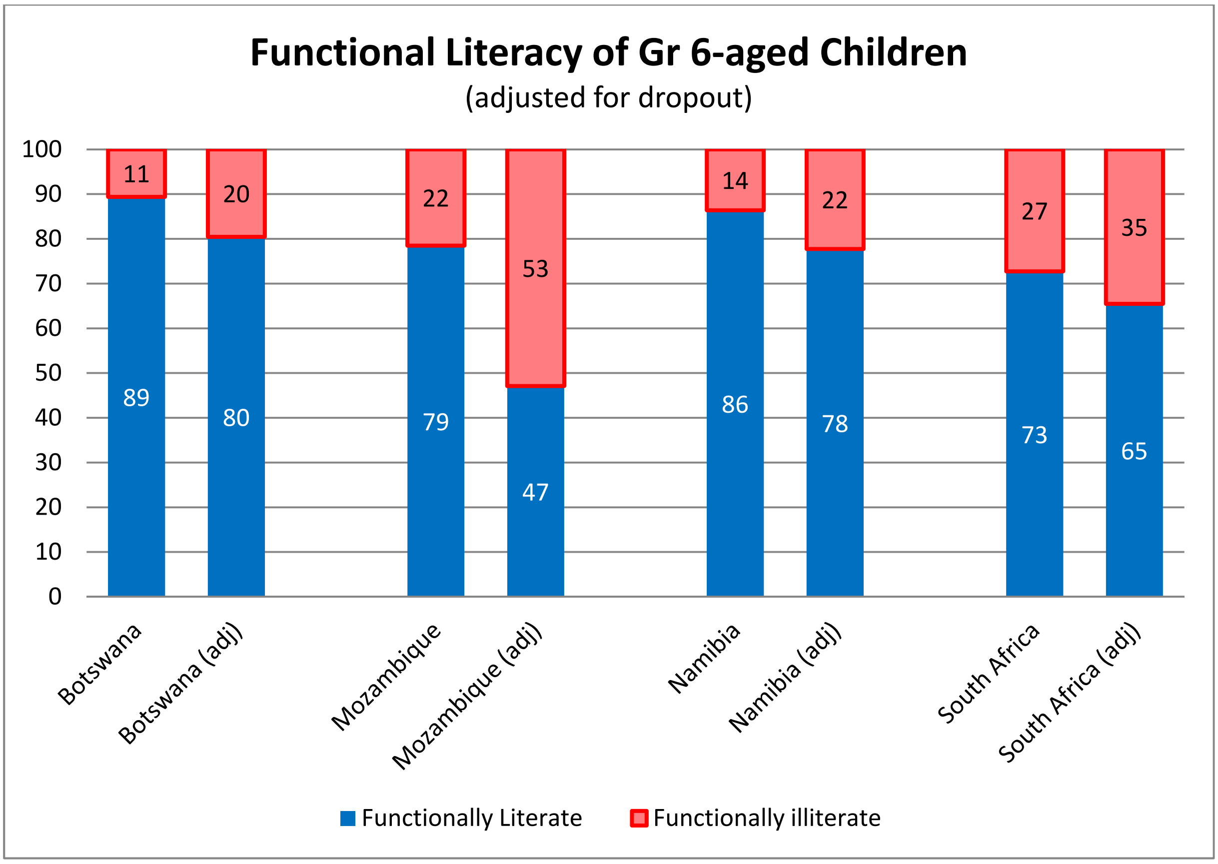
While some of the students who survived to Grade 6 were found to be functionally illiterate and functionally innumerate in the SACMEQ tests (as reported in Tables 5 and 6), it is safe to assume that all students that *did not* survive to Grade 6 (i.e. those who dropped out) are most certainly

[19] Although South Africa's survival rate is 98% in Table 1, this figure was drawn from national statistics reported by the South African Department of Basic Education. The other three survival rates were drawn from the Education For All report (2011). Given the differences in data collection, data sources, and educational definitions, it is difficult to compare these figures directly. In reality, South Africa's survival rate to Grade 5 is likely to be higher than Namibia and Botswana's, but not as high as 98%. This is the reason why *stylised* figures are presented here, and not the actual figures reported in Table 1.

functionally illiterate and functionally innumerate. If we add the proportion of dropouts in a system to the proportion that is functionally illiterate and functionally innumerate, we can provide an indicator of overall primary school success. Here success is defined as the ability to provide access to schooling for all children *and* a sufficient quality of schooling such that all students can progress to the end of primary school acquiring the necessary skills and knowledge at each grade.

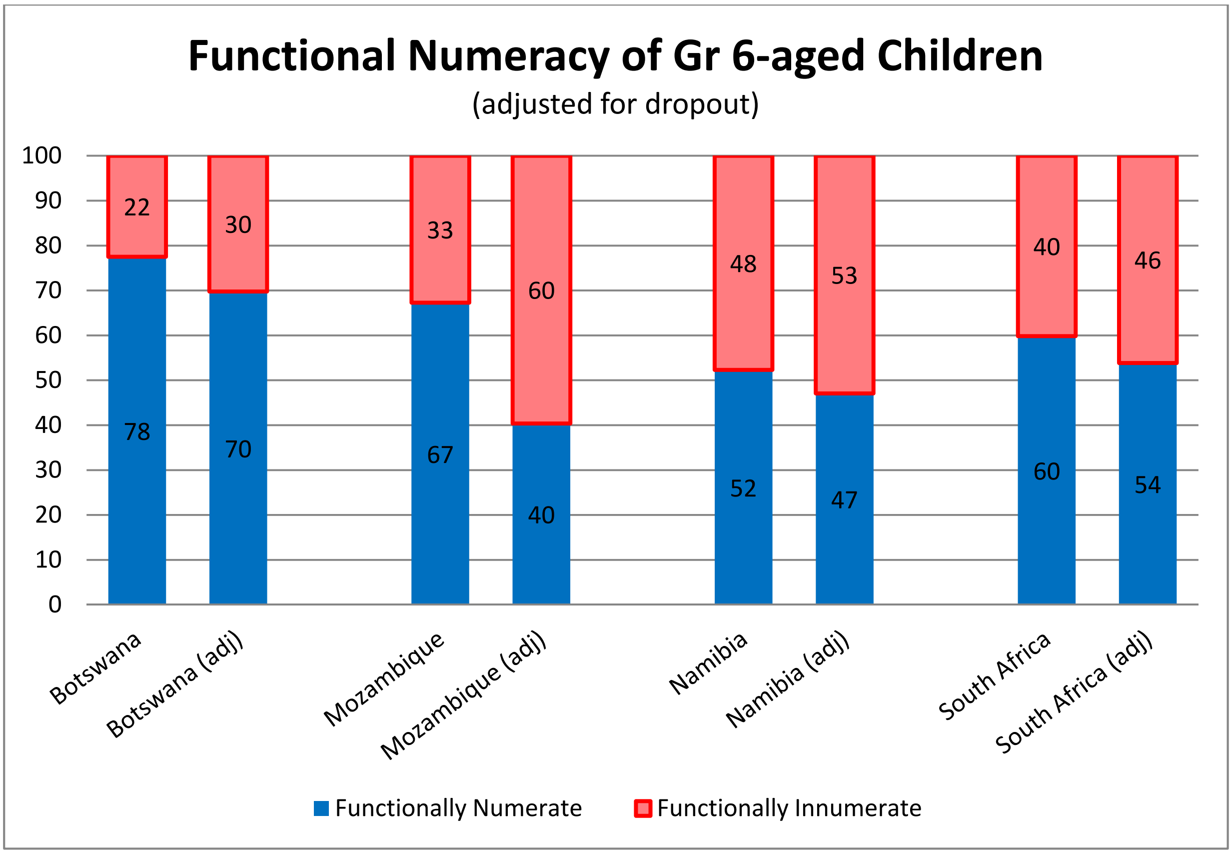
Figure 17 and Figure 18 below show both the unadjusted and adjusted distributions of functional illiteracy and functional innumeracy. The adjusted rate was calculated by adding the proportion of dropouts to the proportion of functionally illiterate and functionally innumerate students in each country. Since 40% of Mozambican students drop out of school prior to Grade 6, compared to 10% in South African, Namibia and Botswana, Mozambique has the largest adjustment of the four countries[20].

Figure 17



[20] To calculate the adjusted proportion of functionally illiterate students, the following calculation was performed: {100 - (unadjusted functionally literate)*(r/100)} where r is the survival rate to the end of Grade 5 stylised to 90% in South Africa, Namibia, and Botswana, and 30% in Mozambique. The same procedure is followed to calculate the functionally innumerate adjustment.

Figure 18



From the above analysis of dropout rates, it becomes clear that simply reporting mean SACMEQ numeracy and literacy scores can be misleading. These figures are only representative *of those students who progressed to Grade 6*. However, progression rates differ drastically across SACMEQ countries, as the Mozambican example above illustrates. High dropout rates prior to Grade 6 mean that many students are leaving the schooling system without basic numeracy and literacy skills – these students are not captured in the SACMEQ statistics. It is imperative that one is aware of these differences when making cross-country comparisons of student performance, as in SACMEQ. For the remainder of the report, the findings are reported *for students enrolled in Grade 6* in that country, irrespective of the selection processes involved.

Section 4 – Additional Aspects of Schooling

4.1) Teacher Absenteeism

Following from the premise that teachers are essential to the learning process, it is logical to suspect that higher rates of teacher absenteeism are associated with lower student performance. This is largely due to inadequate coverage of the curriculum and shorter time-on-task. High rates of teacher absenteeism can also have a reciprocating effect on student absenteeism whereby students choose not to attend school because they are unsure about whether their teachers will be at school on that particular day. The SACMEQ III survey addressed the issue of teacher absenteeism in three ways.

Firstly, principals were asked to indicate the number of teachers who were absent due to AIDS-related illness and, secondly, due to other reasons. Response categories ranged from 'Less than 1 month', '1-2 months', '3-4 months' and so on. Unfortunately these coarse bands do not provide an adequate measure of absenteeism for reasons other than AIDS since the majority of non-AIDS-related absenteeism will be for less than one month. However, the rankings of the four countries when measured by this variable do not change relative to the self-reported figures presented below.

Secondly, teachers were asked how many days they were absent 'during this school year', as well as the reasons[21] for that absence. This self-reported measure of absenteeism is likely to be affected by a number of issues, most prominently the tendency to under-report absenteeism. Nevertheless, the figures which teachers report may provide a useful lower-bound estimate of teacher absenteeism in each country. Table 8 shows the distribution of self-reported maths-teacher[22] absenteeism by province, socio-economic quintile and school location. South African maths-teachers reported being absent for 19.4 days in the current school year, compared to 10.6 days for Botswana, 9.4 days for Namibia, and 6.4 days for Mozambique. Put differently, South African Grade 6 maths teachers are absent for twice as many days as Botswana and Namibian teachers, and three times as many days as the average Mozambican maths teacher.

In 6 of the 40 provinces maths-teachers were absent for more than one month in that year, i.e. more than 20 school days. Five of those 6 provinces are in South Africa: Eastern Cape (20.8 days), KwaZulu-Natal (24.6 days), Limpopo (20.3 days), Mpumalanga (20.8 days), and North West (22.1

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[21] The 12 categories were: own illness, own injury, family member's illness, family member's injury, funerals, medical appointments, bad weather/ road not accessible, official business, maternity leave, security reasons, teachers' strikes, other reasons.

[22] The distributions of reading and health teacher absenteeism are similar to those of mathematics teachers and have not been reproduced due to space constraints.

days), with the 6th province being Hardap (24.7 days) in Namibia. The Western Cape and Gauteng provinces report much lower teacher absenteeism of 11.1 days and 13.1 days respectively. This is in agreement with broad provincial trends, since these two provinces are the best performing provinces in South Africa. A similar trend is seen when comparing quintile 1-4 students (poorest 80%) with quintile 5 students (richest 20%) in South Africa: quintile 5 teachers report half as many days absent on average (11.4 days) when compared to quintile 1-4 teachers (21.2 days).

There is one potential caveat to the above findings: teachers may have a mental reference point for what is an 'acceptable' or 'normal' level of absenteeism, and thus in the self-reported answers tend not to deviate substantially from that reference point. This is especially true given that some legitimate teacher absence is to be expected (sickness, union meetings etc.). Following on from this, teachers in different countries may have different mental reference points for what is acceptable and this may account for some of the large differences between South Africa and the other three countries. However, even if this is the case, the fact that most South African teachers believe that being absent for an entire month (20 days) is 'normal' or 'acceptable' is particularly disconcerting.

The third way that the SACMEQ III study addressed teacher absenteeism was in the School Head questionnaire, where school heads were asked how often they had to deal with *unjustified* teacher absenteeism. It is revealing to see that South African principals do not report higher levels of unjustified teacher absenteeism as compared to the other three countries (Table 7). Indeed, a higher proportion of South African principals report 'never' having to deal with unjustified absenteeism, as compared to Mozambique and Namibia – and this even when South Africa has a vastly higher self-reported teacher absenteeism problem.

Table 7: Frequency of Unjustified Teacher Absenteeism (School Head)

		Country				
		Botswana	**Mozambique**	**Namibia**	**South Africa**	**Average**
About how often does the school have to deal with teacher absenteeism (i.e., unjustified absence)?	Never	38%	29%	32%	33%	33%
	Sometimes	54%	67%	54%	56%	57%
	Often	8%	4%	14%	11%	10%
	Total	100%	100%	100%	100%	100%

In a recent, and highly informative study Carnoy *et al* (2011, p. 6) found that on average, maths teachers in the North West province in South Africa taught only 50 lessons of the scheduled 130 for the period under review. They further note that in spite of this, "teachers and principals we interviewed did not consider teacher absenteeism a major issue."

Table 8: Mathematics-teacher Self-reported **Absenteeism** by Sub-groups (**red** if >20 days)

Botswana			Mozambique			Namibia			South Africa		
Botswana	10.6 days	1.09	Mozambique	6.4 days	0.58	Namibia	9.4 days	0.83	South Africa	**19.4** days	0.94

Mathematics-teacher self-reported absenteeism Prevalence by Province

Province	Avg. days	SE	Province	Avg. days	SE	Province	Avg. days	SE	Province	Avg. days	SE
CEN	9.2	2.99	CAB	7.3	1.79	CAP	16.4	4.23	ECA	**20.8**	2.04
CES	9.1	1.80	CID	9.7	2.52	ERO	12.3	6.43	FST	17.0	2.13
GAB	17.3	6.36	GAZ	4.4	0.91	HAR	**24.7**	14.31	GTN	13.1	3.04
NOR	13.9	3.15	INH	9.6	4.20	KAR	5.5	1.42	KZN	**24.6**	2.34
SOC	8.9	1.62	MAN	5.6	1.22	KAV	10.7	2.22	LMP	**20.3**	1.42
SOU	10.7	2.71	MAP	3.6	0.80	KHO	5.8	1.29	MPU	**20.8**	2.55
WES	9.8	2.57	NAM	5.4	0.95	KUN	6.0	2.60	NCA	17.6	2.22
			NIA	6.9	1.41	OHA	7.1	1.28	NWP	**22.1**	3.11
			SOF	9.0	2.18	OMA	13.8	3.55	WCA	11.1	1.76
			TET	5.9	1.97	OMU	8.5	1.31			
			ZAM	4.9	0.89	OSH	12.3	3.74			
						OTJ	7.6	3.48			
						SHN	7.6	1.37			

Mathematics-teacher self-reported absenteeism by Socioeconomic Quintiles

Quintile	Avg. days	SE	Quintile	Avg. days	SE	Quintile	Avg. days	SE	Quintile	Avg. days	SE
1	10.6	1.39	1	7.2	0.98	1	9.4	1.11	1	**23.2**	1.17
2	10.9	1.55	2	5.9	0.54	2	9.4	0.88	2	**21.2**	0.92
3	10.7	1.24	3	6.6	0.60	3	9.3	0.91	3	**21.5**	1.29
4	10.5	1.47	4	6.3	0.79	4	9.2	1.07	4	18.9	1.36
5	10.3	2.07	5	6.2	1.03	5	9.7	1.89	5	11.4	1.13

Mathematics-teacher self-reported absenteeism by School Location

Location	Avg. days	SE	Location	Avg. days	SE	Location	Avg. days	SE	Location	Avg. days	SE
Rural	10.8	1.72	Rural	6.2	0.64	Rural	9.4	1.58	Rural	15.6	1.28
Urban	10.4	1.31	Urban	6.9	1.15	Urban	9.4	0.91	Urban	**23.2**	1.37

4.2) Teacher Content Knowledge

One of the numerous factors that are thought to impact student performance is teacher content knowledge. Taylor (2008, p. 24) states the obvious, but important, reality: "teachers cannot teach what they do not know." While pedagogical skills, teacher motivation and classroom resources are all important inputs into the student learning process, sufficient teacher content knowledge of the subject being taught is a necessary condition for student learning.

In addition to students that were tested in numeracy and literacy in SACMEQ III, the students' teachers were also tested in the subjects that they taught. While the majority of the test was the same as the student test, some more challenging questions were added, and some elementary questions were removed. Using Rasch scaling, the teacher scores were adjusted so that they would be comparable with the student test scores.

Figure 20 and Figure 19 below show the violin plots of reading-teacher reading score, and maths-teacher maths score. The violin plot shows a mirrored kernel density curve of the teacher score with a box-plot of teacher score in the centre. The box plot shows the median teacher score (white dot) as well as the inter-quartile range i.e. 25th percentile – 75th percentile (box), while the line within the violin extends to the upper adjacent value and the lower adjacent value.[23]

Table 9 shows that Botswana teachers are, on average, the most knowledgeable teachers in reading and mathematics among the four countries. In contrast, Mozambican teachers have the lowest scores for teacher reading and teacher maths scores. As part of Mozambique's effort to reach the Education For All goals of universal access to primary schooling, resources within the country (both human and material) are under strain. This could partially explain Mozambique's poor teacher content knowledge. Three additional observations:

1. Of the four countries, South Africa has both the highest and lowest teacher test scores for both reading and maths.
2. The average maths-teacher mathematics score for all four countries is below the SACMEQ average, substantially so in the case of Mozambique.
3. Mozambican and Namibian Grade 6 reading teachers know less than the average SACMEQ reading teacher.

[23] The upper adjacent value is defined as [X_{75} + 3/2(X_{75} – X_{25})], while the lower adjacent value is defined as [X_{25} - 3/2(X_{75} – X_{25})].

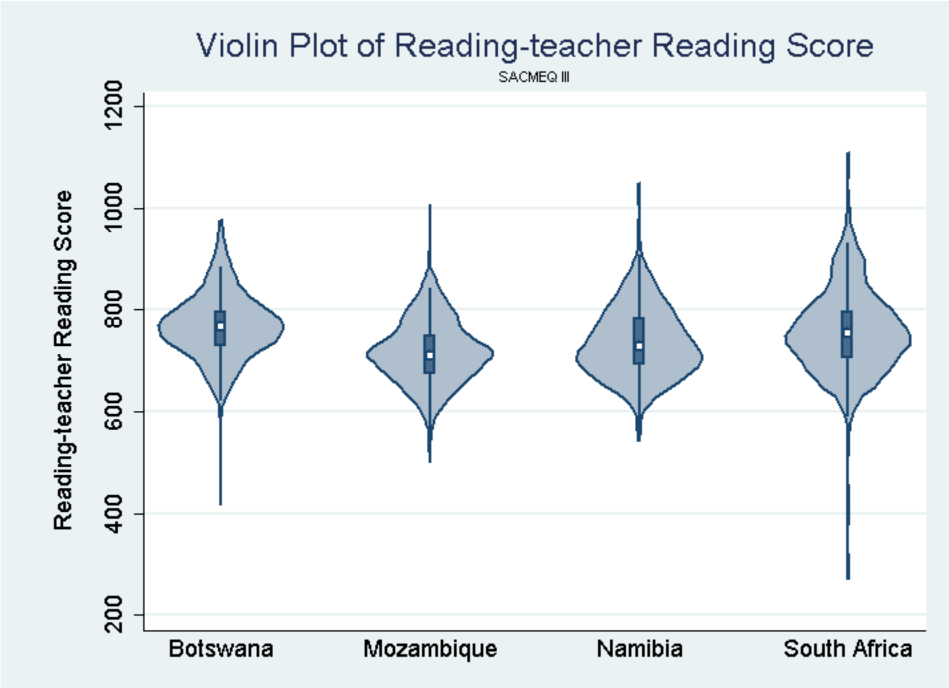


Figure 19

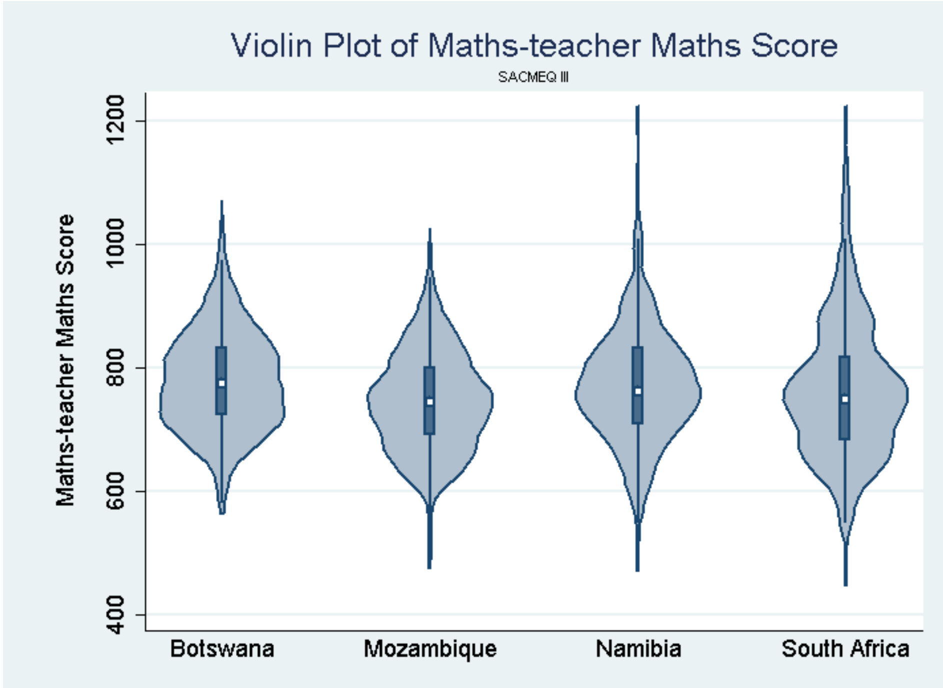


Figure 20

Table 9 Teacher Content Knowledge (red if below SACMEQ avg.)

		Mean	Std. Dev.	Min	Max
Reading teacher Reading score	Botswana	769.0	64.5	434.8	958.6
	Mozambique	**717.9**	62.2	518.3	990.3
	Namibia	**738.6**	73.9	560.4	1032.5
	South Africa	757.7	81.7	289.9	1090.3
	SACMEQ Avg.	**747.5**	**73.2**	**289.9**	**1090.3**
Maths teacher Maths score	Botswana	**780.0**	81.3	584.6	1051.1
	Mozambique	**745.6**	81.3	497.0	1006.9
	Namibia	**771.1**	91.1	492.6	1204.4
	South Africa	**763.6**	108.8	469.3	1204.4
	SACMEQ Avg.	**789.2**	**104.7**	**412.6**	**1204.4**

4.3) Textbooks

Textbooks are a fundamental resource to both teachers and students. Teachers can use textbooks for lesson-planning purposes, as a source of exercises and examples, and also as a measure of curriculum coverage. Students can use textbooks to 'read-ahead' if they have sufficiently mastered the current topic, preventing gifted students from being held back. Textbooks can, to a certain extent, also mitigate the effect of a bad teacher since they facilitate independent learning.

The problem of a lack of textbook-access is now commonly accepted in the South African research literature. For example, in Hoadley's (2010, p. 11) review of the classroom-based literature research in South Africa, she finds that one of the dominant descriptive features of primary schools is "a lack of print materials in classrooms, especially textbooks."

Figure 21 and Figure 22 below show the distributions of reading and mathematics textbooks across each of the four countries. Botswana has the highest proportion of students with their own reading textbooks (63%) and own mathematics textbooks (62%), followed by Mozambique (reading 53%, maths 52%), South Africa (reading 45%, maths 36%), and Namibia (reading 32%, maths 32%).

Figure 23 shows a scatterplot of the proportion of students who have their own maths and reading textbooks for each of the 40 provinces. The diagonal line is where the proportions of students who have their own maths textbook and own reading textbooks are equal. The dotted lines show the SACMEQ averages for 'own-textbook' for reading and mathematics.

The majority of Mozambican and Botswana Grade 6 children have their own maths and reading textbooks, while the majority of South African and Namibian Grade 6 students do not have access to their own textbooks – i.e. they do not have textbooks or they must share with fellow students. Given the importance of textbooks for student learning, particularly so for poorer students from text-deprived environments, the lack of access for Namibian and South African students is concerning. Furthermore, since the only constraints to textbook provision are financial and logistic (procurement and distribution), it is quite remarkable that the majority of South African and Namibian Grade 6 students do not have access to their own textbook, given that both of these countries are wealthier than most SACMEQ countries, especially Mozambique.

Figure 22

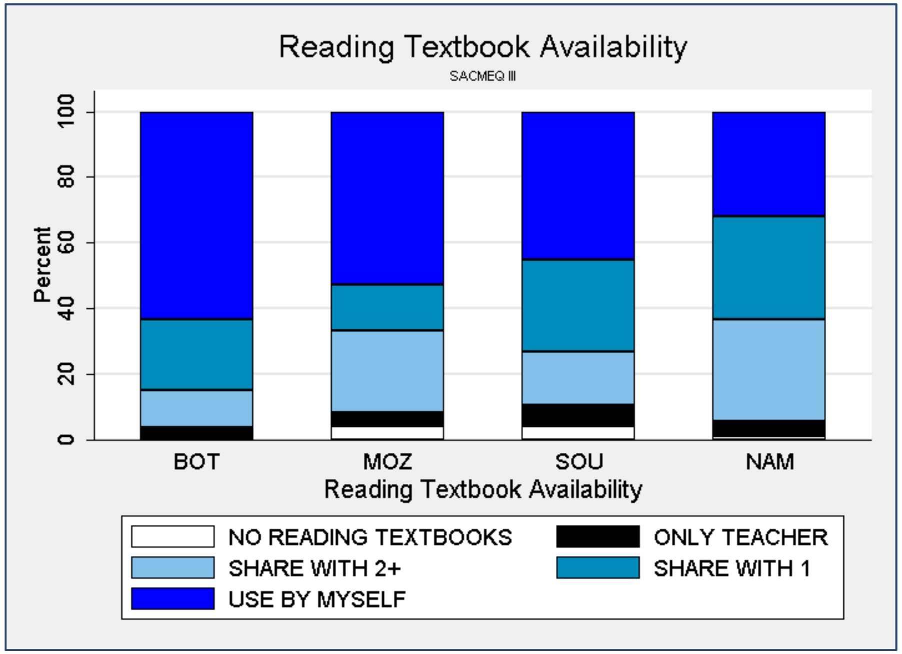


Table 10

Reading Textbook Availability				
	Botswana	Mozambique	Namibia	South Africa
No textbooks	1%	4%	1%	4%
Only the teacher has a textbook	3%	4%	4%	6%
Share with 2+	11%	25%	31%	16%
Share with 1	22%	14%	31%	28%
Own textbook	63%	53%	32%	45%
Total	**100%**	**100%**	**100%**	**100%**

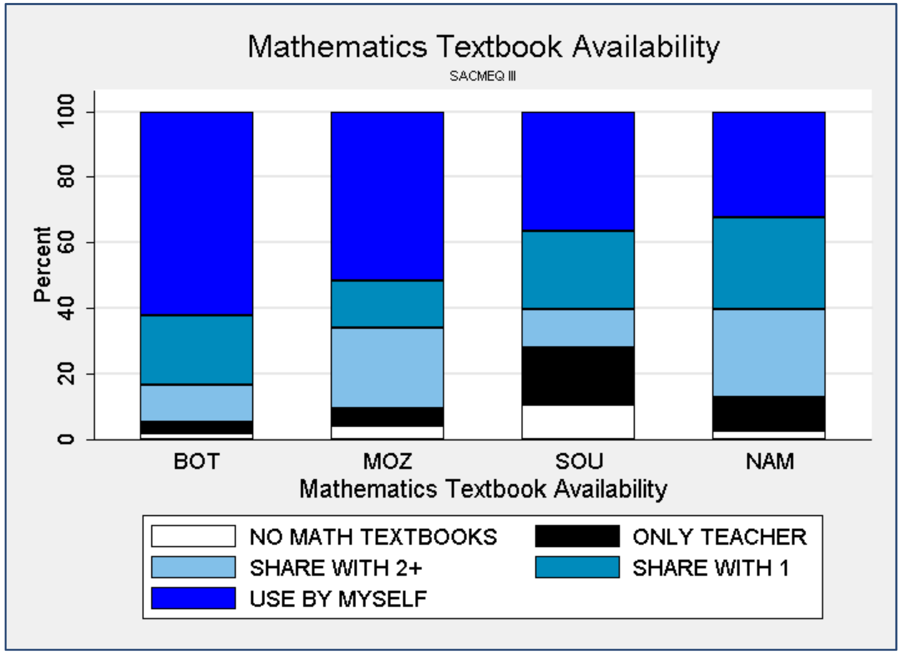
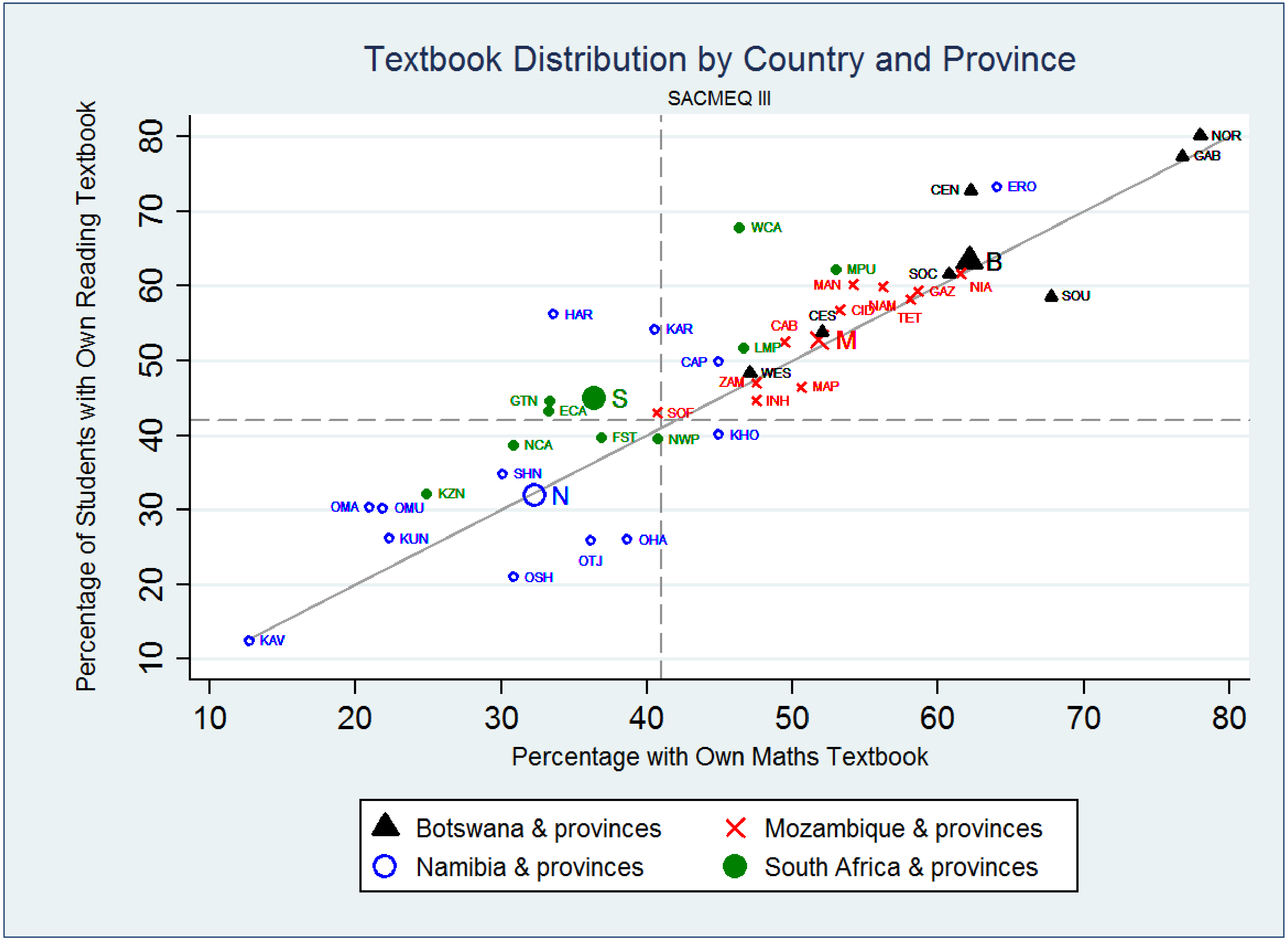


Figure 21

Table 11

Mathematics Textbook Availability				
	Botswana	Mozambique	Namibia	South Africa
No textbooks	2%	4%	2%	11%
Only the teacher has a textbook	3%	5%	11%	17%
Share with 2+	11%	24%	27%	12%
Share with 1	21%	14%	28%	24%
Own textbook	62%	52%	32%	36%
Total	100%	100%	100%	100%

Figure 23



Textbook Distribution by Country and Province
SACMEQ III
Percentage of Students with Own Reading Textbook
Percentage with Own Maths Textbook
10
20
30
40
50
60
70
80
NOR
GAB
CEN
ERO
WCA
MPU
SOC
B
MAN
NIA
GAZ
SOU
CID
NAM
TET
HAR
KAR
CAB
CES
M
LMP
CAP
WES
ZAM
MAP
INH
GTN
S
ECA
SOF
FST
NWP
KHO
NCA
SHN
KZN
N
OMA
OMU
KUN
OTJ
OHA
OSH
KAV
Botswana & provinces
Mozambique & provinces
Namibia & provinces
South Africa & provinces

4.4) Grade Repetition

Excessive grade repetition is a common problem in many developing countries, especially so in Sub-Saharan Africa. Students who do not achieve the required grades are held back and repeat that same grade in the hope that they will acquire the skills the second time around. However, in a report on learner retention commissioned by the South African Department of Education, a team of experts concluded that:

> "Grade repetition is generally ineffective as an intervention to address learning problems, regardless of when the repetition occurs. Learners repeating grades should have special programmes that are not a mere repetition of the material and content covered during the first year in the grade" (DoE, 2008, p. xix).

While these comments were made with specific reference to the South African context, the point is well taken that repetition is likely to produce more of the same results (failure) unless it caters to the specific reasons *why* students did not acquire the skills they were meant to during the first year in that grade. The solution to grade repetition is therefore not to simply push students through to higher grades when they clearly lack the capabilities necessary to acquire the skills and knowledge - and thus benefit - from that level of education, but rather some form of remedial education.

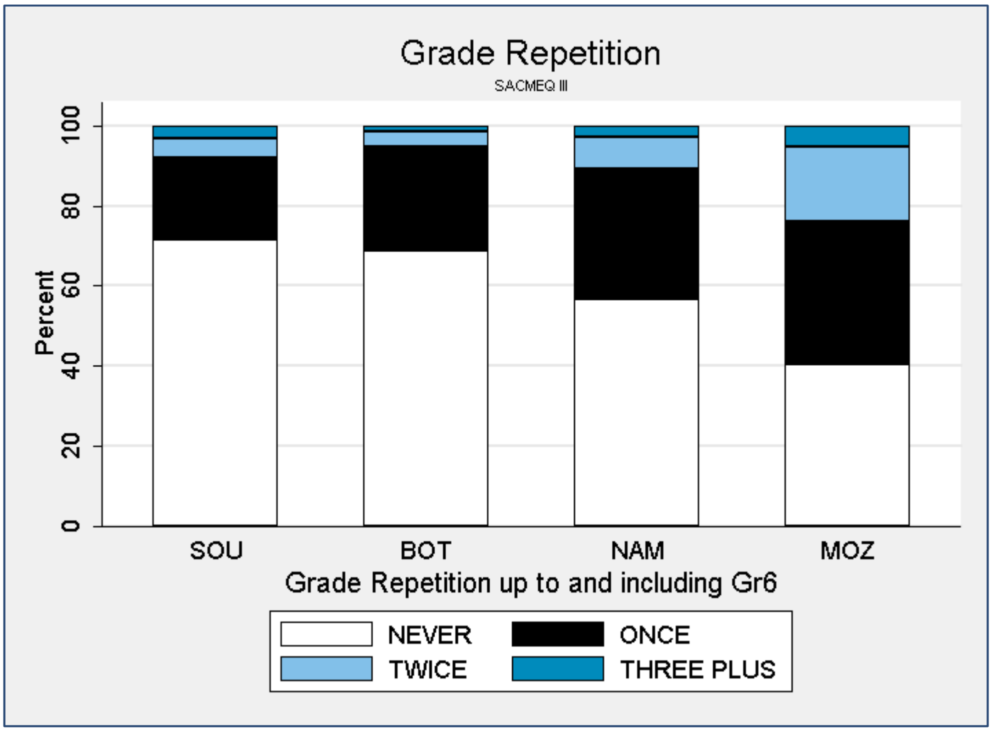
In the SACMEQ III survey, students were asked how many times they had repeated a grade (including Grade 6, the current year) since they started school. Figure 24 below shows that Mozambican Grade 6 students reported the highest rates of repetition with 60% reporting that they had repeated at least one grade. 19% of Mozambican students, almost 1 in 5, reported that they had repeated 2 grades compared to 8% for Namibia, 5% for South Africa, and 4% for Botswana.

Appendix A provides the grade-specific repetition and dropout rates for each country.

Table 12

	Grade Repetition			
	Botswana	**Mozambique**	**Namibia**	**South Africa**
Never	69%	40%	57%	72%
Once	26%	36%	32%	20%
Twice	4%	19%	8%	5%
Three +	2%	5%	3%	3%
Total	**100%**	**100%**	**100%**	**100%**

Figure 24



4.5) Preschool Education

One feature of the SACMEQ III survey that was not present in previous SACMEQ surveys was that students were asked how long they had attended preschool before Grade 1. This enables us to determine the distribution and duration of schooling prior to Grade 1. Students who have been exposed to at least one year of quality preschool education perform better in primary school than those with little or no preschool exposure. Preschools play an important role in readying the student for primary education by imparting the emotional, intellectual and social skills necessary to succeed at school. Students who have attended preschool are more acclimatised to the schooling environment, socialise better with peers and have a better relationship with teachers than those who have no school exposure prior to Grade1. Research shows that the formative years of childhood are crucial for cognitive development, and that deficits arising from a lack of mental stimulation early on cannot be made-up for in later schooling. These social and cognitive benefits mean that children who have attended preschool are more likely to succeed at primary school, and less likely to repeat or drop-out.

In both South Africa and Namibia, the government plays an active role in the provision and monitoring of preschool education. In Botswana, preschool education is provided mainly by the private sector, individuals, communities and NGO's, with the government providing support with respect to curriculum development and policy formulation (Monyaku & Mereki, 2011). In Mozambique, pre-school education is provided by crèches and kindergartens, which are usually under the authority of the Ministry of Health or private organisations (Passos, 2009). However, this is not compulsory and is too expensive for most Mozambican students.

Figure 25 below shows that the majority of Namibian (70%) and South African (68%) Grade 6 students attended at least one year of preschool education, with a significant proportion attending for 2 years or more. In contrast, the majority of Mozambican (74%) and Botswana (60%) Grade 6 students did not attend preschool at all (Table 13).

Table 13 – Preschool Incidence

Preschool	Botswana	Mozambique	Namibia	South Africa
None	60%	74%	24%	26%
A few months	4%	5%	6%	5%
1 year	12%	10%	42%	33%
2 years	12%	4%	16%	15%
3+ years	11%	7%	12%	20%
Total	100%	100%	100%	100%

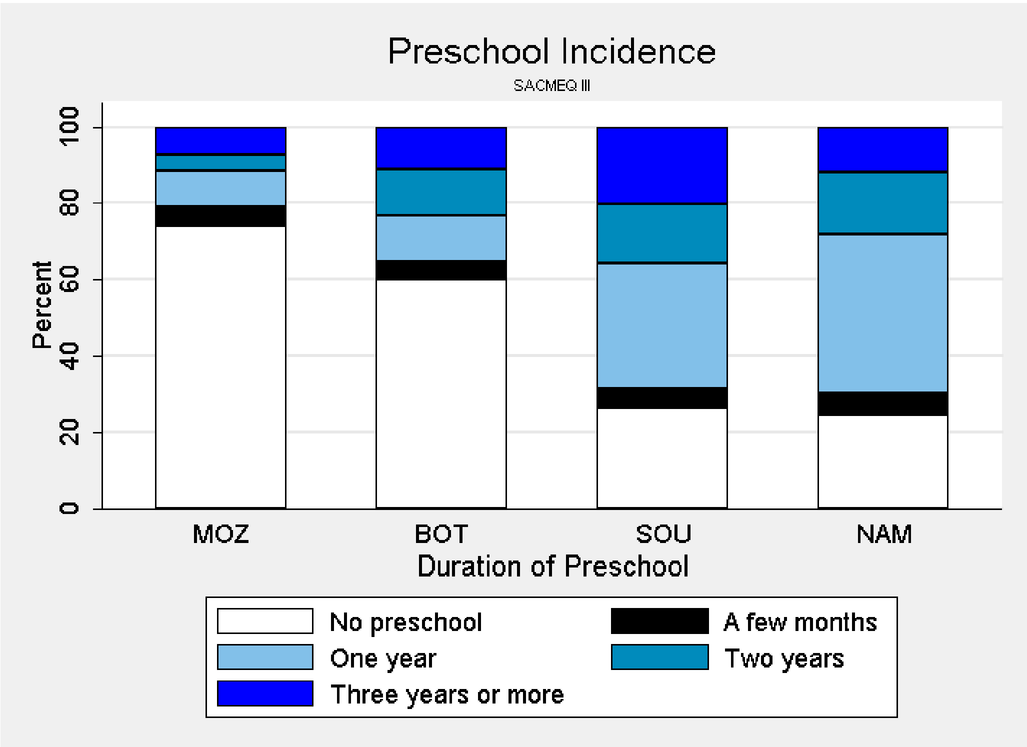


Figure 25

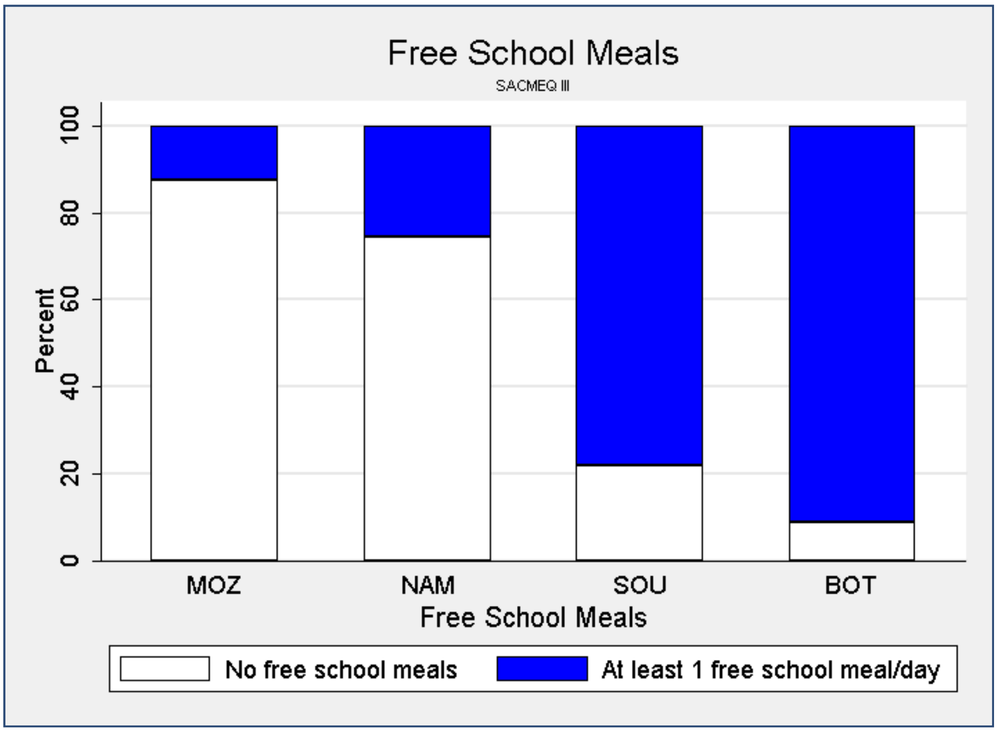
4.6) School Feeding Programmes and Child Nutrition

The importance of nutrition for cognitive development has been well established in the literature. Del Rosso (1999, p. 5) provides a concise summary of the impact of poor nutrition:

> "Children who lack certain nutrients in their diet (particularly iron and iodine), or who suffer from protein-energy malnutrition, hunger, parasitic infections or other diseases, *do not have the same potential for learning* as healthy and well-nourished children. Weak health and poor nutrition among school-age children *diminish their cognitive development* either through physiological changes or by reducing their ability to participate in learning experiences – or both … Children with diminished cognitive abilities and sensory impairments naturally perform less well and are more likely to repeat grades and drop out of school than children who are not impaired; they also enrol in school at a later age, if at all, and finish fewer years of schooling."

In response to this, and partially as an initiative to alleviate child hunger, many low income countries have implemented school feeding programs, including Botswana and South Africa. Figure 26 below shows the proportion of Grade 6 students that reported receiving at least one free school meal per day. Botswana has the highest proportion (91%), followed by South Africa (78%), Namibia (25.64%), and Mozambique (12.64%). The success of Botswana's school feeding program is widely acknowledged, and has also been credited with improving school attendance rates in the country (Zuze, 2010, p. 3).

Figure 26

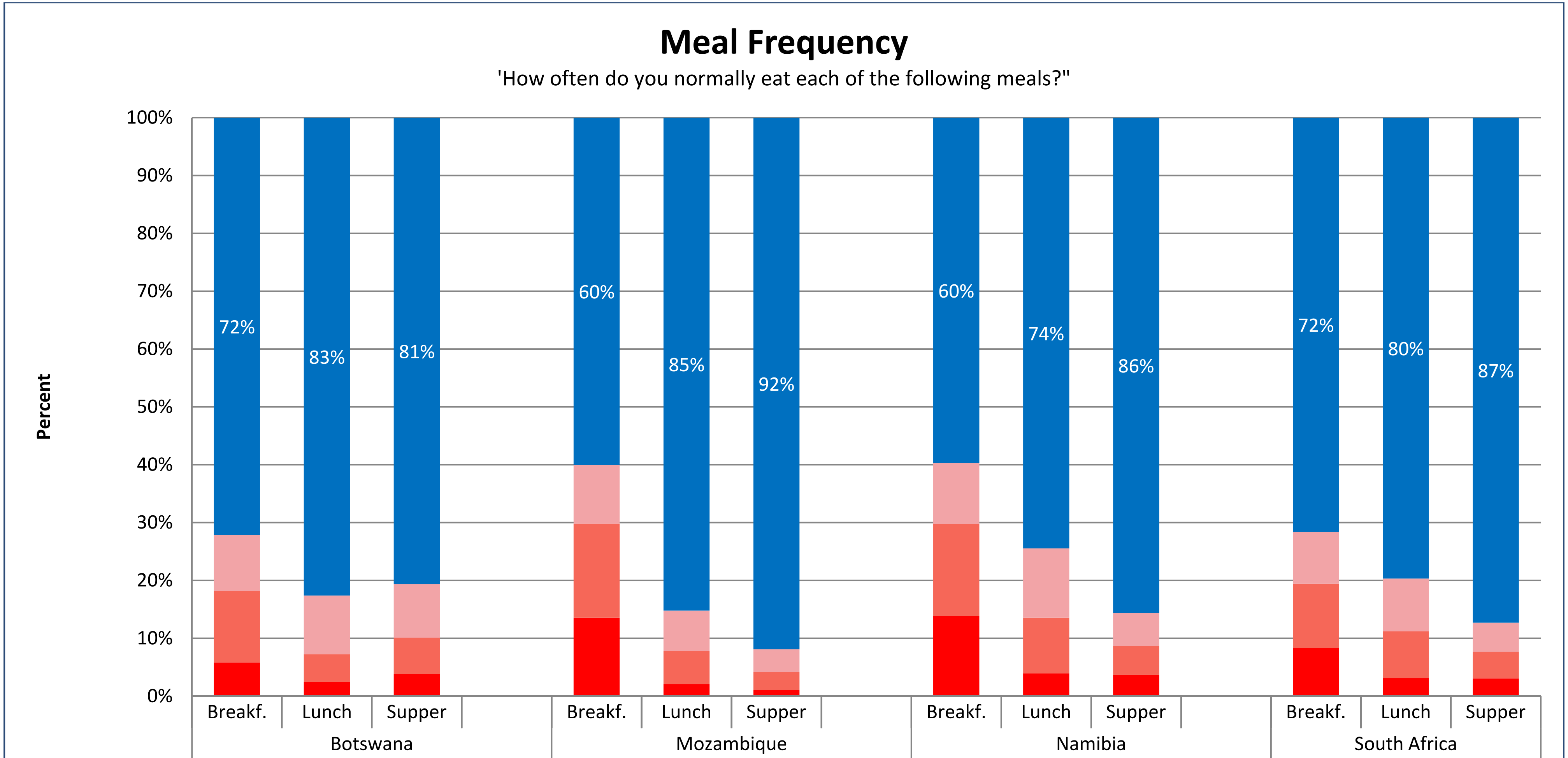


Although free school meals can make up for a lack of nutrition at home, the majority of a child's nutrition will come from the home-context. The SACMEQ III survey provides a useful measure of meal frequency. One question in the student questionnaire asked “How often do you eat each of the following meals?” (breakfast, lunch and supper), with the four options being ‘every day of the week’, ‘3 or 4 days per week’, ‘1 or 2 days per week’, and ‘not at all’. The results of this question split by country are shown in Figure 27 below. Three observations are worth noting:

1) There is a high proportion of Mozambican and Namibian students who do not eat breakfast regularly, if at all. Indeed, 30% of Grade 6 children in Mozambique and Namibia reported that they only ate breakfast once or twice a week, or not at all, compared to only 19% in South Africa and 18% in Botswana. This can have a detrimental effect on learning. As Del Rosso (1999, p. 5) notes: “Even temporary hunger, common in children who are not fed before going to school, can have an adverse effect on learning. Children who are hungry have more difficulty concentrating and performing complex tasks, even if otherwise well nourished.”
2) 14% of Namibian children reported that they only ate lunch once or twice a week, or not at all, compared to 11% for South Africa, 8% for Mozambique, and 7% for Botswana.
3) There is a relatively low proportion of Botswana students who reported having supper every day (81%), compared to Namibia (86%), South Africa (87%), and Mozambique (92%).

It is perhaps counter-intuitive that Mozambique should have the highest proportion of students receiving lunch and supper ‘every day’. However, this may be because many Mozambican children do not receive a morning meal and thus their parents are more likely to give them mid-day and evening meals. If this were the case, one might expect Namibia to show a similar trend since it also has a low proportion of students receiving breakfast ‘every day’, yet it does not seem to exhibit such a trend.

Although meal frequency is an important indicator of nutritional *intake*, it provides no indication of nutritional *content*. Within our four country sample, it is not unreasonable to assume that there is a positive relationship between nutritional-content of the average meal and GDP per capita. For example, it is more likely that South African children have access to iodized salt and fortified cereals than do their Mozambican counterparts. Therefore, although 92% of Mozambican children report that they receive supper ‘every day’ (compared to 87% of South African children), one should be aware that these meals most probably have differing nutritional content.



	Botswana Breakf.	Botswana Lunch	Botswana Supper	Mozambique Breakf.	Mozambique Lunch	Mozambique Supper	Namibia Breakf.	Namibia Lunch	Namibia Supper	South Africa Breakf.	South Africa Lunch	South Africa Supper
Every day	72%	83%	81%	60%	85%	92%	60%	74%	86%	72%	80%	87%
3-4 days/week	10%	10%	9%	10%	7%	4%	11%	12%	6%	9%	9%	5%
1-2 days/week	12%	5%	6%	16%	6%	3%	16%	10%	5%	11%	8%	5%
Not at all	6%	2%	4%	14%	2%	1%	14%	4%	4%	8%	3%	3%

Figure 27

Conclusion

The aim of this paper was to provide a more nuanced understanding of student performance both within and between the four countries analysed. Although a fairly simple and sequential approach was adopted, there were numerous important findings arising from the analysis. Split by section, the most important of these were as follows:

Section 1 – Country profiles

Although there are large performance inequalities between the four countries under review, there are equally large, if not larger, differentials *within* countries. National averages in reading and mathematics performance shroud the inequalities between provinces within a country, especially in South Africa and Namibia. Across all countries except Botswana, there is a large performance differential between urban and rural schools. The provincial analysis showed that the level of aggregation in comparison is important, and that these differences between sub-groups must be remembered when interpreting aggregated means – especially at the national level.

Section 2 - Cross national comparisons

While cross-national comparisons of student performance are both useful and interesting, they are fraught with a number of comparability issues. Aside from the non-quantifiable differences between countries (history, culture, geography, etc.), there are also large population and resource differentials which must be taken into account when comparing student performance between the four countries. Also, and perhaps most importantly when looking at performance, there are large differences in the progression and grade survival rates for each of the four countries. Only students that have passed all previous grades and have progressed to Grade 6 are actually included in the SACMEQ sample. Therefore, in countries where there is low enrolment and/or high dropout prior to Grade 6, this is a very select sub-sample of the total population of age-appropriate students. Mozambique is one such example. If we only observe the performance of students sampled in SACMEQ, only 22% of 14 year old Mozambican students are found to be functionally illiterate. However, if we look at the total age-appropriate population of Mozambique whether in school or out (i.e. making adjustments for dropout), the figure rises to 53% of Mozambican 14 year olds – a 31% increase. The rise in functional illiteracy for the other three countries is less than 10%. While this adjustment is a rather crude method and sensitive to the survival rates used, it does provide an indication of the quality of a country's education system, at least in terms of its ability to educate its youth.

Section 3 - Performance of students

The ability to test what Grade 6 students actually know is one of the unique contributions of the SACMEQ initiative. Moving beyond questions of access and enrolment, educational planners and researchers are placing increased focus on student performance as a measure of educational quality. Unfortunately the results that emerge from the SACMEQ III numeracy and literacy tests show that an unacceptably large proportion of students in each of these four countries have not mastered even the most basic numeracy and literacy skills. For example, more than one in four Grade 6 children in South Africa are functionally illiterate, while 48% of Namibian Grade 6 students are functionally innumerate. The situation in Mozambique is as bad, and marginally better in Botswana. Given this state of affairs, one begins to question the efficacy of a schooling system that cannot impart elementary reading and mathematics skills to all students in 6 years of formal full-time schooling.

Section 4 – Additional Aspects of Schooling

The six additional aspects of schooling that were analysed show that the schooling environment is very different between these four countries. In Mozambique, grade repetition is a particularly acute problem, with more than one in two students repeating at least one grade in their primary school career. South Africa, in contrast, is plagued with excessive teacher absenteeism, with maths teachers reporting that they were absent for an entire month in the previous year, more than twice as much as maths teachers in the other three countries.

Similar differences can be seen in school feeding programmes and preschool education. Although Botswana has an extremely successful school feeding program, the vast majority of Batswana students receive no preschool education whatsoever, whereas most South African and Namibian students receive at least one year of preschool education prior to Grade 1. While the reasons for some of these trends are understandable; for example Mozambique’s budgetary constraints, other trends are more perplexing. How is it possible that more Mozambican students have access to their own textbook as compared to South African students? Especially when South African per-student spending is 15 times higher than that of Mozambique. The same can be said of Namibia, where textbook provision is also worse than in Mozambique.

The discussion in this paper on selected aspects of primary schooling is by no means comprehensive or exhaustive. The school effectiveness literature points to many other important variables such as school management, homework-frequency, curriculum coverage, teacher’s motivation and pedagogical skill etc. However, even if one only looks at the variables that *were* included in this analysis, the simple descriptive approach provided here can only tell us so much. More often than not, these observable variables interact with unobservable variables to determine their true benefit. Ideally one should look not only at textbook *access* but also at textbook *use,* since it is the latter not the former that improves learning. Similarly, one should measure not only the *duration* of preschool, but also the *quality* of that preschool education. And lastly, one should identify not only what teachers *know* but also what they are able to *convey.* While it was not within the purview of this paper to model student performance, this is possible using the SACMEQ data, and necessary for a more accurate picture of the educational process. Structural multivariate analysis can go some way to isolating and understanding those variables that are significant predictors of student performance.

While this study has focused on only four of the 14 SACMEQ countries, many of the issues addressed here have been summarily dealt with in numerous SACMEQ policy briefs. These include papers on grade repetition (Hungi, 2010), textbook provisioning (Ross, 2010), and student performance (Makuwa, 2010). As one example of what is possible using the SACMEQ data, Garrouste (2011) uses the Namibian SACMEQ III data to analyse the impact of mother-tongue instruction on mathematics education.

Concluding comments

Although there are many issues of contention in educational research, there is broad consensus on a number of issues. This paper has focussed on five of these areas of consensus:

1. Students *should* be functionally literate and numerate by the 6^{th} year of primary schooling.
2. Students cannot learn if their teachers are not present, in school, teaching.
3. Teachers cannot teach what they do not know.
4. Hungry children have difficulty learning.
5. Textbooks are a fundamental pedagogical tool especially in poorer, text-deprived schools.

The policy implications arising from the above tenets are not simple or obvious; each one has a different set of logistical and financial implications with differing educational payoffs. Thus, to determine the cost-effectiveness of each of these options (or a myriad of others) more in-depth country-specific analysis is required. This report presents researchers and educational planners with relevant information on the conditions of schooling and student performance in each of these four countries, making it is possible to monitor progress over time and to benchmark the level of various schooling variables.

However, it has focused on only four countries, and only a handful of variables. There are ten other SACMEQ countries, and hundreds of other variables – all of which have the potential to shed light on the determinants and drivers of student performance and educational quality. A far more complex and nuanced analysis is required if we are to understand the intricate process of teaching and learning in Sub-Saharan Africa. Consequently, the challenge remains to visualise and analyse this rich SACMEQ dataset in an effort to accumulate evidence for sound educational policy.

Appendix A – Repetition and Dropout

Table 14 - Repetition rate

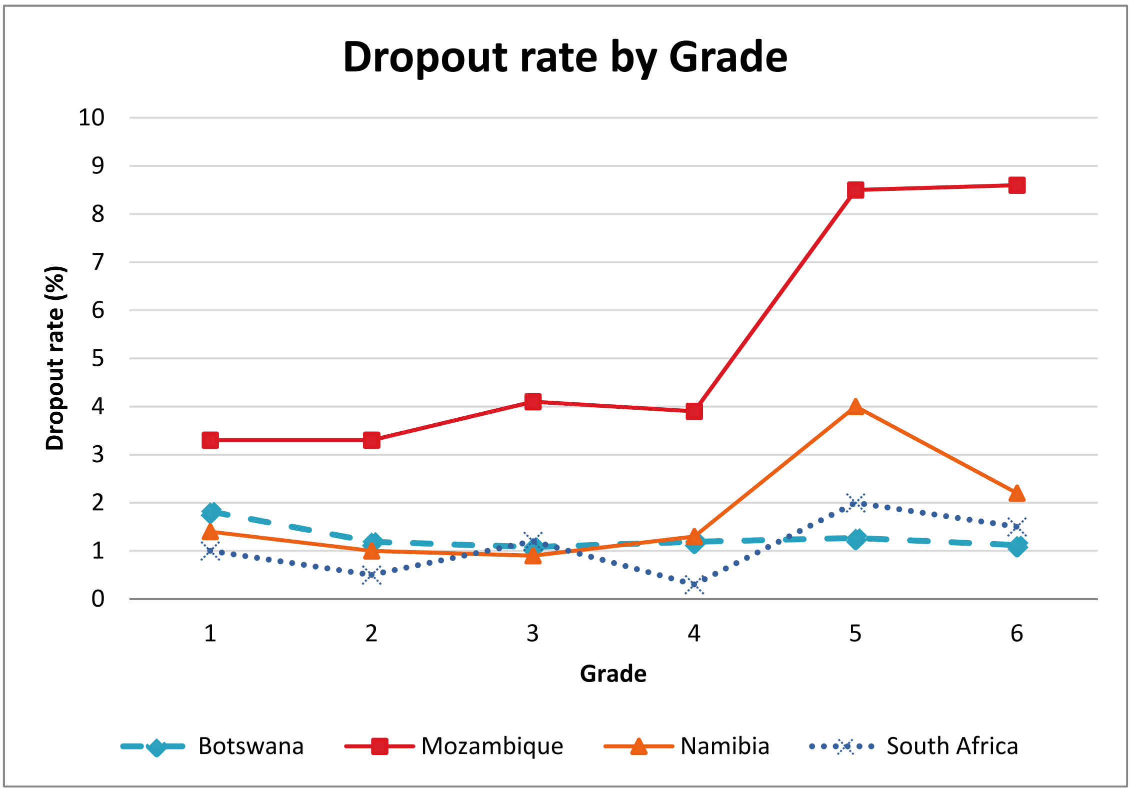
Country	Grade						Source	Date of Data
	1	2	3	4	5	6		
Botswana	8.6	5.3	4.5	8.8	3.3	2.2	(CSO, 2010, p. cxv)	2007
Mozambique	25.7	12.7	14.4	12.2	10.6	13.9	(DHS, 2005: 28)	2003
Namibia	12.0	6.1	6.3	5.3	10.4	4.9	(DHS, 2008: 15)	2006
South Africa	7.2	7.4	7.4	7.1	6.9	6.7	(DBE, 2011: 5)	2009

Table 15 - Dropout rate

Country	Grade						Source	Date of Data
	1	2	3	4	5	6		
Botswana	1.8	1.2	1.1	1.2	1.3	1.1	(CSO, 2010: cxviii)[24]	2007
Mozambique	3.3	3.3	4.1	3.9	8.5	8.6	(DHS, 2005: 28)	2003
Namibia	1.4	1.0	0.9	1.3	4.0	2.2	(DHS, 2008: 15)	2006
South Africa	1.0	0.5	1.2	0.3	2.0	1.5	(DBE, 2011: 3)	2007-2008[25]

[24] Own calculations
[25] Based on National Income Dynamics data 2008

Figure 29



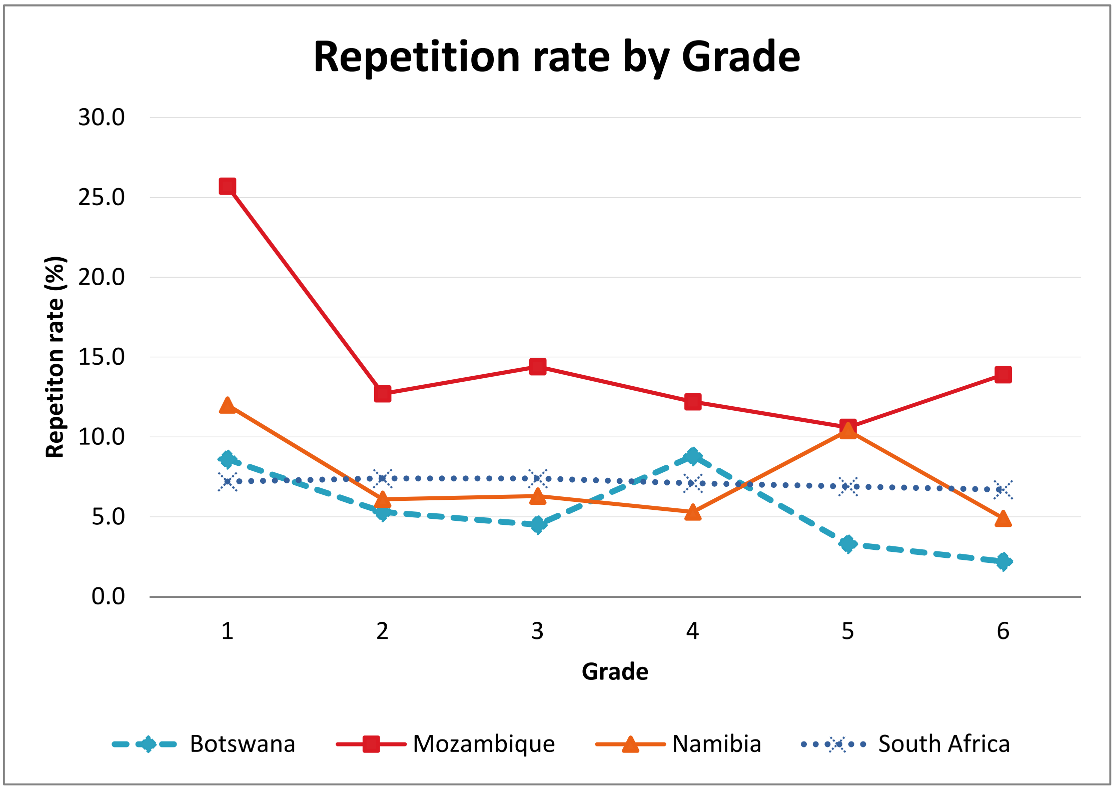


Figure 28

Reading Competency Levels

Description of levels	Range on 500 point scale[26]	Skills
Level 1 *Pre-reading*	< 373	Matches words and pictures involving concrete concepts and everyday objects. Follows short simple written instructions.
Level 2 *Emergent reading*	373 → 414	Matches words and pictures involving prepositions and abstract concepts; uses cuing systems (by sounding out, using simple sentence structure, and familiar words) to interpret phrases by reading on.
Level 3 *Basic reading*	414 → 457	Interprets meaning (by matching words and phrases, completing a sentence, or matching adjacent words) in a short and simple text by reading on or reading back.
Level 4 *Reading for meaning*	457 → 509	Reads on or reads back in order to link and interpret information located in various parts of the text.
Level 5 *Interpretive reading*	509 → 563	Reads on and reads back in order to combine and interpret information from various parts of the text in association with external information (based on recalled factual knowledge) that "completes" and contextualizes meaning.
Level 6 *Inferential reading*	563 → 618	Reads on and reads back through longer texts (narrative, document or expository) in order to combine information from various parts of the text so as to infer the writer's purpose
Level 7 *Analytical reading*	618 → 703	Locates information in longer texts (narrative, document or expository) by reading on and reading back in order to combine information from various parts of the text so as to infer the writer's personal beliefs (value systems, prejudices, and/or biases).
Level 8 *Critical reading*	703+	Locates information in a longer texts (narrative, document or expository) by reading on and reading back in order to combine information from various parts of the text so as to infer and evaluate what the writer has assumed about both the topic and the characteristics of the reader – such as age, knowledge, and personal beliefs (value systems, prejudices, and/or biases).

Source: (SACMEQ, SACMEQ III Project Results: Pupil Achievement Levels in Reading and Mathematics, 2010)

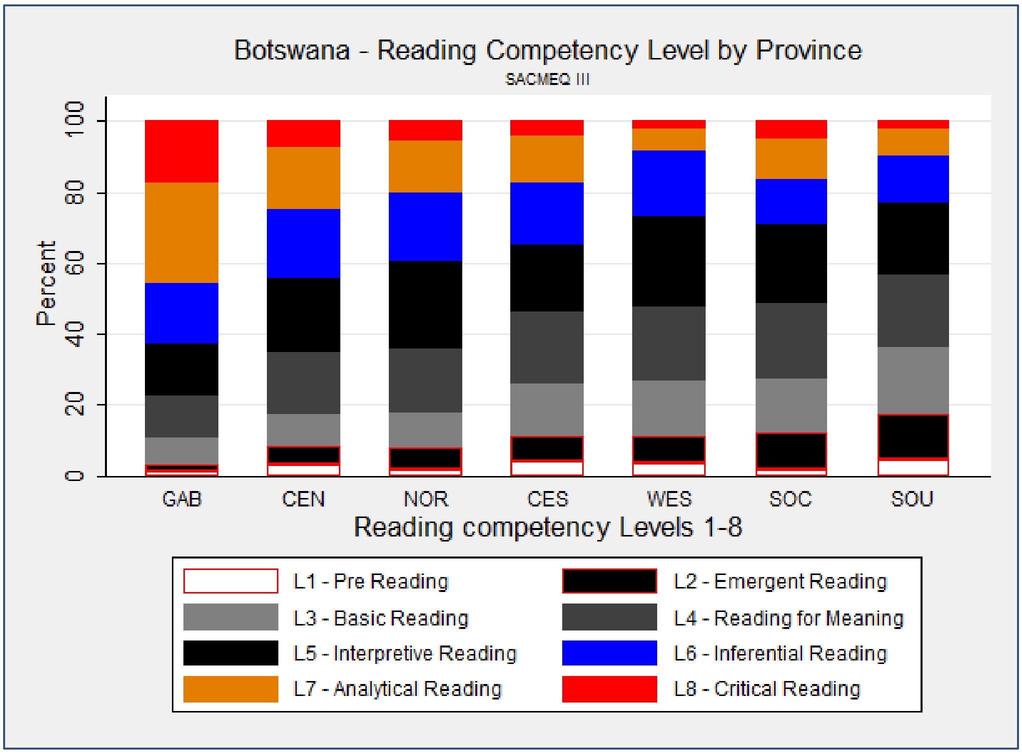
[26] See (Ross, et al., 2005, p. 95).

Mathematics Competency Levels

Description of levels	**Range on 500 point scale**[27]	**Skills**
Level 1 *Pre-numeracy*	< 364	Applies single step addition or subtraction operations. Recognizes simple shapes. Matches numbers and pictures. Counts in whole numbers.
Level 2 *Emergent numeracy*	364 → 462	Applies a two-step addition or subtraction operation involving carrying, checking (through very basic estimation), or conversion of pictures to numbers. Estimates the length of familiar objects. Recognizes common two-dimensional shapes.
Level 3 *Basic numeracy*	462 → 532	Translates verbal information presented in a sentence, simple graph or table using one arithmetic operation in several repeated steps. Translates graphical information into fractions. Interprets place value of whole numbers up to thousands. Interprets simple common everyday units of measurement.
Level 4 *Beginning numeracy*	532 → 587	Translates verbal or graphic information into simple arithmetic problems. Uses multiple different arithmetic operations (in the correct order) on whole numbers, fractions, and/or decimals.
Level 5 *Competent numeracy*	587 → 644	Translates verbal, graphic, or tabular information into an arithmetic form in order to solve a given problem. Solves multiple-operation problems (using the correct order of arithmetic operations) involving everyday units of measurement and/or whole and mixed numbers. Converts basic measurement units from one level of measurement to another (for example, metres to centimetres).
Level 6 *Mathematically skilled*	644 → 720	Solves multiple-operation problems (using the correct order of arithmetic operations) involving fractions, ratios, and decimals. Translates verbal and graphic representation information into symbolic, algebraic, and equation form in order to solve a given mathematical problem. Checks and estimates answers using external knowledge (not provided within the problem).
Level 7 Concrete problem solving	720 → 806	Extracts and converts (for example, with respect to measurement units) information from tables, charts, visual and symbolic presentations in order to identify, and then solves multi-step problems.
Level 8 *Abstract problem solving*	> 806	Identifies the nature of an unstated mathematical problem embedded within verbal or graphic information, and then translate this into symbolic, algebraic, or equation form in order to solve the problem.

Source: (SACMEQ, SACMEQ III Project Results: Pupil Achievement Levels in Reading and Mathematics, 2010)

[27] See (Ross, et al., 2005, p. 95).


Botswana - Reading Competency Level by Province
SACMEQ III
Percent
0
20
40
60
80
100
GAB
CEN
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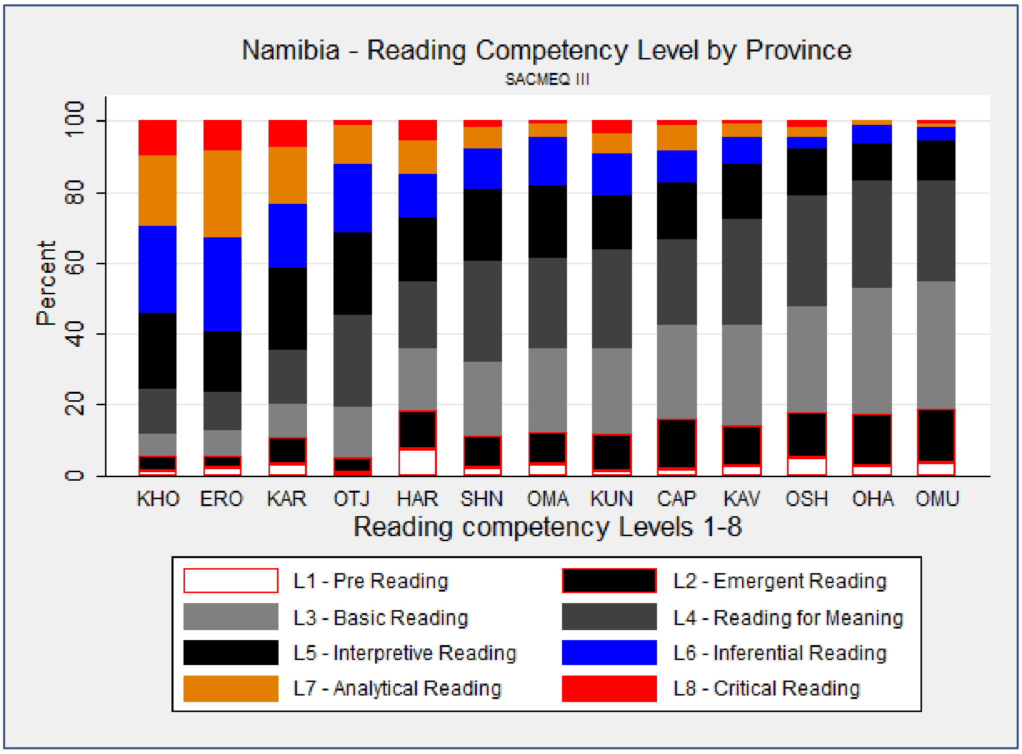
SOU
Reading competency Levels 1-8
L1 - Pre Reading
L2 - Emergent Reading
L3 - Basic Reading
L4 - Reading for Meaning
L5 - Interpretive Reading
L6 - Inferential Reading
L7 - Analytical Reading
L8 - Critical Reading


Namibia - Reading Competency Level by Province
SACMEQ III
Percent
0
20
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60
80
100
KHO
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Reading competency Levels 1-8
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L5 - Interpretive Reading
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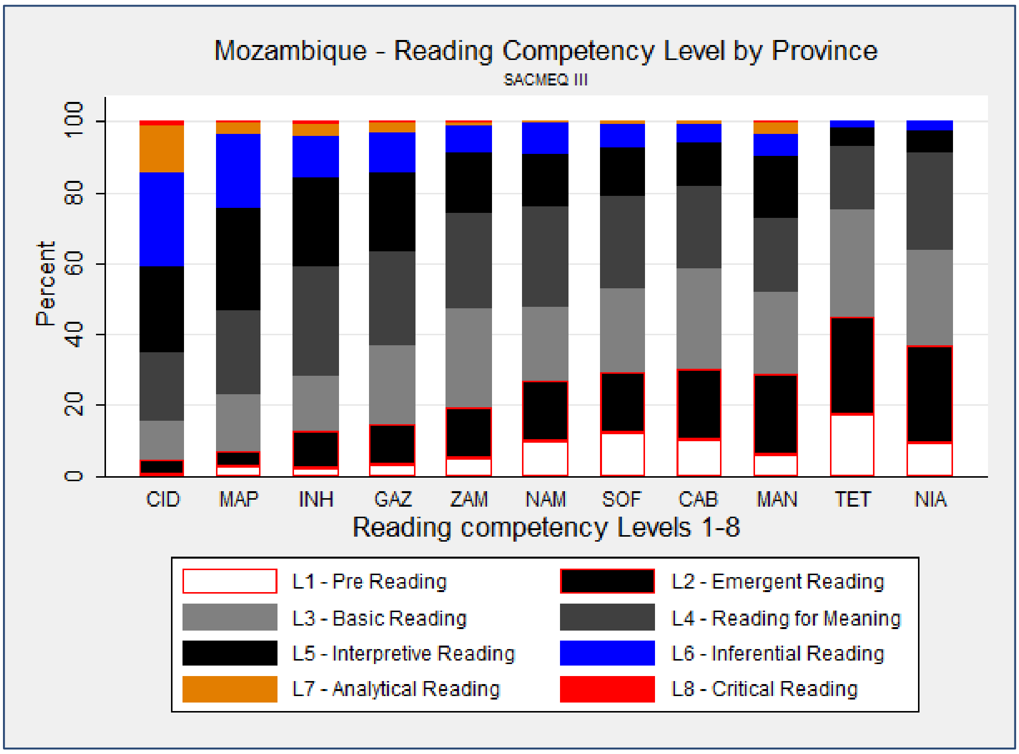
L7 - Analytical Reading
L8 - Critical Reading


Mozambique - Reading Competency Level by Province
SACMEQ III
Percent
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CAB
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Reading competency Levels 1-8
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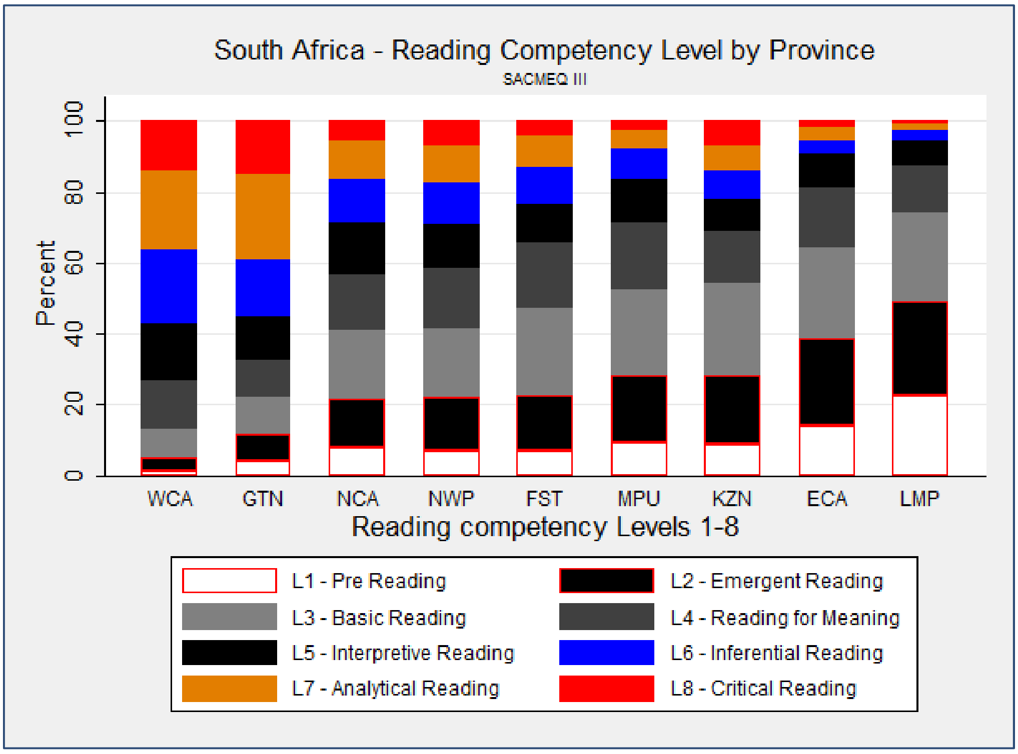
South Africa - Reading Competency Level by Province
SACMEQ III
Percent
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20
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ECA
LMP
Reading competency Levels 1-8
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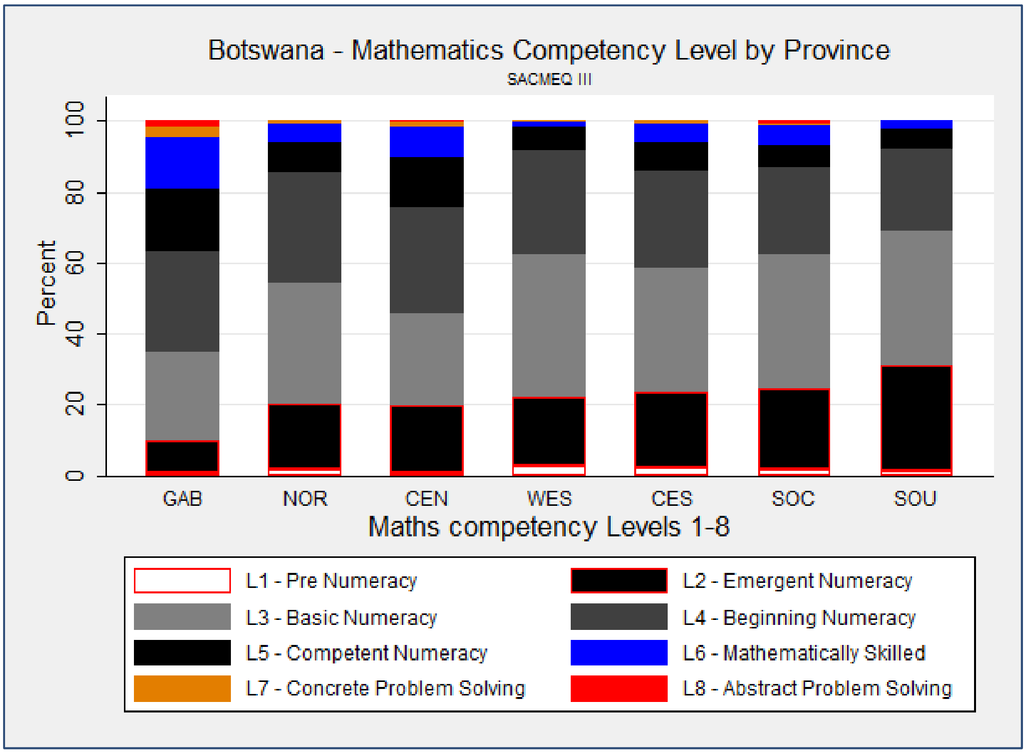
Botswana - Mathematics Competency Level by Province
SACMEQ III
Percent
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GAB
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Maths competency Levels 1-8
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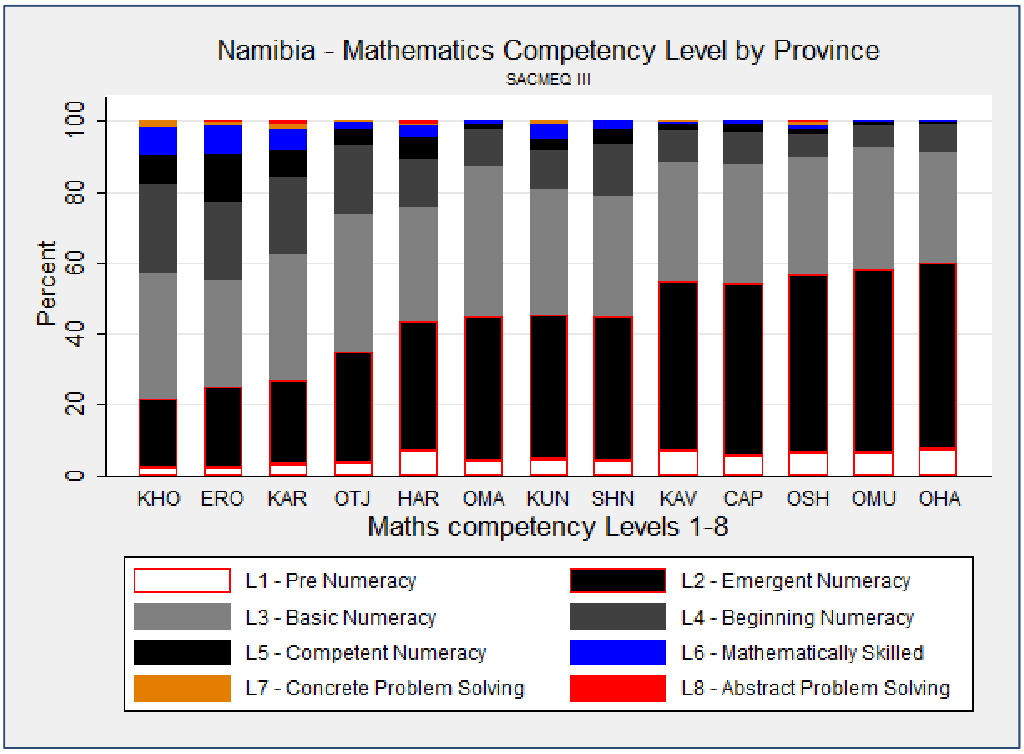
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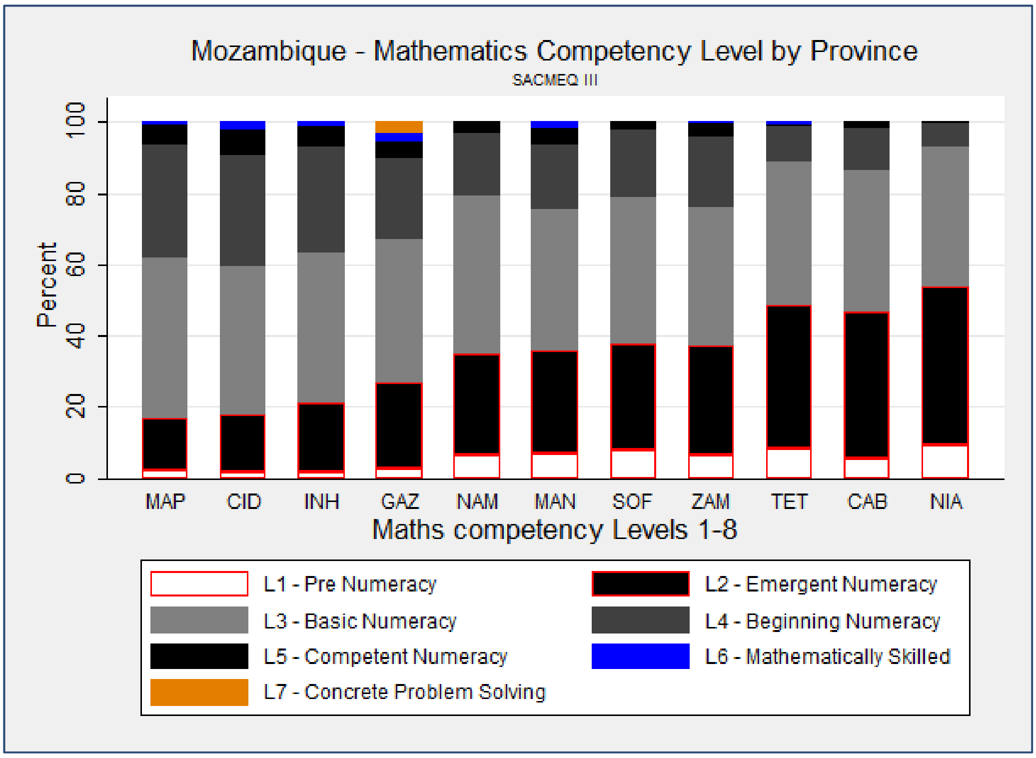
Mozambique - Mathematics Competency Level by Province
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Percent
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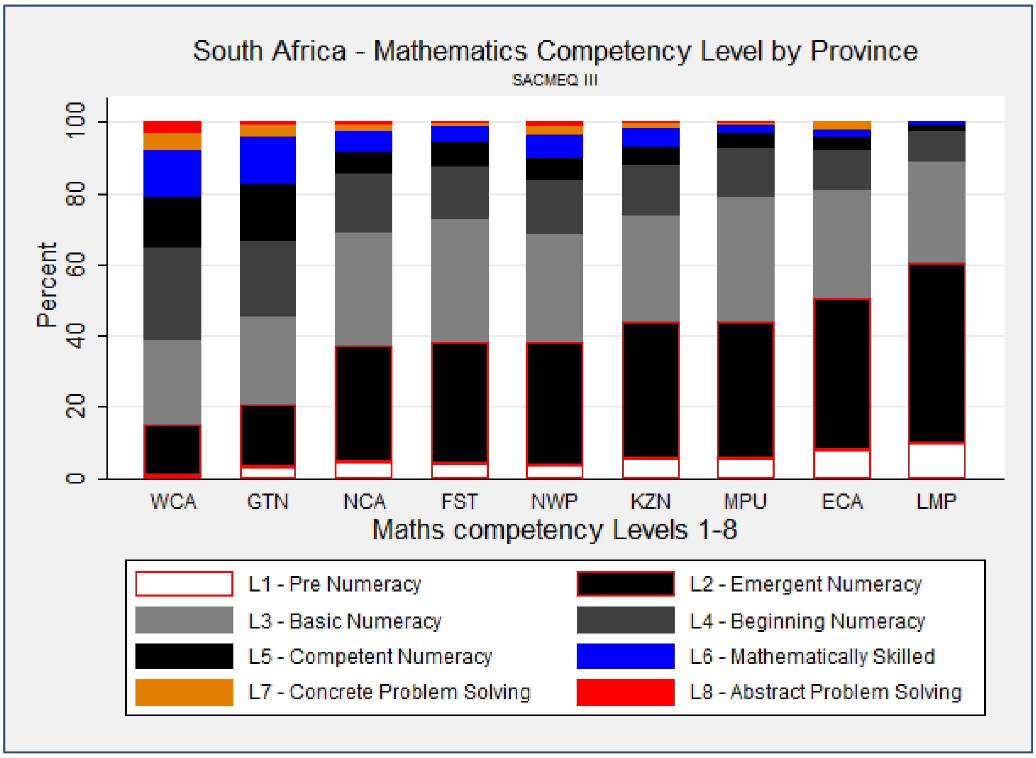
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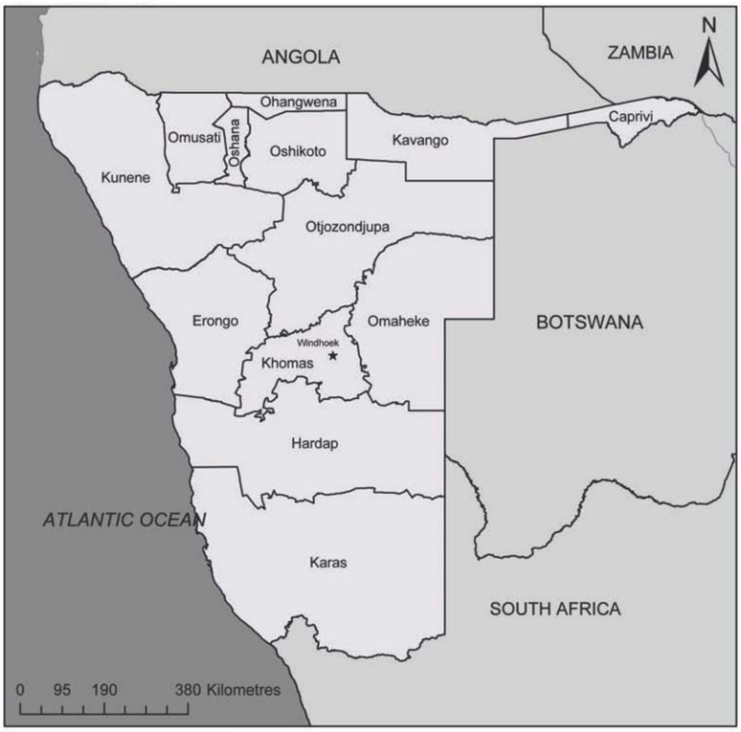
Appendix C – Provincial Maps

Figure 30 - South Africa Provincial Map

Figure 31 - Mozambique Provincial Map

Figure 32 - Namibia Provincial Map



*The provincial map for Botswana has not been included since the SACMEQ survey did not use provinces but rather regions, and furthermore, the regional names are self-explanatory (Central, North etc).

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