Optimal school-level Grade 12 performance indicators and a proposed school report card

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Contents

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EXECUTIVE SUMMARY

The current report forms part of a larger project examining **problems and solutions in the collection and use of data in provincial education systems** in South Africa. This report focusses on ways in which the Grade 12 examinations data could be utilised in better ways to gauge performance and progress at the level of the school. It also presents a **proposed school report card**.

Sections 2 and 3 of the current report describe the rather rudimentary approaches currently used in South Africa to gauge performance and progress at the Grade 12 level in schools. To a large extent lists of schools with '**pass rates**' for the National Senior Certificate (NSC) and a few key subjects are used. Two problems with these approaches stand out. Firstly, they do not take into account **dropping out** before Grade 12, or **selection into specific subjects**, phenomena which can easily be manipulated by schools to artificially improve pass rates. Secondly, by not taking into consideration the **socio-economic barriers** faced by schools, schools easily become considered weak when in fact they are performing relatively well under the circumstances. Lessons for the way forward exist in the form of systems outside South Africa, and earlier analysis undertaken in South Africa.

Section 3 moreover discusses crucial data issues in relation to the Grade 12 '**denominator**', meaning an estimate of how many learners should have reached the Grade 12 examination had there been no dropping out. The important point is made that in the context of **high levels of grade repetition** in, for instance, Grade 10, it is deceptive to use an unadjusted enrolment total from an earlier grade and earlier year as one's denominator. The ideal would be if one could, say, obtain the number of non-repeating Grade 10 learners. That should result in a relatively good denominator. However, inconsistencies in the **learner identifiers in LURITS** make such an adjustment impossible currently, though with a tightening up of the LURITS system, the problem could be solved. These issues are in part what prompts a strong emphasis on the use of enrolment by age data in the report.

Section 4 describes the 2016 initiative of the Department of Basic Education (DBE) to develop better measures of Grade 12 performance, and how the current report is intended to inform that work. The current report examines **six indicators** identified by the DBE as important, plus **a further 31 indicators** that seemed worth exploring.

What is clearly very important is **specifying criteria** that will be used to identify effective school-level indicators. Given how complex the topic is, and given the popularity of firmly entrenched but problematic indicators such as the pass rate, without clear criteria one may end up with new but still problematic indicators. Section 5.1 specifies four key criteria: (1) indicators must be easily understood and appear sensible; (2) they should allow for sufficient differentiation across schools; (3) they should result in minimal year-on-year instability with respect to the rankings of schools; and (4) different indicators measuring similar things should produce similar school rankings.

Section 5.2 provides another important element: **a service delivery logic** for the indicators and any school report cards. Such a logic, or rationale, needs to explain how certain people will use the indicators and specific reports for specific purposes, with the aim of improving schooling.

Section 5.3 discusses the Grade 12 examinations data used, and how issues of school identifiers were handled.

Section 5.5 discusses a data source other than the Grade 12 examinations data, namely the **enrolment by age data of the Annual Survey of Schools**. These data seem to provide an opportunity to circumvent the LURITS problems mentioned above. Given how little attention enrolment by age data in the basic education sector have received, the relevance of section 5.5 probably extends beyond the current report. One finding is that enrolment by age patterns are not neat. For different schools one may have to use different age cohorts as one's 'denominator', depending on the distribution of learners across ages and grades in the school. A method for arriving at the **optimal age-based denominator** is presented.

Section 5.6 examines various indicators in terms of criterion (2), or their **ability to differentiate across schools**. Section 5.7 turns to criterion (3), or **year-on-year stability**. Sections 5.9 and 5.10 deal with criterion (4), or **whether similar indicators in fact rank schools similarly**. Section 5.11 sums up the findings on the effectiveness of the various indicators. It is found that denominators other than Grade 12 enrolment, specifically earlier enrolment in Grade 10 and a relevant age cohort, do not boost the effectiveness of the indicator relative to simply using Grade 12 enrolment. This is not because the latter is a good 'denominator', but rather because developing good alternatives is clearly not easy. This underlines the importance of exploring the use of, say, Grade 10 enrolment minus repeaters, once problems with the LURITS learner identifiers are resolved. With respect to the 'numerator', ratios of learners obtaining the NSC or a Bachelors-level NSC emerge as rather useful in terms of the four criteria. Indicators dealing with the attainment of a critical mark in a subject are less useful because of **floor and ceiling effects**, and hence weak differentiation across schools. What emerges strongly as an effective indicator is the **mathematics mark at the 95th percentile within a school.** There are good reasons to popularise this indicator, even if it means people would have to become accustomed to the meaning of the '95th percentile'.

Section 6 introduces a proposed **seven-page report card**, for an actual school and using the actual data. Finally, section 7 offers suggestions for further work to strengthen the report card.

List of acronyms

ASS	Annual Survey of Schools
CEM	Council for Education Ministers
DBE	Department of Basic Education
EMIS	Education Management Information System
FAL	First additional language
HESA	Higher Education South Africa
IDEB	Index of Basic Education Development (from Portuguese *Índice de Desenvolvimento da Educação Básica*)
LURITS	Learner Unit Record Information Tracking System
NSC	National Senior Certificate
SES	Socio-economic status

1 Introduction

The current report is part of a broader project examining the use of data in two South African provinces, **KwaZulu-Natal** and **Western Cape**, to strengthen service delivery in schools. The inception report for the project provides details on the project design[1]. The project is titled '***Assessment of education department data use in provinces and the formulation of recommendations aimed at improving systems and service delivery outcomes***'.

The current report essentially pursues the following work specified in the inception report (page 2):

> … it has been agreed that some time would be devoted to making recommendations on **optimal Grade 12 school-level performance indicators**, on the basis of fresh analysis of the excellent Grade 12 examinations data, and whilst taking into account previous work that has occurred in this area. One output of this work would be examples of school **'report cards'** which would allow schools to compare themselves to other schools in a manner that promoted better planning and management. These specific products, apart from being of use in the area of Grade 12 monitoring, could serve as inspiration and examples for other systems development work recommended by the project, in particular in relation to the **Annual National Assessments** (ANA) programme.

Section 2 below outlines previous work that has occurred in relation to Grade 12 in South Africa. Section 3 provides a brief discussion of what the literature suggests are good indicators of school performance and progress. Section 4 discusses the national Department of Basic Education's past and current initiatives to produce better Grade 12 performance indicators. Section 5 provides the results of a fresh analysis of the suitability of various indicators drawing from Grade 12 examinations data for the years 2012 to 2015. Section 6 presents a proposed school report card, and some discussion of the logistics of taking this to scale. Finally, section 7 suggests areas of future analysis which could lead to improvements in the design and understanding of Grade 12 indicators.

2 Past work in South Africa

Improvement over time versus current standing. A separate report from the current one[2], forming part of the same research project, discusses why school-level indicators and report cards can serve as useful accountability tools. In a nutshell, knowing whether the learning outcomes of schools are improving or not allows schools themselves to know whether they need to rethink their strategies, whilst allowing the administration above the school to know where to direct interventions, and what schools to promote as role models. Reliable indicators are not as easy to devise as one may first imagine. Measures of learning outcomes must be sufficiently comparable over time. Decisions need to be taken as to whether to use statistics such as test averages or the rankings of schools within the testing system. One must obviously differentiate *improvement* from *relative standing* in a particular point in time. With regard to the latter, many factors other than the quality of teachers and school principals can make a school appear to be a well-performing school. In particular, the socio-economic status (SES) of learners plays an important role. SES includes, crucially, the educational level of household members with whom the learner reacts on a regular basis. In the case of Grade 12 results, a key factor is the degree to which learners drop out of school before Grade 12. Some of this dropping out is known to be the result of deliberate manipulation by the school, to improve Grade 12 indicator values[3].

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[1] The seven-page inception report is dated 18 May 2016.
[2] Title *Towards better generation and use of data within the basic education sector*.
[3] Taylor, 2009: 348.

The Crouch and Mabogoane study. An article displaying the importance of SES in South Africa is that of Crouch and Mabogoane's (1998), which arrives at two very different school rankings based on Grade 12 results. In the first, the Grade 12 'pass rate' (overall passes over examination candidates) is taken at face value. Historically advantaged schools clearly emerge at the top of the rankings. In the second list, the Grade 12 pass rate is considered *after controlling for socio-economic status* and school resources. Here most top performing schools are historically *dis*advantaged schools. The measurement of SES was fairly crude, and reflected the data available at the time. The type of geographical area of each school (for instance township, or tribal area) plus the apartheid-era education administration of each school was used. Despite being almost two decades old, the article remains relevant today.

The need to be move beyond a basic approach. Since the 1990s, the approach to gauging school quality on the basis of Grade 12 results has been basic and would undoubtedly be prone to manipulation by schools. The pass rate, the most commonly used indicator, can be manipulated by getting learners to drop out before Grade 12 or take easier subjects. Pass rates obtained in one year, without any consideration of socio-economic background, are commonly used to judge schools, though to some degree improvements in the pass rate over mostly just two years are considered. The official national examinations reports have included lists of schools with their results[4]. For instance, one report from the 2015 year-end examination provides, for each school and for each of the three years 2013, 2014 and 2015 the following: the number of learners writing the examination; the number qualifying for the National Senior Certificate; and the second value as a percentage of the first. Another 2015 report provides subject-specific statistics per school. This has the number of learners writing each subject and the percentage passing (at the 30% level). The eleven subjects were: accounting, agricultural sciences, business studies, economics, English first additional language (FAL), geography, history, life sciences, mathematical literacy, mathematics and physical sciences. Clearly all these measures are basic in the sense that they do not take into account dropping out or socio-economic status. Moreover, their focus is on a rather basic level of success, namely passing official minimum thresholds. They do not focus on the attainment of subject-specific thresholds, for instance a mark of 60% in mathematics, a threshold required for entry into many mathematically-oriented university programmes.

Western Cape's system of awards. The Western Cape appears to have gone furthest in formalising annual awards for specific categories of schools, based on Grade 12 performance[5]. These awards have gone to schools with high pass rates, and with large improvements in the pass rate over three years. To some extent manipulation has been controlled for in the improvement statistics through the inclusion of a criterion that there had to be 'consistency' in the number of Grade 12 learners over the years. On the whole it can be said that current practices across the country have followed rather basic methodologies, with for instance virtually no testing of how well different indicators lend themselves to measuring progress.

Proposals developed ten years ago. In 2007, in response to an interest on the part of the Minister of Education in paying financial rewards to schools displaying exceptional Grade 12 improvements, two fairly detailed reports were produced within the Department of Education which looked partly at the feasibility of various Grade 12 indicators[6]. These reports focussed on the pass rate and the number of overall Grade 12 passes as a basis for measuring schools, though passes were considered as a percentage of Grade 8 enrolment in the school five years earlier. The latter would to a large degree resolve distortions brought about selection effects, or dropping out before Grade 12. However, as pointed out in the reports, only four-fifths of

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[4] Available at http://www.education.gov.za.

[5] See https://www.westerncape.gov.za/text/2016/January/western_cape_2015_nsc_school_awards.pdf.

[6] Department of Education, 2007a, 2007b.

Grade 12 learners are in schools which also have Grade 8. The remaining one-fifth of learners are in schools which begin in a grade that is higher than Grade 8.

More recent analyses. Gustafsson and Taylor (2016) have published a working paper which compares the stability of eight Grade 12 mathematics indicators over a period of nine years. The stability of the indicators, in the sense of their ability to keep schools in the same ranking position, was analysed. The most stable indicator in the 2008 to 2013 period, of the indicators using actual marks (and not just participation in mathematics), was the school's average mathematics mark, followed by performance at the 95th percentile relative to earlier enrolment in Grade 10. The least stable indicator was performance at the 95th percentile relative to current Grade 12 enrolment, followed by the mathematics pass rate. Gustafsson (2016), in examining why Grade 12 mathematics and physical science results have moved in different directions during the 2008 to 2015 period, concludes that levels of difficulty have shifted slightly over the years, but in different directions in the two subjects. This suggests that average marks need to interpreted with considerable caution. An increase in a school's average mark in a subject may not be indicative of actual improvements in teaching and learning.

3 Existing guidance of relevance to the current task

SMART indicators. National Treasury uses the concept of 'SMART' to determine whether a performance indicator is an appropriate one[7]. SMART, as understood by National Treasury, stands for Specific, Measureable, Achievable, Relevant and Time-bound. The 'SMART' concept has been used around the world since the 1980s to guide the design of indicators. All the indicators discussed in the current report clearly fulfil SMART requirements, but what is also argued is that criteria more specific to the learning outcomes of schools are also needed. Put differently, there is a need to establish exactly how to produce SMART indicators that serve the purpose of monitoring performance in the Grade 12 examinations, at the national level, and down to the level of the individual school.

Brazil's IDEB indicator. The literature examining Brazil's widely used IDEB[8] indicator of the learning outcomes of a school is particularly useful for South Africa[9]. This indicator combines test scores with a measure of the degree to which learners drop out and repeat in the grades leading up to the tested grade. The more learners drop out and repeat, the lower the indicator value. The promotion element of IDEB is calculated as follows:

$$P = \sum_{r=1}^{n} \frac{n}{p_r}$$

where *p* is the promotion rate for a specific grade, in other words the percentage of pupils who do not drop out or repeat, and *n* refers to the number of grades within a school phase. The IDEB approach underscores the importance of measuring the flows of learners across grades and ensuring that schools do not 'game' the system by keeping weaker learners from reaching the tested grade. In the proposals made below in the current report, dropping out is taken into account through the use, as a denominator, of the size of the age cohort which *should* have reached Grade 12 had there been no dropping out. However, what is not taken into account below in any direct manner (but is in the case of IDEB), is grade repetition. Grade repetition was left out here to reduce the complexity of the formula.

[7] National Treasury, 2007: 9.
[8] Index of Basic Education Development (from Portuguese *Índice de Desenvolvimento da Educação Básica*).
[9] Bruns (2010: 19), Fernandes (2007), Gustafsson (2014: 271).

Limitations of using enrolment in an earlier grade. It seems logical to use enrolment in an earlier grade, before large-scale dropping out, as one's denominator, instead of an age cohort. The problem with this, however, is that in any grade there are repeaters, and insofar as repeaters are included the denominator becomes inflated as learners are essentially counted twice. One viable alternative to the age cohort approach would be earlier enrolment, in Grade 10 for instance, *after repeating learners have been subtracted.* This alternative is not explored in the current report. The fact that, say, Grade 10 enrolment with repeaters included would be an inappropriate indicator is a point argued in Gustafsson and Taylor (2016). Because repetition patterns differ across schools, and over time, not only does using unadjusted enrolment as a denominator result in an under-estimate of performance (because the denominator is inflated), but the degree of under-estimation varies in a way that undermines indicator comparisons across space and time.

Problems with the repeater data. The reason why enrolment in any grade minus repeaters is not used as a denominator in the current report, despite its theoretical appeal, is that the data on repeaters per school are still problematic. For many years, schools reported, through the Annual Survey of Schools, the total number of repeaters per grade. It was clear that many schools under-reported the number of repeaters[10]. They had an incentive to do this as the administration often put pressure on schools to reduce grade repetition, yet it was almost impossible for the administration to prove any under-reporting. The LURITS[11] system, introduced in 2008, with its unique learner identifiers provided new opportunities for more accurate grade repetition statistics. Essentially if the same learner appears in the same grade for two consecutive years, one can conclude that the learner is a repeater in the second year. However, because there have been problems with the consistency of learner identifiers, LURITS data are not currently able to provide reliable repeater statistics for a sufficient number of schools[12]. Of course this problem could be fairly easily resolved if controls around learner identifiers were tightened.

4 The 2015 Grade 12 indicators initiative of the DBE

Six high-priority indicators. In 2015 the Council for Education Ministers (CEM) approved a set of six Grade 12 indicators which should receive special emphasis in reporting processes. These indicators had been proposed by the Department of Basic Education (DBE). The idea was that these indicators would guide planning at the national, provincial, district and school levels. The six indicators are as follows[13]:

1. Overall pass percentage
2. Mathematics pass percentage
3. Physical Sciences pass percentage
4. Bachelor attainment percentage [Bachelors-level passes divided by all learners.]
5. Distinction percentage [Marks of 80% or more divided by all subject-specific marks obtained, so roughly seven marks per learner.]
6. Throughput rate [The number of learners writing the Grade 12 examinations divided by Grade 10 learners two years previously.]

One consolidated indicator. The six indicator values would moreover be converted to a single consolidated indicator value, using importance weights based on expert opinion. For the 2015 year-end examinations, a model report was produced that included province- and district-level indicator values (for 2015 only).

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[10] Department of Education, 2008: 22-24.
[11] Learner Unit Record Information Tracking System.
[12] This is discussed in the literature review forming part of the same project as the current report.
[13] Department of Basic Education, 2016a.

The model report was used as a basis for an internal review of the way forward for the work. The following 14 recommendations were arrived at[14]:

a. The formulation of a logic linking the system of indicators to school improvement.
b. Clarity on who should use indicator values, and for what purpose as well as ensure limiting unintended consequences.
c. The product should be informed by a range of departmental officials to ensure buy-in.
d. The system needs to be positioned within current policies.
e. The product needs to provide planners and managers across the system with a deeper analysis looking at patterns over space and time and correlations between examination variables and other variables.
f. Indicator data should be presented on online platforms
g. We should conduct periodic monitoring of the system at ground levels on how people perceive the system.
h. The analysis should be used to identify areas where the standardisation process can be improved.
i. The analysis will need to look at data of several years, since single year data could be deceptive as rankings could vary considerably.
j. The ranking of schools could be useful in eliminating weak standardisation of subjects across years.
k. The use of a quintiles or percentiles could avoid confusion associated with simple rankings.
l. Using a credible socio-economic (SES) indicator as part of the process is recommended.
m. Drop-out or throughput rate is more effective when measured on a subject level relative to non-repeating Grade 10 learners.
n. Review the current Weightings

The aim of the data analysis appearing in the next section is to take forward these recommendations.

5 New data analysis

5.1 The focus of the analysis

Years covered. The analysis uses data from the year-end examinations of four years: 2012, 2013, 2014, and 2015. This seemed sufficient to gain a reliable sense of the stability of specific indicators over time.

Institutions and learners covered. *The analysis is limited to full-time learners in public schools.* Thus independent schools and examination centres which are not schools (because they are, for instance, adult centres) would not be covered. Moreover, part-time examination candidates were not considered. Given the strong policy focus on public schools and full-time learners, it seemed optimal to limit the analysis to these schools for now.

Thirty-seven possible indicators. The symbol ✷ in Table 1 below points to the six DBE indicators discussed in section 4 above. These six indicators were used as a point of departure in selecting a wider range of indicators which could be of interest. Row headings in Table 1 refer to 11 possible indicators. On the whole, these 11 indicators can be calculated in four different ways, depending on the denominator or reference group used, hence the four column headings. Altogether 37 possible indicators are identified within the table, represented by cells with ✷ or ✓. Certain cells are blank because the indicator cannot be calculated or would not make sense.

[14] Department of Basic Education, 2016b.

Table 1: Selected indicators

Denominator or reference group ➔ Key indicators ⬇	Learners who wrote the examination(s) in question	Any Grade 12 learner who wrote any subject examination	Grade 10 learners two years previously	The size of an earlier age cohort that is indicative of potential Grade 12 learners
NSC passes		✸	✓	✓
Bachelors-level passes		✸	✓	✓
Learners obtaining at least 30% in mathematics	✸	✓	✓	✓
Learners obtaining at least 60% in mathematics	✓	✓	✓	✓
Learners obtaining at least 70% in mathematics	✓	✓	✓	✓
Mathematics performance at the 95th percentile	✓	✓	✓	✓
Learners obtaining at least 30% in physical science	✸	✓	✓	✓
Learners obtaining at least 60% in physical science	✓	✓	✓	✓
Physical science performance at the 95th percentile	✓	✓	✓	✓
Subject marks of 80% or more	✸			
Number of Grade 12 learners			✸	✓

The use of the 95th percentile. The indicators using mathematics performance at the 95th percentile should be explained. Here the actual marks of mathematics learners are used, and anyone who did not take mathematics is assumed to have a mark of zero. Thus for instance, performance at the 95th percentile relative to Grade 10 enrolment two years previously would be calculated as follows. Marks of Grade 12 mathematics learners would be lined up in ascending order. Thereafter the group would be extended at the bottom end, through the addition of zero marks, until the total number of Grade 10 learners was reached. Then the 95th percentile on this extended group of learners would be found. The meaning of the final column will be explained in more detail below. However, it would be something like the number of 15 year olds in the school two years previously.

Four criteria. The following four criteria were identified as being important for guiding the selection of indicators. They guide what went into Table 1 above, and they guide selections amongst the 37 indicators appearing in the rest of the report. .

- **Indicators must be meaningful.** The indicator should be meaningful from a common-sense and theoretical viewpoint. They should not be too difficult for users to understand, meaning the identification of users is important. In this regard, the school-level report card proposed in section 6 is meant to be used largely by school- and district-level managers, in other words people in the system who are either already relatively good at interpreting basic statistics, or can reasonably be expected to do so through some learning.

- **There should be sufficient differentiation across schools.** For indicators to be meaningful, they need to allow users to differentiate between better and worse performing schools. In particular, one should not see too many schools concentrated at the 'floor' (minimum value) or the 'ceiling' (maximum value).

- **Instability in the year-on-year trends should be minimal.** For various reasons, school-level indicators (and even indicators above this level) 'jump up and down' considerably across years. Mostly, this is not because the actual quality of teaching and learning, the matter one should be particularly concerned about, moves up and down. Of course to some extent it does. New teachers move into schools and a cohort of learners may have experienced setbacks in an earlier year specific to that cohort. However, much of the instability over time in indicator values is due to factors which having nothing or little to do with educational quality. For instance, the difficulty of reaching particular mark levels, for instance a mark of 60% in mathematics, does change somewhat from year to year. Despite large advantages with using, as a denominator, some value of what Grade 12 enrolment *should* have been in a particular year, these denominator values can be unstable, depending on dynamics such as earlier across-school migration. There can also be basic problems with the accuracy of the data used for the denominator. One way of reducing year-on-year instability in the indicator values is to standardise indicator values in each year, or to use ranks. If a school is a top performing school and the examination becomes more difficult, its average mark may drop but it remains in rank position 1. But year-on-year instability can also be reduced by designing indicators very carefully, and excluding those which are too unstable.

- **Correlations across similar indicators should be high.** Different indicators which one assumes are measuring similar phenomena, should correlate highly with each other within any year. If a particular indicator is not highly correlated with other indicators, it is probably subject to a high degree of measurement error, or it could be measuring a different concept. Just as similar indicators ought to correlate with each other within a single year, their trends should be correlated. Put differently, if two indicators are measuring roughly the same thing, and one indicator points to an improvement over time, one would expect the other indicator to do the same.

5.2 The logical link between the indicators and school improvement

A service delivery rationale. When tables of indicator values are provided to managers and schools a common complaint is that the purpose of the exercise is not made clear enough. Specifically, the complaint is often made that the link between the indicator values and improving schooling is not made clear. The following box presents a 'service delivery rationale' for having the indicator values discussed in the current report. This narrative informs how the school-level report of section 6 is designed.

School-level indicators are needed to help schools and various levels of the administration above the school to understand how well schools perform relative to other similar schools, and the degree to which this performance is improving or deteriorating over time. This information helps in two ways. On the one hand, it informs parents and the staff of the school whether they need to review how they go about organising the schooling process, or whether a business-as-usual approach is justified. It would not be beneficial to change strategies that work, just as it would not be beneficial to believe that certain strategies are working, when the results suggest they are not. So on the one hand, **the information assists schools themselves to take action**. It is important to have not just information on one's own school, but other similar (and perhaps neighbouring) schools. It is important to know who to learn from.

On the other hand, the provincial department of education, and in particular its **district offices**, **need to know which schools are particularly in need to remediation**, and which schools can be turned to as role models.

Performance information in education is never perfectly reliable. There are always ways in which measurement can improve, for instance by tightening up marking processes, or changing the way performance indicators are constructed. The challenge is to be at least roughly *aware* of how good or bad the data are. When an indicator value goes up, how sure can we be sure that performance is improving? Two activities are particularly important. One is to **produce periodic technical reports on what is going on the data**. How reliable are the different indicator values, in terms of specific purposes, and is this changing over time? What do the indicator trends actually tell us? How does analysis that goes beyond the key indicator values confirm our findings?

A further activity is to **remind stakeholders continually, and in simple terms, of how indicator values can be used** to take decisions. In particular, how does one avoid an unfair 'blame game' arising out of incorrect interpretations of values? It is good to provide specific examples of good and bad practice. For instance, if a specific value looks surprisingly different in just one year, is this on its own a reason to initiate remedial action? Could this be the result of a data problem? Should one perhaps look for specific causes such as a key teacher having been on extended sick leave?

School report cards have been shown in other countries to be effective means of communicating necessary performance information to schools. These report cards need to be crafted in such a way that they are intelligible to, for instance, school principals and parent leaders. They should compare the individual school to other, similar schools. They should explain how indicator values should be interpreted and warn against typical misuse of the information. Typically, the report cards are distributed as **hard copies** to school, but are also **available on the Web**, after one has entered the details of the specific school (any anyone should have access to any school's report). The website should also include background technical reports. The term 'school report card' is perhaps a bit misleading. These things seldom consist of just one page. They tend to run into several pages each, but clearly their length should be limited as far as possible.

Two broad categories of performance need to be dealt with in South African school report cards which draw from Grade 12 examinations data. Firstly, they need to deal with the **quality of learning teaching**, for instance through **indicators focussing on numbers of learners with high-level skills in mathematics**. Secondly, they need to focus on the **achievement of critical qualifications**, in particular the **National Senior Certificate** and a **Bachelors-level pass**. Very importantly, upward trends in the achievement of qualifications are not necessarily a sign that the quality of schooling is improving. It could simply be that learners are opting for different subject combinations. This distinction must be made clear in the report card. Both actual quality and qualifications are important, in different ways. There is some overlap, but they are not the same thing.

5.3 Data versions used

Pre-supplementary data used. For the years 2013 to 2015, Grade 12 learner- and subject-level data in a format referred to as 'Report 343' were used. For 2012, data as supplied to Higher Education South Africa (HESA) were used. These data do not indicate which learners obtain a Bachelors-level pass (a pass allowing a learner to proceed to Bachelors degree studies at a university). This explains certain gaps in the analysis that follows. The examinations data for all four years appear to be data *excluding* supplementary examination results. They thus include data from just the year-end examinations. Unfortunately, it was not possible to establish the exact dates on which data were extracted from the examinations system. Ideally, this should be clear and extracts should be from similar dates, given that after the year-end examinations there is to some degree data editing as disputes around, for instance, the disqualification of learners from the examination are resolved.

One clear advantage with using *pre*-supplementary data for a school-level report card is that the tool can reach schools early in a school year.

5.4 Linking public schools across years

EMIS numbers and examination centre numbers. Linking schools across years in the examinations data, and linking schools in the examinations data to schools in the enrolment data (EMIS[15]) is difficult and time-consuming. This is largely because unique school identifiers in EMIS (the school's 'EMIS number') are not always the same in the examinations and enrolment data, and can be different in different examinations datasets. Given that EMIS is the official source for school EMIS numbers, a different EMIS number in the examinations data means that the examinations carries the incorrect number. Within the examinations data, a separate school identifier called the centre number exists. This number also identifies non-school locations where the examinations are written. The centre numbers are not always consistent across years. In particular, the 2012 examinations data available for the current analysis (which was the HESA version of the data) contained different centre numbers to the examinations data from the other three years.

Infrequent linking across datasets. The underlying problem is that different datasets are seldom joined for monitoring purposes, meaning awareness of the problems around unique school identifiers is not high.

Previously compiled link tables. For the current report, the linking of schools across datasets involved using link tables which had been developed for earlier analyses. Those link tables were produced partly through substantial 'manual' matching of schools, involving examination of, for instance, school names and addresses. Obviously the process is made complex by the fact that over time some school merge or split, and schools acquire new names.

High degree of school-level linking across datasets. Table 2 below indicates that 97% of public ordinary schools with Grade 12 learners appearing in the 2014 EMIS Snap Survey[16] data could be identified within the examinations data in 2014. Column A's total is high because centres which are not schools and centres which are independent schools are included. Column C refers to public ordinary schools which could be found in all four years within the examinations data. Thus for 5,867 schools, report cards which involve monitoring results across four years would be possible.

[15] Education Management Information System.
[16] The Snap Survey is the schooling sector's most important annual count of learners. Snap Survey statistics are used for official DBE enrolment reports and Treasury calculations determining financial transfers to provinces. The Snap Survey counts enrolments in January.

Table 2: Schools with Grade 12 in the data 2012 to 2015

	All in any year (A)	Public ordinary 2014 (B)	Public ordinary 4 years (C)	2014 Snap Survey (D)	B / D (%)
EC	976	841	815	868	97
FS	337	300	299	306	98
GP	888	547	542	598	91
KN	1,776	1,599	1,592	1,652	97
LP	1,434	1,343	1,335	1,356	99
MP	568	476	472	504	94
NC	138	118	118	128	92
NW	405	347	345	357	97
WC	448	349	349	363	96
SA	6,970	5,920	5,867	6,132	97

Linking in terms of learner numbers. Table 3 below provides figures on learners in 2014 in public ordinary schools, where linking across the examinations and EMIS data was possible. Column A reflects all learners who sat for at least one examination. Column B reflects learners with the full set of seven subject marks. Column C reflects those from column B in public ordinary schools. Column D reflects those in column C in schools which could be found in all four years. Column E reflects official Snap Survey figures for public ordinary schools. The final column indicates that nationally learners with seven subject marks in public ordinary schools over the total number of Grade 12 learners in the Snap Survey comes to 94%. The difference between 100% and 94% would be accounted for by learners enrolling at the start of Grade 12 and then not getting to participate fully in the examinations, and by the fact that a few schools in the examinations data which are public ordinary schools could not be identified as such.

Table 3: Learners in the 2014 data

	All (A)	All with 7 subjects (B)	Public ordinary with 7 subjects (C)	Public ordinary with 7 subjects 4 years (D)	2014 Snap Survey (E)	C / E (%)
EC	69,304	68,149	63,321	62,546	68,242	93
FS	26,756	26,666	25,603	25,590	26,573	96
GP	101,213	100,922	85,411	84,948	91,856	93
KN	147,355	144,887	138,100	137,799	145,670	95
LP	73,541	73,253	69,347	69,247	73,157	95
MP	45,900	45,604	41,115	40,979	44,685	92
NC	8,950	8,906	8,567	8,567	9,450	91
NW	26,382	26,286	25,434	25,404	26,181	97
WC	48,835	48,666	44,770	44,770	46,739	96
SA	548,236	543,339	501,668	499,850	532,553	94

5.5 The usability of the enrolment by age data

Estimates of how many Grade 12 learners should ideally exist. The current section examines the quality of the DBE's enrolment by age data, and the suitability of these data for determining a 'denominator' in the Grade 12 examinations statistics, meaning estimates of how many learners *should* have reached Grade 12 had there been no dropping out. As explained in section 3, using Grade 10 learners as one's denominator is problematic because of high levels of repetition in this grade (but even other grades before Grade 12). The analysis in this section is in part important because the enrolment by age data have hardly been used for monitoring or research purposes, and the quality of these data has not been confirmed.

Annual Survey of Schools enrolment by age data. The enrolment by age data used are those of the Annual Survey of Schools (ASS), a survey occurring a few months after the Snap Survey (the Snap Survey has no breakdowns by age). The breakdown of the ASS data is by age, but also grade and gender. ASS for the years 2008 to 2013 were considered, which seemed appropriate insofar as the intention was to gauge enrolments a couple of years before the year of the examination (and the examination data used were for the years 2012 to 2015).

Better quality enrolment by age data in more recent years. The statistics in the next table emerge if one compares learners from the ASS tables which break learners down by age, grade and gender to the ASS tables breaking learners down just by grade and gender (for 2008 and 2009, however, for the latter control learners broken down by race, grade and gender were used as the simpler grade-gender tables did not exist in those two years). A figure of 100 means that 100% of schools with data had the same enrolment total in the age table as in the control table, counting just learners in grades 8 to 12. In particular in 2012 and 2013, the internal consistency of the data have been good and hopefully this level of data quality would be continued beyond 2013. Table 4 draws from the data of 6,220 public ordinary schools having data for at least one year. Of these, 6,210 schools had a 100% correspondence in at least one year between the enrolment total in the age data and the total in the control table.

Table 4: Percentage of schools with 'perfect' age data

	2008	2009	2010	2011	2012	2013	Overall
EC	100	100	100	100	100	100	100
FS	79	86	90	100	100	98	92
GP	99	98	100	100	100	100	100
KN	63	61	63	100	100	99	82
LP	88	96	100	83	100	99	94
MP	95	99	98	99	99	95	98
NC	100	100	100	100	99	99	100
NW	90	93	94	95	98	100	95
WC	100	100	100	100	100	92	99
SA	86	88	89	96	100	99	93

Permitting a small margin of error. Table 5 below is similar to Table 4, but here a small margin of error was permitted for a school to be considered as having good data. Specifically, as long as the two school-level enrolment totals (covering just grades 8 to 12 learners) did not differ from each other by more than 2% *and* by more than 10 learners in absolute terms, the school was considered to have good data.

Table 5: Percentage of schools with 'almost perfect' age data

	2008	2009	2010	2011	2012	2013	Overall
EC	100	100	100	100	100	100	100
FS	87	98	100	100	100	100	98
GP	99	99	100	100	100	100	100
KN	85	84	86	100	100	100	93
LP	94	98	100	86	100	100	96
MP	97	99	100	99	99	99	99
NC	100	100	100	100	99	100	100
NW	95	97	97	100	98	100	98
WC	100	100	100	100	100	100	100
SA	93	95	96	97	100	100	97

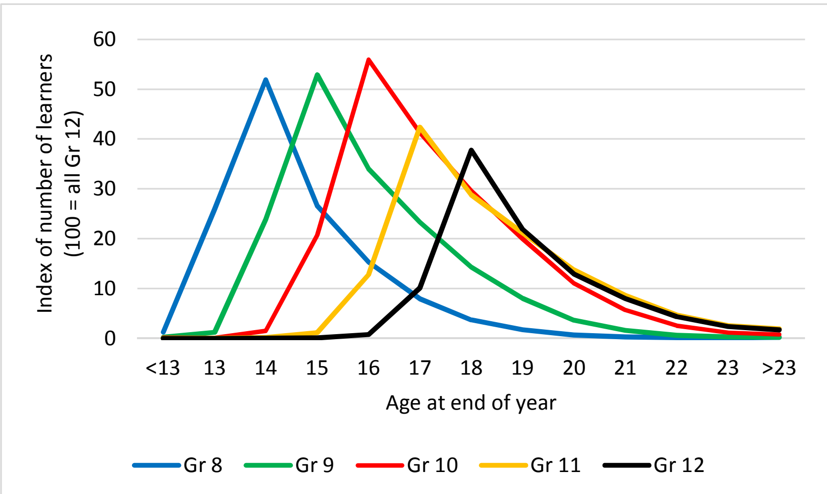
A variety of grade configurations in schools. Table 6 below, which uses Snap Survey data, is important as it makes it clear that many Grade 12 learners are not in traditional secondary schools in the sense of schools offering grades 8 to 12 only. For instance, 9% of learners are in the 8% of schools which offer Grade 12, and whose 'grade configuration' is just grades 10 to 12. Only one province, Limpopo, gets close to having all Grade 12 learners in schools offering grades 8 to 12 (97% of Grade 12 learners are in such schools). One can clearly not use for all schools Grade 8 or any statistic derived from Grade 8 (such as non-repeating Grade 8 learners) as one's denominator. If enrolment by age is to be used to create a denominator, then this must take into account the fact that grade configurations are different across schools.

Table 6: Grade configurations of public schools with Grade 12 (2014)

	% of schools					% of Grade 12 learners				
	<8 to 12	8 to 12	10 to 12	Other	Total	<8 to 12	8 to 12	10 to 12	Other	Total
EC	7	64	29	0.6	100	5	58	37	0.6	100
FS	22	59	19	0.7	100	10	68	21	1.2	100
GP	3	91	5	0.7	100	1	91	7	0.6	100
KN	9	89	2	0.2	100	5	93	2	0.5	100
LP	2	97	1	0.1	100	1	97	1	0.2	100
MP	17	69	13	0.4	100	10	76	13	0.5	100
NC	23	61	11	5.5	100	11	63	17	9.2	100
NW	13	78	8	0.3	100	7	86	6	0.2	100
WC	23	76	0	0.3	100	18	81	0	0.2	100
SA	9	82	8	0.5	100	6	84	9	0.7	100

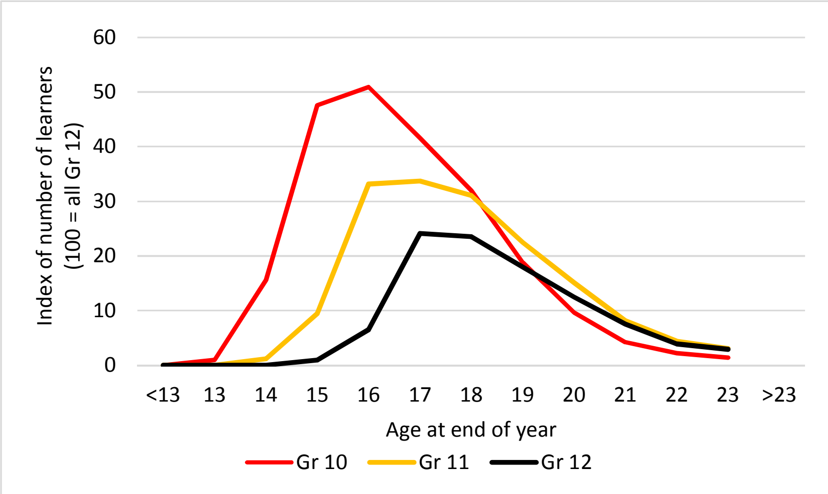
Grade 12 peaks at age 17 or 18. The following three graphs, which reflect the data of just public ordinary schools, illustrate the distribution of learners across age and grade, in three different 'grade configurations'. Note that the age represented is the age of the learner at the end of the year. On the whole, the age profiles per age are similar across the three different types of schools, though there are some minor but noteworthy differences. Schools offering just grades 10 to 12 learners tend to have somewhat younger learners in each grade. Very interestingly, the most common age for Grade 12 learners in grades 10 to 12 schools in 2013 (see Figure 2) is age 17 (at the end of the year). These learners must have been at most age 5 at the start of their Grade 1 year. Combined schools (Figure 3) tend to have a lower range of ages per grade (hence the Grade 12 peak is relatively high, with 44% of Grade 12 learners being age 18).

Figure 1: Age-grade curves for grades 8 to 12 schools (2013)



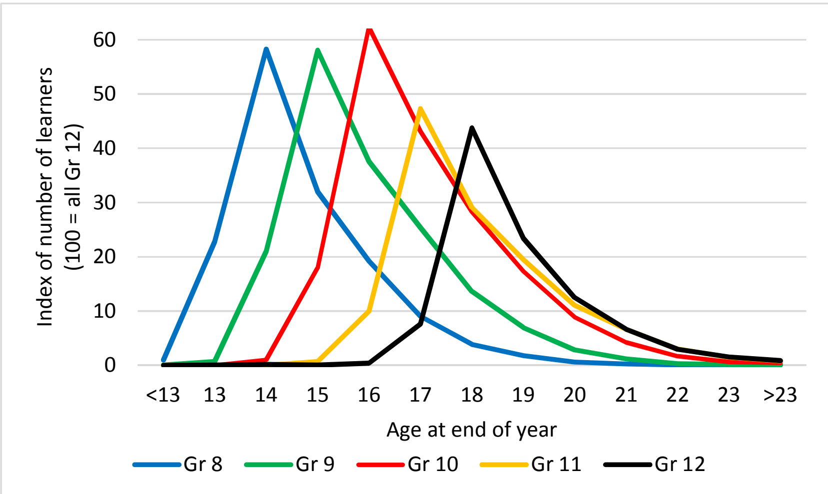
Note: This graph is based on 4,203 schools with 394,202 Grade 12 learners.

Figure 2: Age-grade curves for grades 10 to 12 schools (2013)



Note: This graph is based on 425 schools with 48,435 Grade 12 learners. Just over half of the learners reflected here are from Eastern Cape.

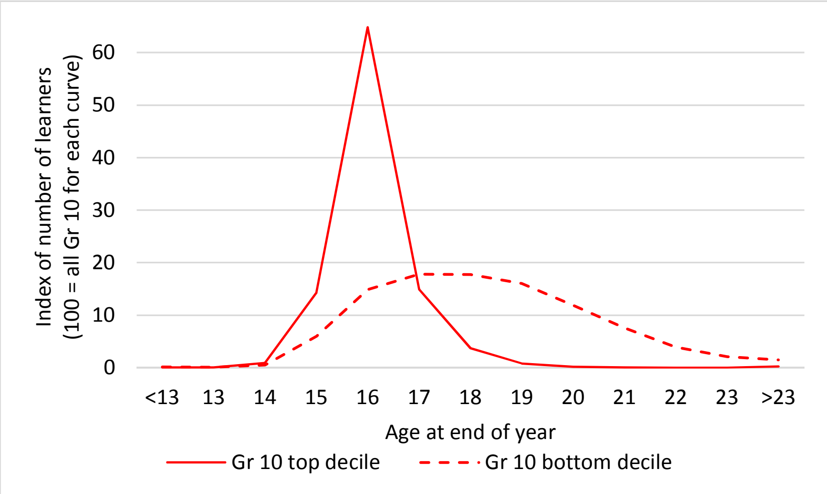
Figure 3: Age-grade curves for combined schools (2013)



Note: This graph is based on 434 schools with 27,090 Grade 12 learners. Schools considered here are schools offering Grade 12 whose lowest grade is lower than Grade 8.

Large variations across schools with respect to age distributions. The next three graphs indicate how much variation there is across schools with respect to the ages of Grade 10 learners. Only Grade 10 learners in schools which also have Grade 12 were considered. The variation we see suggests one cannot simply use a one-size-fits-all specification for an age-based denominator. For instance, one cannot use all fifteen year olds in Grade 10. Even fifteen year olds across all grades could lead to denominators which would confound across-school comparisons. According to Figure 4, at the one extreme one finds schools where over 60% of Grade 10 learners are aged 16, whilst at the other extreme one finds a substantial number of schools where there is such a wide spread of ages in Grade 10 that there are fewer than 20% of learners of any specific age.

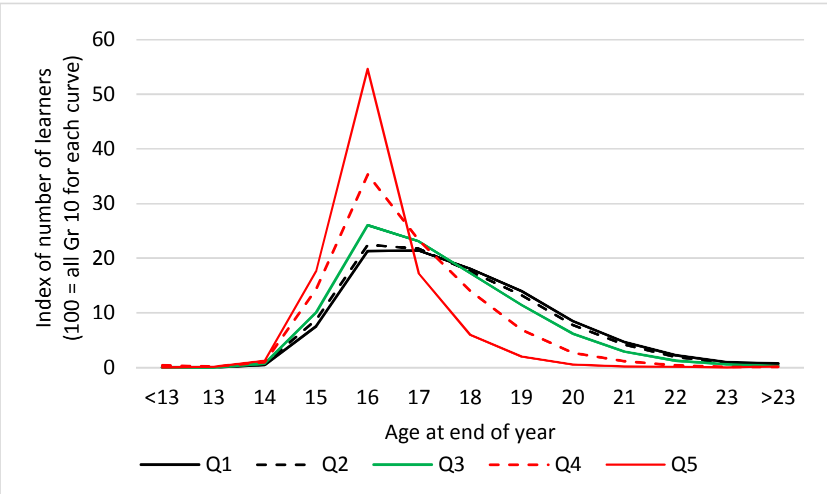
Figure 4: Extremes in terms of Grade 10 age profiles (2013)



Note: In determining top and bottom decile, schools were sorted by the size of their age peak, where this was calculated as a proportion of total Grade 10 enrolments. Thus if most of a school's Grade 10 learners were aged 16, then the number of aged 16 learners was divided by the school's total Grade 10 enrolment to obtain the size of the peak.

Greater age variances in schools serving poor communities. Figure 5 below confirms that it is in the schools serving the poorest communities where one finds the greatest variance of ages per grade. This would largely be the result of high levels of grade repetition in these schools.

Figure 5: Grade 10 age profiles by quintile (2013)



Least variance in Western Cape and Gauteng. Figure 6 confirms that it is the provinces with lower levels of poverty, specifically Western Cape and Gauteng, that one finds the least variance with respect to age within Grade 10.

Figure 6: Grade 10 age profiles by province (2013)

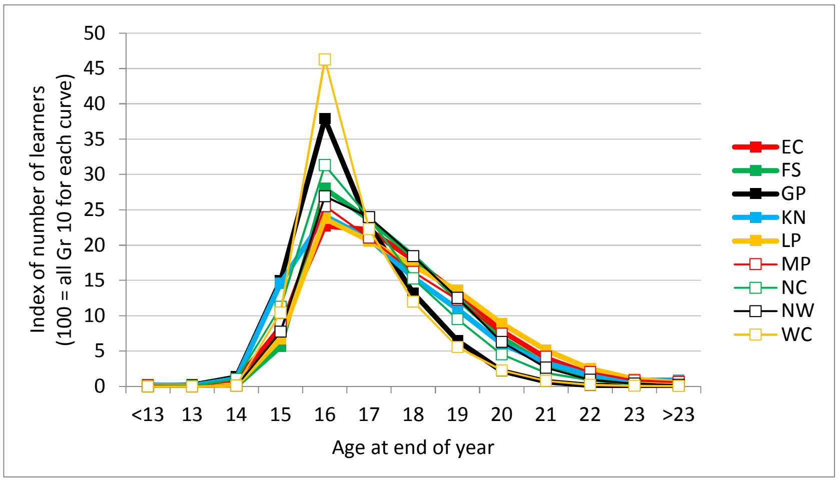


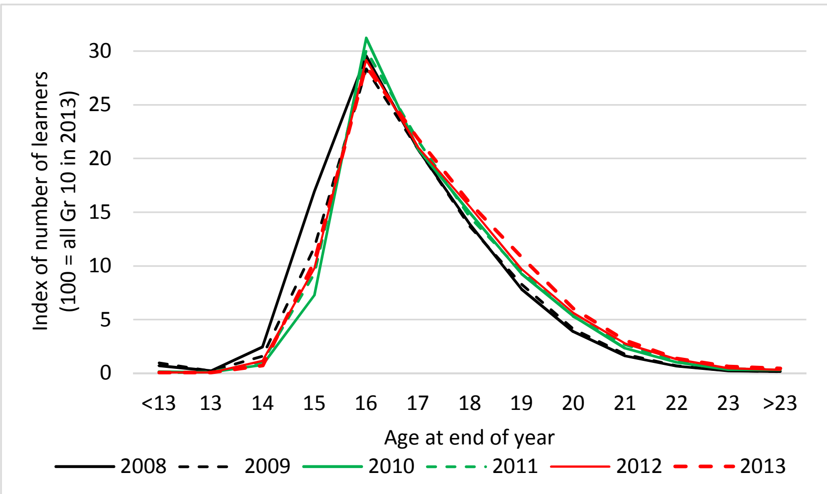
Table 7 below provides the height of the age 16 peak for every province seen in Figure 6.

Table 7: Age distribution in Grade 10 (2013)

	Percentage of Grade 10 learners who were age 16 at the end of the year
EC	23
FS	28
GP	38
KN	24
LP	24
MP	26
NC	31
NW	27
WC	46
SA	29

No large changes over time. The spread across ages in Grade 10 has not changed much over the years, as seen in Figure 7 below.

Figure 7: Grade 10 age profiles across years 2008-2013



Note: This graph draws from the data of 5,067 schools which had data for all of the six years. Any public school with Grade 12 was considered.

Examining age distributions in one school. The discussion now moves to how one can determine an appropriate learner by age denominator for a single school, given the variance and patterns discussed so far. Table 8 below illustrates the age and grade distribution of learners in 2012 in a rural KwaZulu-Natal secondary school (not the same school as the one for which a proposed report card is developed in section 6). The intention is explain the approach for an age-based denominator. The column 'Avg. grade' is the average grade across, for instance, 150 learners aged 17 at the end of 2012. The average grade for these learners is 9.9, which rounded to nearest integer becomes Grade 10, meaning it is assumed that the average 17 year old gets to Grade 12 two years later, in other words in 2014 (the possibility of grade repetition is thus ignored). The last column simply indicates the year in which the learners in the row would have been born, but only in the case of learners who are likely to reach Grade 12 in 2014 (the focus in the current discussion is on how to arrive at a denominator for Grade 12 performance indicators for 2014).

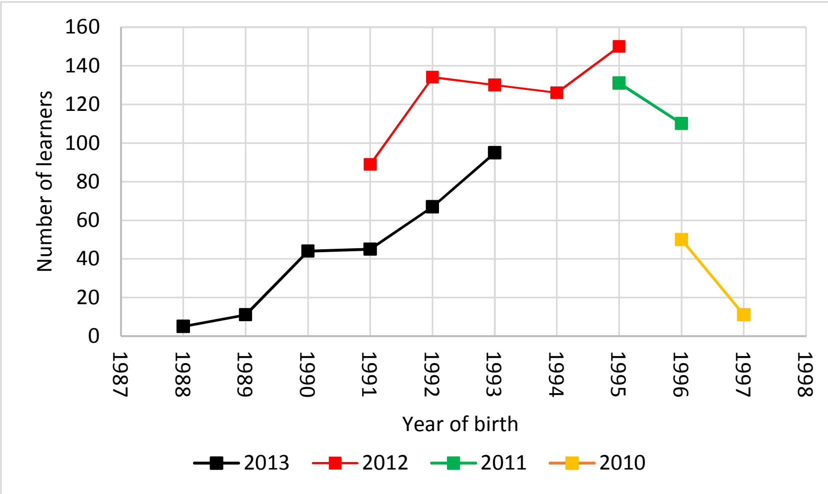
Table 8: Obtaining 'candidates for denominator' in one school (2012 age data)

Grade→ Age↓	8	9	10	11	12	Total	Avg. grade	Year in Gr 12	Birth year
13	3					3	8.0	2016	
14	20	13				33	8.4	2016	
15	25	29	5			59	8.7	2015	
16	29	24	24	8		85	9.1	2015	
17	16	32	61	35	6	**150**	9.9	2014	1995
18	14	21	62	26	3	126	9.9	2014	1994
19	35	27	30	29	9	130	9.6	2014	1993
20	26	21	38	29	20	134	10.0	2014	1992
21	10	15	21	29	14	89	10.2	2014	1991
22		16	8	32	9	65	10.5	2013	
23			10	11	30	51	11.4	2013	
24			9	15	5	29	10.9	2013	
25				3	4	7	11.6	2012	
Total	178	198	268	217	100	961			

Comparing age data from different annual surveys. The red curve in Figure 8 below illustrates the number of learners, by birth year, who are likely to be in Grade 12 in 2014, according to Table 8 above. One can imagine constructing other tables similar to Table 8 for the other ASS years (so 2008 to 2011, and 2013). If one used those tables to insert further curves, one would get the black, green and yellow curves seen in Figure 8, for the ASS years 2013, 2011 and 2010 respectively. There are no curves for the ASS years 2008 or 2009 as there are no learners from those years likely to be in Grade 12 in 2014.

Obtaining a maximum age cohort. The maximum number of learners, reading across all the points in Figure 8, is important. This maximum is 150 learners, which is the number of 17 year olds in 2012 one would expect to find in Grade 12 in 2014. This value of 150 is the denominator we shall use for this school. It is the size of the birth cohort we would consider as a predictor of Grade 12 enrolment in 2014, if there were no dropping out. This logic would be unfamiliar to many who monitor Grade 12 performance, because we are not accustomed to thinking of age cohorts and learners by age. To put it simply, one could argue that no school could expect to pass more Grade 12 learners in one year than were born in one earlier year, within the community which it serves. This is largely because a school would normally only pass a learner through Grade 12 just once. One cannot really 'cheat' by recycling the same learner. Of course, as seen in the foregoing analysis, the patterns are a bit 'messy' because there is no neat correspondence between age and grade. There could thus be exceptional situations where a school *could* pass more Grade 12 learners than people in one birth cohort, if the school concentrated many Grade 12 learners in one specific year (say, 2014) and reduced the number of Grade 12 learners in adjacent years (say, 2013 and 2015). However, on average the size of a single birth cohort represents a ceiling to the number of Grade 12 learners a school with good retention rates would experience.

Figure 8: Options for denominator for 2014 in one school



Understanding dropping out and late entry. Why is the *maximum* in Figure 8 selected? Are the other, lower values not also possible candidates for the relevant denominator? These other values are not representative of the birth cohort we want for two reasons. Some (those towards the left-hand side of the graph) suffer from the fact that many learners in this birth cohort would have dropped out. Others (those on the right-hand side) are low because members of the same birth cohort are not in the school yet – they are still located in primary schools feeding the secondary school in question. Note that the maximum value of 150 is considerably lower than the total enrolment in either grades 10, 9 or 8. This is mainly because these grades include high numbers of repeaters (this is why we would not want to use, for instance, total Grade 10 enrolment from any year as a denominator). But note too that the figure of 150 is *lower* than the number of Grade 12 learners in 2012 or in 2014, which is 106 learners. We can thus say that about 44 learners (150 minus 106) who should ideally have reached Grade 12 in 2014, dropped out before Grade 12.

Different 'denominators' depending on the school's age profiles. The process described above would be repeated for Grade 12 in 2012, in 2013 and 2015, for all schools. Table 9 below describes results obtained where Grade 12 in 2014 was the focus. The school described above is one of 887 schools nationally offering grades 8 to 12 where the number of learners aged 17 at the end of 2012 emerge as the appropriate denominator. Of the 4,203 schools covered in Table 9, age 17 in 2012 (so two years before the Grade 12 focus year of 2014) presents the most commonly used denominator, but there are clearly many other optimal choices, something one would expect given the extent to which schools differ from each other in terms of the age-grade dynamics.

Table 9: Distribution of denominators for 2014 Grade 12 results

Age	2010	2011	2012	2013	Overall
12	1				1
13	7	4	1		12
14	69	70	2		141
15	11	608	76	1	696
16		481	559	16	1,056
17		107	887	114	1,108
18		3	598	260	861
19		1	109	152	262
20			8	46	54
21			1	8	9
23				1	1
25				1	1
26			1		1
Overall	88	1,274	2,242	599	4,203

A table such as Table 9 for combined schools would show that for those schools age 17 at the end of 2012 would also be the most commonly selected denominator. For schools offering just grades 10 to 12, however, this would be learners aged 18 at the end of 2013.

5.6 Floor and ceiling effects

At times around 40% of schools in the floor or ceiling. With this section, the discussion returns to the effectiveness of the various Grade 12 indicators identified in section 5.1, specifically Table 1. Table 10 below provides statistics on 'floor' and 'ceiling' effects, meaning the extent to which many schools perform too poorly to be differentiated from each other, because all are assigned the minimum value (the 'floor' value), or the extent to which many schools perform too well to be differentiated from each other, because all are assigned the maximum (or 'ceiling') value. The table refers to 2015 and just public ordinary schools. To illustrate, the indicator 'Learners obtaining at least 60% in mathematics' is of limited use because around 38% of schools are either in the floor or ceiling (the exact value depends on what denominator is selected). Virtually all of the 38% is accounted by schools where the indicator value is zero because no learner reaches the mark threshold, though there are one or two schools in the 'ceiling' as all learners obtain a mark of at least 60% – these details appear in Table 12 in a subsequent section.

Much differentiation for mathematics performance at the 95th percentile. As discussed in section 5.1, one of four criteria for a good indicator is that it should differentiate sufficiently across schools. Three indicators in Table 10 stand out as good insofar as the presence of floor and ceiling effects is relatively low, meaning they differentiate to a high degree. The first is the percentage of learners obtaining the NSC. The second is the percentage of learners obtaining a Bachelors-level pass. The third is performance at the 95th percentile in mathematics. The main problem with this indicator is that 4.3% of schools, mostly small schools, accounting for 1.3% of Grade 12 learners, did not offer mathematics in 2015. The problem is larger for physical science, a subject not offered by 10.7% of schools (accommodating 4% of Grade 12 learners).

Table 10: Percentage of schools in floors and ceilings

Denominator or reference group ➔ Key indicators 🡻	Learners who wrote the examination(s) in question	Any Grade 12 learner who wrote any subject examination	Grade 10 learners two years previously	The size of an earlier age cohort that is indicative of potential Grade 12 learners
NSC passes		4	0	0
Bachelors-level passes		4	4	4
Learners obtaining at least 30% in mathematics	12	8	8	8
Learners obtaining at least 60% in mathematics	38	38	37	36
Learners obtaining at least 70% in mathematics	53	53	53	52
Mathematics performance at the 95th percentile	4	5	8	5
Learners obtaining at least 30% in physical science	17	12	12	12
Learners obtaining at least 60% in physical science	42	42	42	41
Physical science performance at the 95th percentile	11	12	16	11
Subject marks of 80% or more	16			
Number of Grade 12 learners			0	0

5.7 The stability of indicators in terms of percentiles

Absolute movements in percentile rankings. The process for arriving at the statistics in Table 11 below, whose aim is to identify which indicators display less year-on-year instability (one of the four criteria from section 5.1) is the following. Comparisons were made across adjacent years, 2012 to 2013, 2013 to 2014 and 2014 to 2015. For each of the three comparisons, the percentile rankings of schools in the first and second year were compared. For instance, one school may move from percentile rank 36 to percentile rank 40, meaning a movement of 4. The average *absolute* movement across two years was then calculated. Three averages would be obtained for the three comparisons. Each value in the table is the average across the three averages.

Floor and ceiling schools removed from the calculation. How 'floors' and 'ceilings' were dealt with should be explained. If half of the schools were in the floor, meaning they all had the minimum indicator value, then each school within this half would be given the percentile rank of 1. The remaining schools would be spread across the percentile ranks 51 to 100. Before the average movement across two years was calculated, schools in the floor or ceiling in either year were removed.

Very high levels of year-on-year instability in the rankings. There is clearly much year-on-year instability with respect to many indicators, with year-on-year movement statistics in Table 11 often being in the range of 15 to 30 percentile ranks. This implies considerable movement and instability, and is in line with similar findings in Simkins (2010).

Certain indicators are less unstable. Which indicators are good in the sense that they display the *least* year-on-year instability? The indicators on obtaining the NSC, the Bachelors-level pass or a basic pass in mathematics or physical science are relatively stable. So are the 95th percentile statistics.

Table 11: Year-on-year percentile changes for non-floor non-ceiling schools

Denominator or reference group ➔ Key indicators 🡻	Learners who wrote the examination(s) in question	Any Grade 12 learner who wrote any subject examination	Grade 10 learners two years previously	The size of an earlier age cohort that is indicative of potential Grade 12 learners
NSC passes		17	15	18
Bachelors-level passes		17	15	15
Learners obtaining at least 30% in mathematics	17	16	14	16
Learners obtaining at least 60% in mathematics	26	26	25	25
Learners obtaining at least 70% in mathematics	35	34	33	33
Mathematics performance at the 95th percentile	17	16	15	15
Learners obtaining at least 30% in physical science	18	17	15	16
Learners obtaining at least 60% in physical science	29	28	27	27
Physical science performance at the 95th percentile	18	17	15	15
Subject marks of 80% or more	20			
Number of Grade 12 learners			18	22

Low benefits associated with non-traditional denominators. Interestingly, the differences across columns within a single row in Table 11 are not substantial. Thus the more 'sophisticated' denominator of the last column does not appear to bring great benefits according to this table.

5.8 Full analysis results per indicator

Column 'Both %' in Table 12 repeats the statistics of Table 10 whilst the column 'Change' contains the statistics of Table 11. Further statistics are also provided in Table 12: the number of schools available for the comparison, before the removal of floor and ceiling schools (the average across the three comparisons is given); the number of unique indicator values (in the last year of the all years considered); the number of schools in the floor; the number of schools in the ceiling; what the 'Change' value would be if schools were weighted by learners ('Weighted'); the change values for each of the three comparisons.

Table 12: Full details on year-on-year changes, floors, ceilings

Indicator	Denominator/reference group	Schools	Values	Floor	Ceiling	Both %	Change	Weighted	12-13	13-14	14-15
NSC passes	Learners who wrote any	5912	2968	14	235	4	17	15	17	18	16
NSC passes	Grade 10 learners two years previously	5876	4059	14	1	0	15	13	15	16	15
NSC passes	Earlier age cohort	5090	3292	10	1	0	18	17	18	18	19
Bachelors-level passes	Learners who wrote any	5900	2652	254	3	4	17	14	0	17	16
Bachelors-level passes	Grade 10 learners two years previously	5865	3218	253	1	4	15	12	0	15	14
Bachelors-level passes	Earlier age cohort	5092	2683	192	1	4	15	13	0	15	15
At least 30% in mathematics	Learners who wrote the examination	5912	1534	484	248	12	17	15	18	18	17
At least 30% in mathematics	Learners who wrote any	5912	2419	484	2	8	16	13	16	17	16
At least 30% in mathematics	Grade 10 learners two years previously	5876	3048	483	1	8	14	12	13	14	14
At least 30% in mathematics	Earlier age cohort	5086	2506	390	1	8	16	13	16	15	15
At least 60% in mathematics	Learners who wrote the examination	5912	970	2217	2	38	26	20	26	26	27
At least 60% in mathematics	Learners who wrote any	5912	1369	2217	1	38	26	19	26	26	26
At least 60% in mathematics	Grade 10 learners two years previously	5876	1762	2202	1	37	25	18	24	24	25
At least 60% in mathematics	Earlier age cohort	5086	1464	1843	1	36	25	19	25	24	25
At least 70% in mathematics	Learners who wrote the examination	5912	744	3141	1	53	35	27	35	35	35
At least 70% in mathematics	Learners who wrote any	5912	1042	3141	1	53	34	26	34	34	35
At least 70% in mathematics	Grade 10 learners two years previously	5876	1354	3116	1	53	33	26	33	33	34
At least 70% in mathematics	Earlier age cohort	5086	1112	2633	1	52	33	26	32	32	34
Mathematics at the 95th percentile	Learners who wrote the examination	5912	144	251	1	4	17	16	17	18	17
Mathematics at the 95th percentile	Learners who wrote any	5912	145	282	2	5	16	14	16	17	16
Mathematics at the 95th percentile	Grade 10 learners two years previously	5876	148	480	1	8	15	14	15	15	15
Mathematics at the 95th percentile	Earlier age cohort	5838	152	315	2	5	15	13	15	15	15
At least 30% in physical science	Learners who wrote the examination	5912	1162	721	295	17	18	16	18	18	18
At least 30% in physical science	Learners who wrote any	5912	2325	721	2	12	17	15	17	17	17
At least 30% in physical science	Grade 10 learners two years previously	5876	2938	717	1	12	15	12	14	15	15
At least 30% in physical science	Earlier age cohort	5086	2432	585	1	12	16	14	17	16	16
At least 60% in physical science	Learners who wrote the examination	5912	781	2496	3	42	29	22	28	29	29
At least 60% in physical science	Learners who wrote any	5912	1241	2496	1	42	28	22	28	28	29
At least 60% in physical science	Grade 10 learners two years previously	5876	1640	2479	1	42	27	21	27	27	27
At least 60% in physical science	Earlier age cohort	5086	1341	2089	1	41	27	21	27	27	28
Physical science at the 95th percentile	Learners who wrote the examination	5912	138	632	2	11	18	16	18	17	18
Physical science at the 95th percentile	Learners who wrote any	5912	135	685	2	12	17	15	17	17	17
Physical science at the 95th percentile	Grade 10 learners two years previously	5876	134	913	2	16	15	14	15	16	15
Physical science at the 95th percentile	Earlier age cohort	5759	138	621	3	11	15	14	15	15	15

Indicator	Denominator/reference group	Schools	Values	Floor	Ceiling	Both %	Change	Weighted	12-13	13-14	14-15
Subject marks of 80% or more	Learners who wrote the examination	5912	2580	967	1	16	20	15	19	20	20
Number of Grade 12 learners	Grade 10 learners two years previously	5876	4129	1	1	0	18	16	17	18	20
Number of Grade 12 learners	Earlier age cohort	5086	3598	1	1	0	22	21	24	20	23

5.9 School-level correlations dealing with level of performance

Ranking similarities with respect to levels and trends. In this section and the next one the criterion that correlations across similar indicators should be high is explored. In this section the focus is on whether similar indicators provide similar rankings of schools in one point in time. The next section focuses on whether similar indicators say similar things in relation to the improvement trends of schools.

Correlations across school-level percentile rankings. The three tables that follow indicate correlations of school values across two indicators. The values considered are the percentile rankings of schools, calculated as for the earlier Table 12. For each correlation coefficient, the average percentile ranking, across the four (or occasionally three) years for one indicator was compared to the corresponding figure for the other indicator. The three tables each use three different denominators in the indicator: all Grade 12 examination candidates; Grade 10 enrolments two years previously; and a relevant age cohort from an earlier year (as explained in section 5.5). When correlation coefficients were calculated, schools in the 'floor' for either of the two indicators being concerned were excluded from the calculation.

High correlations for mark at the 95th percentile indicators. So what do the three tables show? The indicators using performance at the 95th percentile emerge as consistent indicators in the sense that their correlations tend to be high relative to all other indicators. The left-hand panel of Table 16 facilitates the interpretation by finding the averages across the correlations associated with each indicator[17]. In each of the first three columns mathematics performance at the 95th percentile carries the highest correlation, and the corresponding indicator for physical science displays the second-highest correlation. Moreover, in the three tables Table 13 to Table 15, the correlation between the two 95th percentile indicators is amongst the highest in each table (see the values appearing within a rectangle). The mathematics 95th percentile indicator also displayed particularly favourable characteristics when floors and ceilings and year-on-year percentile rank changes were considered in earlier sections.

Relatively low correlations for qualifications indicators. The degree to which learners obtain the NSC is highly correlated with the degree to which learners obtain a Bachelors-level NSC, but in the larger picture the NSC and Bachelors-level indicators are less correlated with other indicators than, say, achievement of the mathematics thresholds 30%, 60% and 70%.

Is it worth using the non-traditional denominators of earlier Grade 10 enrolment and a relevant age cohort? If one compares values across the first three columns of Table 16 it becomes clear that the earlier Grade 10 denominator always offers the most consistent statistics. One should remember that we are looking at the consistency across indicators *during the same time period* (specifically the same three or four years). Though Grade 10 enrolments may be inconsistent denominators over time due to changing grade repetition patterns (as discussed in section 3), for a given time period one would be using the same denominator values across various indicators (or 'numerators'), so one would not expect inconsistency here.

One remarkable thing is that the indicator on mathematics performance at the 95th percentile is more closely correlated to the percentage of learners passing at the 30% mark level, than to the percentage of learners reaching a mark of 60% or 70% in mathematics. This is largely because 'floors' have been excluded, so there are fewer percentile rankings left to use in the attainment of 60% or 70% mark thresholds.

[17] For instance, for each of the ten indicators in Table 13, the average across the nine correlation coefficients relating to the other nine indicators was found. For Table 14 and Table 15, the indicator 'Gr 12 enrolment' was excluded from the calculation in order to make the calculations from the three tables consistent.

Table 13: Correlations of level indicators relative to all Grade 12

	NSC passes	Bach. passes	Math. 30%	Math. 60%	Math. 70%	Math. 95th p'tile	Physics 30%	Physics 60%	Physics 95th p'tile	Distinctions
NSC passes	1									
Bach. passes	.85	1								
Math. 30%	.57	.61	1							
Math. 60%	.62	.70	.78	1						
Math. 70%	.58	.65	.71	.89	1					
Math. 95th p'tile	.65	.73	.90	.91	.84	1				
Physics 30%	.47	.51	.83	.65	.58	.75	1			
Physics 60%	.60	.68	.71	.85	.82	.82	.69	1		
Physics 95th p'tile	.63	.71	.82	.83	.77	.89	.86	.89	1	
Distinctions	.57	.67	.57	.64	.64	.64	.47	.63	.62	1

Table 14: Correlations of level indicators relative to earlier Grade 10

	NSC passes	Bach. passes	Math. 30%	Math. 60%	Math. 70%	Math. 95th p'tile	Physics 30%	Physics 60%	Physics 95th p'tile	Gr 12 enrolment	Distinctions
NSC passes	1										
Bach. passes	.85	1									
Math. 30%	.70	.70	1								
Math. 60%	.66	.74	.81	1							
Math. 70%	.62	.68	.74	.89	1						
Math. 95th p'tile	.71	.74	.97	.86	.78	1					
Physics 30%	.66	.65	.88	.73	.68	.86	1				
Physics 60%	.65	.72	.75	.87	.84	.79	.76	1			
Physics 95th p'tile	.69	.71	.88	.79	.73	.89	.96	.83	1		
Gr 12 enrolment	.80	.56	.58	.50	.50	.54	.57	.49	.56	1	
Distinctions	.59	.69	.63	.67	.67	.65	.58	.67	.63	.41	1

Table 15: Correlations of level indicators relative to age cohort

	NSC passes	Bach. passes	Math. 30%	Math. 60%	Math. 70%	Math. 95th p'tile	Physics 30%	Physics 60%	Physics 95th p'tile	Gr 12 enrolment	Distinctions
NSC passes	1										
Bach. passes	.79	1									
Math. 30%	.65	.70	1								
Math. 60%	.61	.72	.80	1							
Math. 70%	.58	.67	.74	.90	1						
Math. 95th p'tile	.70	.72	.92	.88	.82	1					
Physics 30%	.59	.62	.88	.70	.65	.79	1				
Physics 60%	.59	.70	.74	.87	.84	.80	.73	1			
Physics 95th p'tile	.67	.68	.83	.80	.76	.90	.89	.85	1		
Gr 12 enrolment	.62	.49	.55	.39	.38	.39	.55	.37	.39	1	
Distinctions	.52	.68	.60	.67	.67	.60	.52	.66	.58	.27	1

Table 16: Average correlations

	Levels			Trends		
	All Gr 12	Earlier gr 10	Age cohort	All Gr 12	Earlier gr 10	Age cohort
NSC passes	.62	.68	.63	.26	.26	.18
Bach. passes	.68	.72	.70	.23	.23	.21
Math. 30%	.72	.78	.76	.41	.42	.36
Math. 60%	.76	.78	.77	.39	.36	.36
Math. 70%	.72	.74	.74	.35	.33	.33
Math. 95th p'tile	.79	.81	.79	.46	.43	.39
Physics 30%	.65	.75	.71	.38	.40	.34
Physics 60%	.74	.76	.75	.39	.35	.36
Physics 95th p'tile	.78	.79	.77	.44	.40	.37
Distinctions	.61	.64	.61	.22	.17	.18

Surprising non-importance of the choice of denominator. The next table indicates that correlations across indicators using different denominators are surprisingly high. One would not expect this, if one assumes that certain denominators are preferable to others insofar as they control for selection effects. To illustrate, the correlation between mathematics at the 95th percentile relative to all Grade 12 learners (indicator 2 in Table 17) and mathematics at the 95th percentile relative to an earlier age cohort (indicator 4) is high, at 0.87. It is almost as high as the 0.90 correlation between the mathematics and science indicators using the same age-based denominator (indicators 4 and 8).

Table 17: Correlations across the 95th percentile indicators

			1	2	3	4	5	6	7	8
1	Mathematics at the 95th percentile	Learners who wrote the examination	1							
2	Mathematics at the 95th percentile	Learners who wrote any	.88	1						
3	Mathematics at the 95th percentile	Grade 10 learners two years previously	.73	.89	1					
4	Mathematics at the 95th percentile	Earlier age cohort	.75	.87	.87	1				
5	Physical science at the 95th percentile	Learners who wrote the examination	.89	.80	.68	.69	1			
6	Physical science at the 95th percentile	Learners who wrote any	.78	.89	.80	.78	.86	1		
7	Physical science at the 95th percentile	Grade 10 learners two years previously	.64	.79	.89	.78	.71	.88	1	
8	Physical science at the 95th percentile	Earlier age cohort	.63	.75	.76	.90	.72	.84	.85	1

5.10 School-level correlations dealing with performance trends

High integrity of the 95th percentile indicators with respect to trends. The next three tables, whose statistics are summed up in the right-hand panel of Table 16 above, deal with similarities across indicators with respect to their measurement of school-level improvement trends. Specifically, for every indicator the improvement slope with respect to a school's percentile ranking, a slope which could be positive or negative, was calculated. As was the case with correlations focussing on levels of performance (see section 5.9), in the next three tables the high level of school-level correlation, with respect to trends, between the two 95th percentile indicators for the two subjects mathematics and physical science stand out (see the cells marked with rectangles). However, within each subject, the correlation between the trend for the 95th percentile and the trend for basic passes at the 30% level is also high (something similar was seen in the previous section). The utility of the 95th percentile indicators is underscored by the fact that in the last three columns of Table 16, these indicators display particularly high average correlations.

Table 18: Correlations of trend indicators relative to all Grade 12

	NSC passes	Bach. passes	Math. 30%	Math. 60%	Math. 70%	Math. 95th p'tile	Physics 30%	Physics 60%	Physics 95th p'tile	Distinctions
NSC passes	1									
Bach. passes	.42	1								
Math. 30%	.40	.28	1							
Math. 60%	.16	.17	.40	1						
Math. 70%	.08	.15	.27	.71	1					
Math. 95th p'tile	.31	.26	.71	.55	.44	1				
Physics 30%	.36	.22	.62	.27	.20	.52	1			
Physics 60%	.14	.15	.30	.65	.63	.46	.35	1		
Physics 95th p'tile	.28	.22	.52	.41	.33	.68	.75	.53	1	
Distinctions	.22	.22	.17	.22	.30	.23	.17	.28	.20	1

Table 19: Correlations of trend indicators relative to earlier Grade 10

	NSC passes	Bach. passes	Math. 30%	Math. 60%	Math. 70%	Math. 95th p'tile	Physics 30%	Physics 60%	Physics 95th p'tile	Gr 12 enrolment	Distinctions
NSC passes	1										
Bach. passes	.42	1									
Math. 30%	.42	.27	1								
Math. 60%	.15	.18	.39	1							
Math. 70%	.10	.15	.29	.71	1						
Math. 95th p'tile	.38	.26	.80	.41	.33	1					
Physics 30%	.39	.23	.62	.26	.22	.56	1				
Physics 60%	.11	.17	.31	.64	.63	.33	.35	1			
Physics 95th p'tile	.31	.21	.56	.29	.25	.64	.83	.38	1		
Gr 12 enrolment	.57	.13	.22	.04	.05	.21	.21	.02	.18	1	
Distinctions	.08	.19	.12	.20	.29	.14	.10	.26	.12	-.11	.08

Table 20: Correlations of trend indicators relative to age cohort

	NSC passes	Bach. passes	Math. 30%	Math. 60%	Math. 70%	Math. 95th p'tile	Physics 30%	Physics 60%	Physics 95th p'tile	Gr 12 enrolment	Distinctions
NSC passes	1										
Bach. passes	.22	1									
Math. 30%	.20	.27	1								
Math. 60%	.09	.19	.38	1							
Math. 70%	.07	.17	.27	.70	1						
Math. 95th p'tile	.37	.19	.59	.43	.37	1					
Physics 30%	.17	.24	.69	.29	.21	.38	1				
Physics 60%	.08	.20	.30	.65	.63	.37	.33	1			
Physics 95th p'tile	.33	.17	.39	.32	.29	.65	.61	.43	1		
Gr 12 enrolment	.17	.13	.42	.11	.08	.02	.42	.07	.02	1	
Distinctions	.06	.20	.11	.21	.29	.18	.10	.27	.17	-.06	1

5.11 Summing up the effectiveness of the various indicators

Disappointing results with respect to non-traditional 'denominators'. What is disappointing is that non-traditional denominators for Grade 12 performance indicators, specifically earlier Grade 10 enrolments and a relevant age cohort, do not emerge as particularly useful, relative to the traditional denominator of just the Grade 12 enrolment of a school. This is disappointing because we know that just Grade 12 enrolment is far from ideal, because it is easily manipulated, and alternative denominators are needed. One solution which in theory should work well, but has not been explored here, is earlier Grade 10 enrolments minus repeaters. This was not explored because of data problems described in section 3. The Grade 10 minus repeaters solution is probably the best solution to pursue going forward. This would entail fixing problems in relation to the consistency of learner identifiers in LURITS, a matter which in any case requires attention.

Interesting findings with respect to 'numerators'. The interesting findings in the current report relate to the choice of the 'numerator'. The next table sums up the findings, using the four criteria explained in section 5.1. Each of the four column headings refer to a desirable characteristic. Overall, the traditional indicators relating to the percentage of learners obtaining the NSC or a Bachelors-level NSC emerge as relatively good across all four columns. The indicators on performance at the 95th percentile, but particularly the one for mathematics, emerge as especially good in the last three columns though they may be a bit difficult for stakeholders to become accustomated to.

Table 21: Summary of findings

	Meaningful and clear?	Differentiation across schools? (Table 10)	Minimal year-on-year in stability? (Table 11)	High school-level correlations across similar indicators? (Sections 5.9 and 5.10)
NSC passes	Yes – widely known	Yes, very much so	Yes, reasonable	Reasonable
Bachelors-level passes	Yes – widely known	Yes, very much so	Yes, reasonable	Reasonable
Learners obtaining at least 30% in mathematics	Yes – widely known	Reasonable, but strong floor effects	Problematic – considerable instability	High
Learners obtaining at least 60% in mathematics	Yes – under-utilised, but very important and easy to understand	Weak – strong floor effects	Problematic – considerable instability	High
Learners obtaining at least 70% in mathematics	Yes – under-utilised, but very important and easy to understand	Weak – strong floor effects	Problematic – considerable instability	High
Mathematics performance at the 95th percentile	Potentially yes, but requires some getting used to	Yes, very much so	Yes, reasonable	Very high
Learners obtaining at least 30% in physical science	Yes – widely known	Reasonable, but strong floor effects and schools without the subject	Yes, reasonable	High
Learners obtaining at least 60% in physical science	Yes – under-utilised, but very important and easy to understand	Weak – strong floor effects	Problematic – considerable instability	High
Physical science performance at the 95th percentile	Potentially yes, but requires some getting used to	Reasonable, but schools without the subject	Yes, reasonable	Very high
Subject marks of 80% or more	Yes, but requires some getting used to	Weak – strong floor effects		Reasonable

6 A proposed school report card

This section presents a proposed school-level report card, for an actual school, drawing from the analysis and discussion in the foregoing sections. It was decided to include the use of a relevant age cohort as a denominator for certain indicators in the report card, despite the limitations of this approach. In line with the discussion in section 5.11, the ideal would probably be to replace the age cohort denominator with a Grade 10 enrolment minus repeaters denominator, as soon as it becomes possible to calculate the latter with sufficient accuracy using LURITS.

90% of programming already done. The report card for Sibumbene High appearing below draws from an Excel file which accompanies the current report[18]. In that Excel file, any one of 5,817 schools can be selected to generate the report card. However, the Excel file is intended

[18] *Grade 12 indicators.xls.*

to demonstrate the report card, not implement it fully. Full implementation would require some additional work in order for a properly formatted report along the lines of what appears below to be generated for each school. The work could occur in Microsoft Access, for instance. MS Access could generate a report card per school in PDF format. Thereafter some web-based development would be necessary to implement a downloadable report card per school on, for instance, the DBE website. Importantly, around 90% of the programming has already been accomplished if one considers the Stata .do file[19] and the Excel calculations developed to arrive at the proposed report card.

So how might the school principal of Sibumbene, and his or her manager at the district office, interpret the report card seen below? A few highlights would be the following:

- **A dropping out problem.** If one examines the first set of four graphs, the two graphs referring to NSCs and Bachelors-level NSCs *relative to Grade 12 learners* point to a school which performs a bit better than other quintile 2 schools in KwaZulu-Natal. However, the two graphs which examine the indicators *relative to an age cohort* paint a less encouraging picture, where Sibumbene is more often below the average for quintile 2 schools in the province, than above. This suggests the school needs to pay special attention to ensuring that learners reach Grade 12 and do not drop out before then.

- **An unusual and fast decline in Bachelors-level passes.** What is clearly worrying is the declining number of learners with Bachelors-level passes, from 23 in 2013 to 9 in 2015. There has been no such decline in the province, or the country. Something unusual is happening in Sibumbene.

- **Conclusions change depending on denominator considered.** In mathematics Sibumbene appears to perform well insofar as its mathematics passes or mathematics attainment at a 60% mark level, all relative to Grade 12 learners, tend to be above what is seen in comparable schools, or KwaZulu-Natal quintile 2 schools. However, again the problem of dropping out emerges if one examines attainment at the 60% mark level relative to an age cohort. Here Sibumbene performs worse than comparable schools.

- **Greater problems in physical science than in mathematics.** Sibumbene's best mathematics and physical science performers obtain marks which are below what one sees in KwaZulu-Natal quintile 2 schools, if one focusses on performance at the 95th percentile. What is also clear if one focusses on these indicators that in physical science the school performs worse than in mathematics.

- **An 'uneven decline' in the school's rankings.** What should worry Sibumbene's management, if one looks at the descriptive summaries appearing at the end of the report card, is that both with respect to the attainment of Grade 12 qualifications and the ability of learners to qualify for entry into mathematically-oriented programmes at university, the ranking of school nationally has experienced an *uneven decline.*

[19] *Grade 12 indicators.do*, a file which accompanies the current report.

SCHOOL REPORT CARD FOLLOWING THE GRADE 12 EXAMINATIONS OF 2015

School (and EMIS no.)	SIBUMBENE H (500263625)
Quintile	2
District	Zululand
Province	KwaZulu-Natal

This report card is intended to assist the school community and district officials to understand the **current levels of performance** of the school as well as **recent trends**. The statistics in the report use data only from full-time students who wrote examinations in at least seven subjects, and data as they stood after the year-end examinations. Results from the subsequent supplementary examinations are thus not taken into account for any year.

Users of this school-level report are advised to consult the accompanying **national report** (available at www.education.gov.za), which explains in more depth what the various indicators mean.

Attainment of qualifications

This section focuses on how successful the school has been in recent years in ensuring that learners obtain the **National Senior Certificate** (NSCs), and an NSC which allows the learner to pursue **Bachelors degree studies at a university**. Some of the statistics in the table appearing below take successful Grade 12 learners and divide this by an **age cohort**. For instance, the number of NSCs in 2015 is divided by an age cohort. This age cohort denominator is the number of learners one could expect in Grade 12 in ideal circumstances, where there was no dropping out before Grade 12, and no repetition in Grade 12. This denominator is in many ways preferable to the alternative of Grade 10 enrolments two years earlier. The problem with the latter denominator is that it is inflated by Grade 10 repeaters and hence generally results in an under-estimate of the school's degree of success. The precise method for calculating the age cohort denominator appears in the national report referred to above.

Asterisks in the table mean that statistics from the row are used in the summary appearing at the end of the report.

	2012	2013	2014	2015
Statistics for this school				
NSCs obtained (A)	33	55	51	39
NSC with Bachelors level (B)		26	14	9
Learners who wrote seven subjects (C)	57	69	74	57
An age cohort (D)	97	112	100	103
Age used for the above	17	17	18	17
Year used for the above	2010	2011	2012	2013
NSCs over Grade 12s (A / C × 100)	58	80	69	68
NSCs over an age cohort (A / D × 100)*	34	49	51	38
Percentile for above	**23**	**38**	**49**	**16**

	2012	2013	2014	2015
Bachelors passes over Grade 12s (B / C × 100)		38	19	16
Bachelors passes over an age cohort (B / D × 100)		23	14	9
Percentile for above		**65**	**47**	**21**
Comparable statistics for the schooling system				
NSCs over Grade 12s				
Zululand	73	74	60	53
KwaZulu-Natal quintile 2	69	71	62	55
South Africa quintile 2	68	72	69	64
South Africa	74	77	74	70
NSCs over an age cohort				
Zululand	47	53	45	48
KwaZulu-Natal quintile 2*	45	50	44	49
South Africa quintile 2*	41	48	44	55
South Africa	46	53	49	59
Bachelors passes over Grade 12s				
Zululand		26	19	17
KwaZulu-Natal quintile 2		24	18	16
South Africa quintile 2		22	20	18
South Africa		30	27	25
Bachelors passes over an age cohort				
Zululand		19	14	15
KwaZulu-Natal quintile 2		17	13	14
South Africa quintile 2		15	13	16
South Africa		21	18	21

The graphs appearing below use statistics from the above table. What things should the reader look for in the statistics and trends? Firstly, the number of NSCs over all Grade 12s, commonly referred to as the '**overall pass rate**', should be looked at. Is the school doing better or worse than other schools, in particular other schools in the same district and quintile? If the answer is that it is doing worse, this suggests the school should be making especially ambitious plans to improve its results. But is it is also important to look at **NSCs over an age cohort**. If the school is doing relatively well according to the traditional 'overall pass rate', but poorly with respect to NSCs over an age cohort, then this would suggest that the former has been kept high partly through high dropping out before Grade 12. This would obviously point to a problem. The figures provided here thus help in contextualising the traditional pass rate.

What is said about NSC statistics also applies to a large extent to NSCs with a Bachelors-level pass.

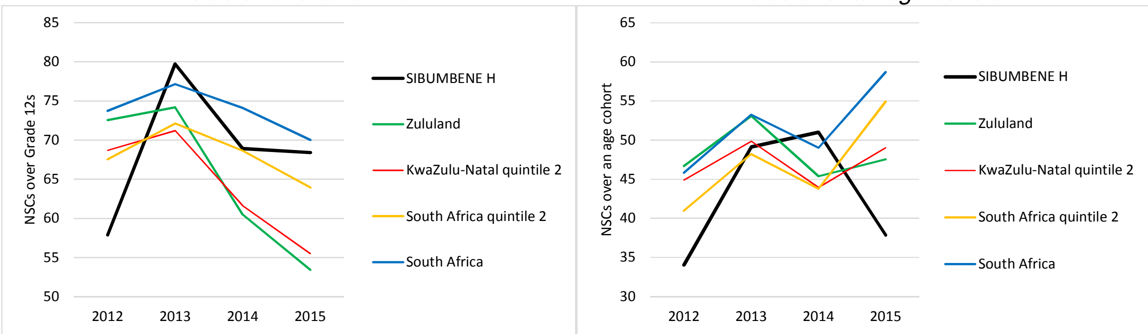
The two rows with **percentile values** in the above table provide an idea of the ranking of the school in the national context. A percentile is a category comprising one-hundredth of the total (just as a quintile comprises one-fifth of the total). If a school is given a percentile value of, say, 45, this means that 55% of learners are in schools which are *better* than the current school, whilst 45% of learners are in schools which are *worse* than the current school. The best percentile value is 100, whilst the worst is 1.

Why is it important to compare the school to other schools in the same **quintile**? Many barriers to learning are linked to circumstances in the household, for instance **poverty and the educational level of parents**. Comparing schools in the same quintile helps in ensuring that one is comparing 'apples to apples'.

In the case of many schools, there are exceptional one-year drops or increases in the various performance statistics shown in this report. These drops and increases should be studied carefully. They could point to good practices from specific years which should be repeated, or bad practices which should not.

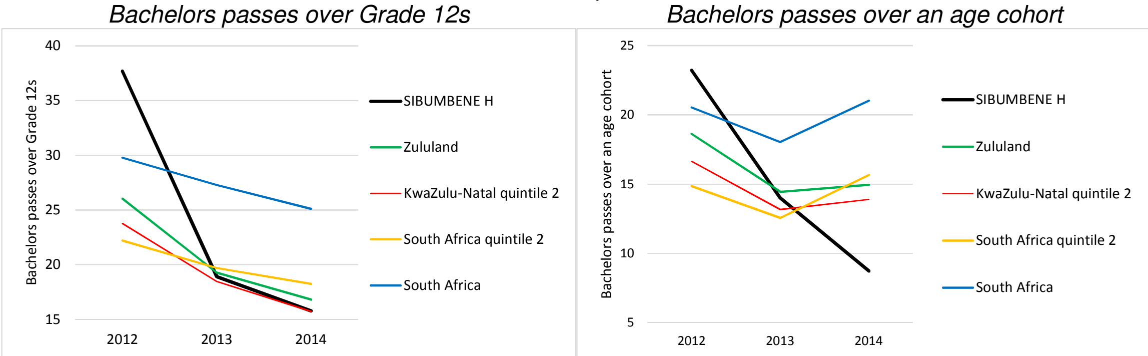
NSC passes

NSCs over Grade 12s | *NSCs over an age cohort*



Bachelors passes

Bachelors passes over Grade 12s | *Bachelors passes over an age cohort*



Passes in mathematics and physical science

The next table provides statistics relating to the passing of mathematics and physical science at the 30% level.

	2012	2013	2014	2015
Statistics for this school				
Maths passes at 30% (E)	12	20	12	8
Physics passes at 30% (F)	9	15	12	8
Learners who wrote maths (G)	17	26	24	23
Learners who wrote physics (H)	18	26	24	21
Maths passes over candidates (E / G × 100)	71	77	50	35
Physics passes over candidates (F / H × 100)	50	58	50	38
Comparable statistics for the schooling system				
Maths passes over candidates				
Zululand	50	52	35	27
KwaZulu-Natal quintile 2	39	45	33	25
South Africa quintile 2	42	49	42	37
South Africa	53	57	52	47
Physics passes over candidates				
Zululand	61	65	49	44
KwaZulu-Natal quintile 2	51	58	48	45
South Africa quintile 2	52	59	53	49
South Africa	59	65	59	56

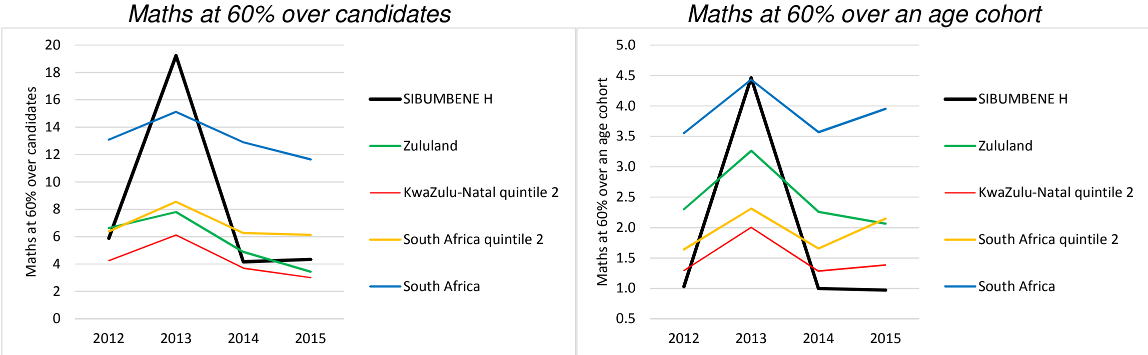
Attainment of university-level thresholds in mathematics and physical science

The next table focusses on attainment of a mark of at least 60% in mathematics and physical science. Universities often require a minimum of 60% in these subject if a learner is to be considered for certain programmes such as engineering, commerce or medicine. Sometimes the requirement is 50% or 70%. The 60% threshold is however a sufficiently common one to warrant attention by schools.

	2012	2013	2014	2015
Statistics for this school				
Maths passes at 60% (I)	1	5	1	1
Physics passes at 60% (J)	1	2	1	1
Maths at 60% over candidates (I / G × 100)	6	19	4	4
Physics at 60% over candidates (J / H × 100)	6	8	4	5
Maths at 60% over an age cohort (I / D × 100)*	1.0	4.5	1.0	1.0
Percentile for above	**39**	**69**	**37**	**34**
Physics at 60% over an age cohort (J / D × 100)*	1.0	1.8	1.0	1.0
Percentile for above	**40**	**52**	**43**	**40**
Comparable statistics for the schooling system				
Maths at 60% over candidates				
Zululand	7	8	5	3
KwaZulu-Natal quintile 2	4	6	4	3
South Africa quintile 2	6	9	6	6
South Africa	13	15	13	12
Physics passes over candidates				
Zululand	8	8	6	5
KwaZulu-Natal quintile 2	5	6	5	5
South Africa quintile 2	7	7	7	7
South Africa	14	14	13	12
Maths at 60% over an age cohort				
Zululand	2.3	3.3	2.3	2.1
KwaZulu-Natal quintile 2*	1.3	2.0	1.3	1.4
South Africa quintile 2*	1.6	2.3	1.7	2.1
South Africa	3.6	4.4	3.6	4.0
Physics at 60% over an age cohort				
Zululand	2.2	2.4	1.9	2.0
KwaZulu-Natal quintile 2*	1.1	1.3	1.0	1.2
South Africa quintile 2*	1.6	1.6	1.4	1.8
South Africa	3.0	3.1	2.6	3.1

Maths at 60%

Maths at 60% over candidates | *Maths at 60% over an age cohort*



Evidence of top-end excellence

What performance is at the top end amongst learners in a school provides one important indication of how good the school is at creating an environment in which especially capable learners can realise their potential. If the top end of the performance spectrum is very low, this suggests the school cannot continue with a 'business as usual' approach.

The concept of performance at the 95th percentile, for instance in mathematics relative to all learners who wrote the mathematics examinations, should be explained. The 95th percentile can be considered 'almost the top'. The learner at the

95th percentile in a mathematics class is the learner who finds that 5% of learners performed better than herself, whilst 95% of learners performed worse. This learner is thus ‘almost at the top’. Why not use the very top, or the best learner, to gauge top-end performance? The problem with using the best learner is that the maximum mark in a year is highly subject to exceptional ‘jumps’, for instance as a result of one exceptionally talented learner. The 95th percentile provides a less ‘jumpy’ and hence smoother indicator.

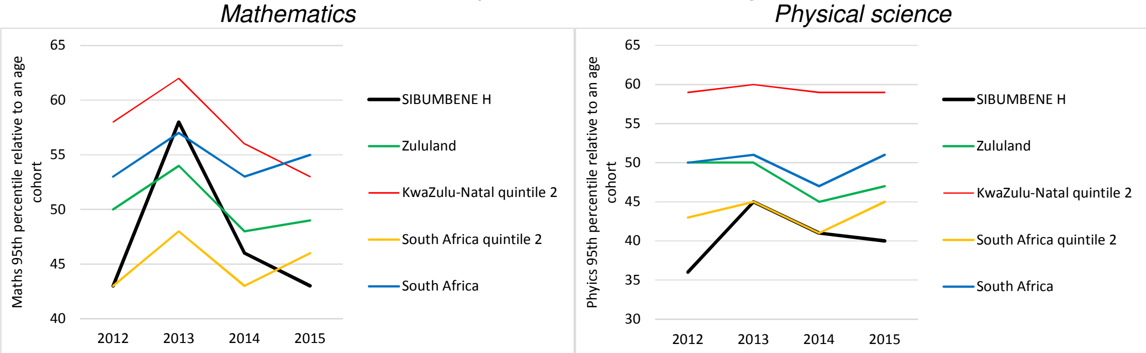
How is the 95th percentile relative to an age cohort calculated? To get this, any learner who did not take mathematics, or did not even get to Grade 12, due to presumed dropping out, is given a mark of 0%. Then the 95th percentile of all the learners is found.

One advantage with the 95th percentile as a measure of the school’s top-end performance is that virtually all schools display a value. This is not the case with, say, the percentage of learners obtaining 60% in mathematics, as schools where no-one attains this level display a value of zero. Performance at the 95th percentile, in particular relative to an age cohort, has been shown to be a particularly reliable indicator of the quality of a school.

	2012	2013	2014	2015
Statistics for this school				
Distinctions (80% and above in any subject) (K)	12	33	14	6
Total subjects written (L)	399	483	518	399
Distinction ratio (K / L × 100)	3	7	3	2
Maths 95th percentile relative to maths candidates	68	65	54	55
Maths 95th percentile relative to an age cohort*	43	58	46	43
Percentile for above	**46**	**69**	**54**	**43**
Physics 95th percentile relative to physics candidates	64	60	48	59
Physics 95th percentile relative to an age cohort*	36	45	41	40
Percentile for above	**29**	**48**	**48**	**39**
Comparable statistics for the schooling system				
Maths 95th percentile relative to an age cohort				
Zululand	50	54	48	49
KwaZulu-Natal quintile 2*	58	62	56	53
South Africa quintile 2*	43	48	43	46
South Africa	53	57	53	55
Physics 95th percentile relative to an age cohort				
Zululand	50	50	45	47
KwaZulu-Natal quintile 2*	59	60	59	59
South Africa quintile 2*	43	45	41	45
South Africa	50	51	47	51

Mark at the 95th percentile relative to an age cohort

Mathematics *Physical science*



Summary of performance levels and trends

In the summary appearing below, the school's performance relative to other schools in the same quintile is assessed. Asterisks in the earlier tables indicate what statistics were used to draw summaries. 'Capacity to provide qualifications' is NSCs relative to an age cohort (using the age cohort means that dropping out before Grade 12 is relatively well controlled for). For the comparison, in each of the four years, the *maximum* of two values was chosen: the value for the same quintile and the same province, and the value for the same quintile nationally. If the school's performance was always relatively close to that of the comparison group, 'About average' appears in the table below. Else 'Always above', 'Always below' or 'Sometimes above, sometimes below' appears. For 'Capacity to produce university-ready learners in mathematics and physical science', averages across the statistics for the two subjects were used. Exact details of the method used can be found in the national report. For 'Capacity to excel', performance at the 95th percentile in mathematics and physical science were considered.

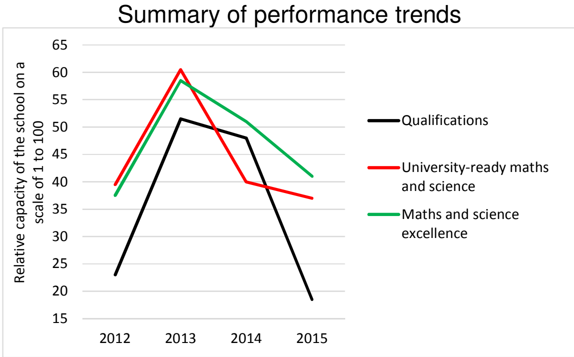
Above or below comparable schools?	
Capacity to provide qualifications	Sometimes above, sometimes below
Capacity to produce university-ready learners in mathematics and physical science	Sometimes above, sometimes below
Capacity to excel	Always below

The next table examines trends. For each of the three rows, two 'Percentile for above' rows from the previous tables of this report were used (there were six such rows in total). Each of the year-specific statistics appearing below thus provides an indication of the school's relative performance, on a scale of 1 to 100. In the 'Slope' column, the linear trend is expressed (such a trend is easily calculated in Excel, using the values provided for each of the four years). If the slope is between -0.5 and 0.5, meaning a relatively small annual change, 'No clear relative trend' appears in the column 'Classification'. Otherwise a negative slope results in the classification 'decline', whilst a positive slope results in 'improvement'. The words 'uneven' and 'even' are used to indicate whether the trend moves consistently in the same direction (as in, for instance, an improvement for each period), or is 'jumpy'. It should be kept in mind that the table below compares the school to all other schools, not just schools in the same quintile.

	2012	2013	2014	2015	Slope	Classification
Capacity to provide qualifications	23	52	48	19	-1.7	Uneven decline
Capacity to produce university-ready learners in mathematics and physical science	40	61	40	37	-2.8	Uneven decline
Capacity to excel	38	59	51	41	0.3	No clear relative trend

The graph appearing below reflects the figures from the table above.

Summary of performance trends



7 Recommendations for future analysis

As pointed out in other reports produced within the same project as the current report, Grade 12 examinations data have been under-utilised. The consequence is that challenges requiring responses in the form of policies and interventions are not very well understood, meaning responses are unlikely to be optimal.

The following is work that could be undertaken to inform future school report cards:

- **Inclusion of English within the report card.** The current report (and the report card) has focussed largely on the subjects mathematics and physical science, which are key subjects in terms of government's priorities. However, poor performance in English is widely considered to hold students back in post-school studies. If one additional subject were to be added to the group of subjects receiving attention in the report card, it should probably be English.

- **Use of a longer time series to gauge trends.** The proposed school report card in section 6 examines trends across just four years. To compare, Australia's 'My School' report cards cover eight years. In particular given the 'jumpiness' of many of the four-year trends seen in the proposed report card, it seems important to cover more than four years.

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