Western Cape Government

Educating Cape 2040: Building Blocks of Future Prosperity

FuturesCape Policy Brief

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INTERNATIONAL FUTURES AT THE PARDEE CENTER

Executive Summary

The Western Cape's long-term vision, OneCape 2040, identifies 'getting the basics right' within the education system as the first priority for achieving a more inclusive and resilient future for the province. But the challenges ahead are substantial. Every year, tens of thousands of Western Cape learners repeat grades, increasing their chances of further repetition and dropout prior to matric. The high repetition and dropout rates are a significant strain on the Western Cape Education Department's capacity.

In this brief we explore potential development paths for Western Cape education to 2040. Our Base Case forecast envisions steady improvements in the retention of learners across all grades and levels of education, but the relatively slow pace of improvement threatens to leave yet another generation of learners without a complete, high-quality education. To address this, we identify two policy options, namely an expansion of the Early Childhood Development initiative and the introduction of specialised supplementary teacher training courses. Both of these have been shown by development research to contribute to a lowering of grade repetition and to boosting learner scores. We then model the potential effects of these policies through the creation of an **Educating Cape** scenario.

In Educating Cape, the burden of schoolchildren who have to repeat is largely absent from primary schools by 2040, and is a rapidly declining problem in secondary schooling. Higher numbers of learners are progressing steadily into secondary and higher education.

Comparing a scenario where these education policies are pursued aggressively with one where they are not (the Base Case), the Western Cape stands to see the following results:

- Near universal net intake primary rates would be achieved six years earlier under the Educating Cape scenario.
- The primary survival rate would reach 100 per cent by 2030 – seven years earlier under the Educating Cape scenario.
- By 2040 upper secondary survival rates in the Western Cape would rise from a forecasted 89 per cent in the Base Case to 93 per cent.
- 10 000 fewer Western Cape residents would be living in extreme poverty by 2040.
- Annual gains to Base Case Gross Domestic Product (GDP) as a result of Educatig Cape interventions would climb from nearly R30 million in 2020 to over R6,5 billion in 2040 (2013 rand).
- 2040 GDP per capita at purchasing power parity would be R1 400 (2013 rand) higher under the Educating Cape scenario.

With higher levels of education will come a reduced burden of communicable disease and poverty in many Western Cape communities, as well as associated gains in GDP and per capita income. The Educating Cape outcomes will help to frame the impact the Western Cape government can have on the future of the province's children. It should also emphasise the positive results that can be realised from long-term investment and action.

Future scenarios for OneCape 2040

The FuturesCape Project is a collaboration between the Western Cape government (WCG) and the African Futures Project, which in turn is a partnership between the Institute for Security Studies and the Frederick S Pardee Centre for International Futures. The aim is for FuturesCape to provide key decision-makers in the WCG with tools to inform their strategic decisions and shape reasonable expectations of long-term development policies. This brief is the first instalment in a series that will focus on the OneCape 2040 long-term strategic vision process.

OneCape 2040 sets out a vision of a Western Cape economy that is both advanced and inclusive, and is characterised by efficiency, innovation and sustainability. Educating Cape is the first of six transitions identified as being necessary for realising this future. Educating Cape aims to transform an education system plagued by inequality and limited innovation to one of world-class quality and innovative excellence. So, what is education in the Western Cape likely to look like in 2040? And what can reasonably be done to put the Western Cape on a path to higher achievement?

This analysis will evaluate the progress to date and forecast potential future developments in the Western Cape education system, using the latest data on Western Cape education and the International Futures (IFs) modelling system.

Glossary of education terms

Net intake rate

$$\frac{\text{\# of age appropriate learners entering education level}}{\text{\# of children in the population of that age}}$$

Example: Children in the Western Cape are expected to enter primary school the year they turn seven. The net intake rate for the province is the number of seven-year-olds in Grade 1 divided by the number of seven-year-olds in the Western Cape.

Note: the data in the model for the Western Cape follows an international convention that is slightly modified from the above definition. The UN Educational, Scientific and Cultural Organisation (UNESCO) uses a definition of 'adjusted net intake rates' for international data. This includes children in the numerator that are of the appropriate age (seven years in the case of the Western Cape) but enrolled in Grade 1 or above. The data therefore includes children who entered Grade 1 at an earlier year and passed on to higher grades by age of seven.

Survival rate

Survival rate is the percentage of learners entering an education level (primary - Grades 1 to 7, lower secondary - Grades 8 and 9, or upper secondary - Grade 10, 11 and 12) who are expected to persist to the end of the level without dropping out.

Net enrolment rate

$$\frac{\text{\# of age appropriate learners enrolled}}{\text{\# of age appropriate children in the Province}}$$

Net enrolment rates capture only the age-appropriate learners in an education level. This measurement cannot exceed 100 per cent and it can never exceed gross enrolment rates (though they could theoretically be equal).

Gross enrolment rate

$$\frac{\text{\# of learners enrolled (irrespective of age)}}{\text{\# of age appropriate children in the Province}}$$

Gross enrolment rates capture the total population of an education level, irrespective of age. This measurement allows for enrolment rates to exceed 100 per cent.

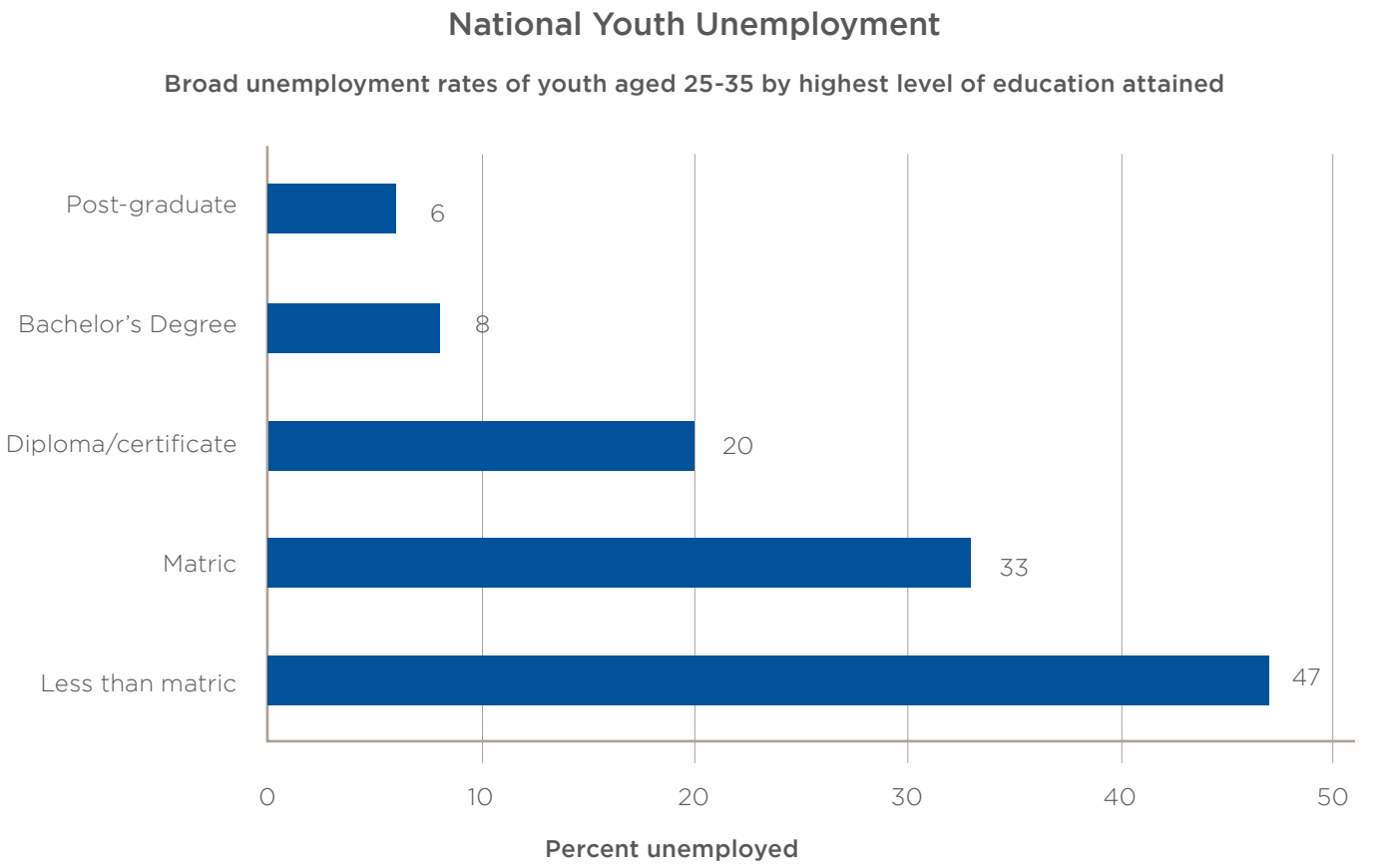
Transition rate

The percentage of learners who graduate from an education level (e.g. lower secondary) and enrol in the next level (e.g. upper secondary). For the Western Cape, the transition rate from lower to upper secondary would therefore be the per cent of learners who graduate from Grade 9 and enrol directly in Grade 10.

Introduction

Education is a key element of human development. Literate and educated people are in a better position to obtain gainful employment (Figure 1) and to create better opportunities for themselves and others.[2] Studies conducted across dozens of developing countries have shown average returns in wages of roughly 8,5 per cent per year of schooling.[3] The Global Campaign for Education (GCE) asserts that education is essential for poverty alleviation and the promotion of economic growth, two of the main priorities for national development in South Africa. Put simply, when people have the opportunity to learn to read and write, economies grow faster and poverty rates decline.[4] The WCG's Strategic Objective Two (PSO2) aims to improve education outcomes in the Western Cape, stating that the goal is to 'improve the life chances of all its children through the provision of quality education'.[5]

Figure 1: National Youth Unemployment (Source: 2011 Census)



The need for action is readily apparent. Several metrics, including the often-cited Trends in International Mathematics and Science Study (TIMSS), show that South African learners are underperforming in numeracy and literacy. While the Western Cape is doing better compared to the other provinces in South Africa, it is still performing below the standards of other upper-middle income countries in the international tests. The 2011 TIMSS placed the Western Cape at about the same level of achievement as Palestine, Jordan and Bahrain in mathematics, and as Macedonia, Lebanon and Indonesia in science.[6]

The question, then, is what action should be taken. In the first instance, the aim of this brief is to identify phenomena that have an impact on the education system across all grade levels. It then delves into the challenges and opportunities for intervention that are specific to bands of the education system. Finally, it sets out a robust, data-driven forecast of the future currently unfolding in the Western Cape and constructs scenarios to investigate the potential effects of interventions currently being discussed by government and in public debates. This analysis examines the anticipated consequences in 2040, both on education outcomes and on economic growth, population health and other social concerns in the province. Fundamentally, this analysis is meant to inform policy decision-making and present plausible pathways for the future of Western Cape education.

Meta-trends in Western Cape education

Educational inequality

Section 29 of the Constitution ensures that 'Everyone has the right to a basic education, including adult basic education'.[7] This landmark principle is a testament to the nation's resolve to overcome historically driven inequalities. Even so, equality in education remains an elusive ideal in the Western Cape and South Africa as a whole.

Inequality in education can be thought of in terms of inputs (such as government expenditures on text books, salaries and infrastructure) and outputs (such as learner achievement). The apartheid government spent roughly seven times more on schooling for white children than on black children. At the dawn of the 'new South Africa', half of the black population had no education or had not completed primary schooling, while only seven per cent had attained a secondary schooling or higher education level.[8] It is critical to address these historically driven under-investments with a progressive, inclusive education policy.

Troubling stratifications in academic success still exist along interrelated divisions of race, location and socioeconomic status. Breaking the cycle of poor education, which leads to unfavourable economic outcomes (and vice versa), is possibly the most critical problem facing the Western Cape's future. Persistent poverty and inequality cannot remain a primary barrier to accessing quality education and achieving a successful adult life.

Many researchers have discovered two distinct systems of educational quality in South Africa.[9,10,11,12,13] One end – classified by some as the top quintile, by others as the top quartile – achieves academic success at a high level (near the international mean). The other end – the bottom 75 to 80 per cent – performs very poorly by international standards. In the 2011 Trends in International Mathematics and Science Study (TIMSS), the top quintile – Quintile 5 – was the only segment of South Africa's public school system to meet the low international benchmark of achievement.[14]

This inequality in achievement begins to manifest itself as early as Grade 3 and persists throughout secondary education.[15] The results from the 2013 Annual National Assessments show that this trend has persisted to the present day. In a report on the 2013 test results, the Department of Basic Education stated that across all grades and subjects there is a 'tendency for learners in higher quintile schools to achieve better than learners in lower quintile schools'.[16]

Bimodality[i] also extends beyond learner achievement into various school-related factors. Spaull (2013) found that the wealthiest quintile of learners are more likely to have their own reading and mathematics textbooks and have teachers that score higher in their respective subject on a standardised test. Furthermore, the wealthiest quintile is less likely to repeat two grades and have lower levels of teacher absenteeism.[17] The primary explanation for the inequalities is legacy; historically disadvantaged schools are still failing, despite policies aimed at ameliorating historical under-investment.

These bimodal features of the schooling system are 'hidden' by mean performance indicators used in reporting, which results in the overestimation of aggregate achievement at the provincial and national levels. The inclusion of high-performing quintile 5 learners in the averages has the effect of obscuring the much lower performance of the other four quintiles. In the Western Cape, as in South Africa, the burden of high dropout, high grade repetition, scarce resources, staffing problems and low achievement falls disproportionately on the lower four quintiles.

Democratic South Africa has made considerable advances in education and the Western Cape has been a leader in many respects. The WCG identified the centrality of education by defining its vision in education as 'Creating opportunity for all through improved education outcomes'.[18] It has been a priority of the WCG since 2009 to improve the quality of education in literacy and numeracy of all its citizens. To date, it is the only province to put into operation a systemic testing and remediation programme in reading and mathematics for Grades 3, 6 and 9. This is designed to improve education standards across the province and give all learners an opportunity for educational achievement.[19]

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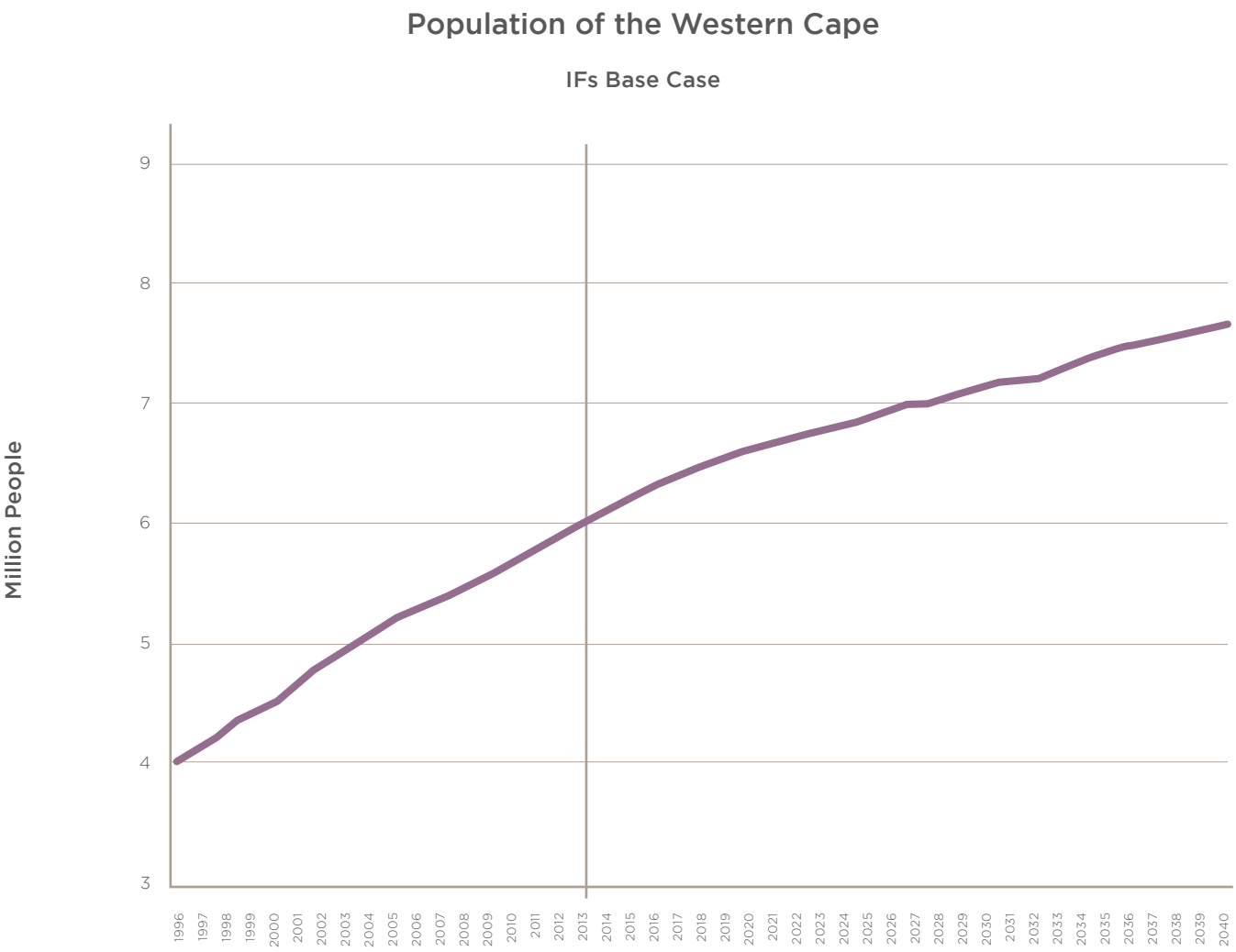
i In referring to South Africa's distribution of education outcomes and resources being represented by two distinct systems. One that achieves (Quintile 5) and one that does not (Quintiles 1 to 4).

Migration

The Western Cape was home to just over 6 million people in 2013. As shown in Figure 2, this represents a population growth of about 20 per cent over the past ten years.[20] From 2006 to 2011, the Western Cape experienced a net influx of some 150 000 migrants, accounting for roughly 40 per cent of the province's population growth. The primary sources of migrants were the Eastern Cape and from outside South Africa.[21] Since the turn of the century, the Western Cape has been the second largest magnet for migrants from within South Africa, with Gauteng lying first.

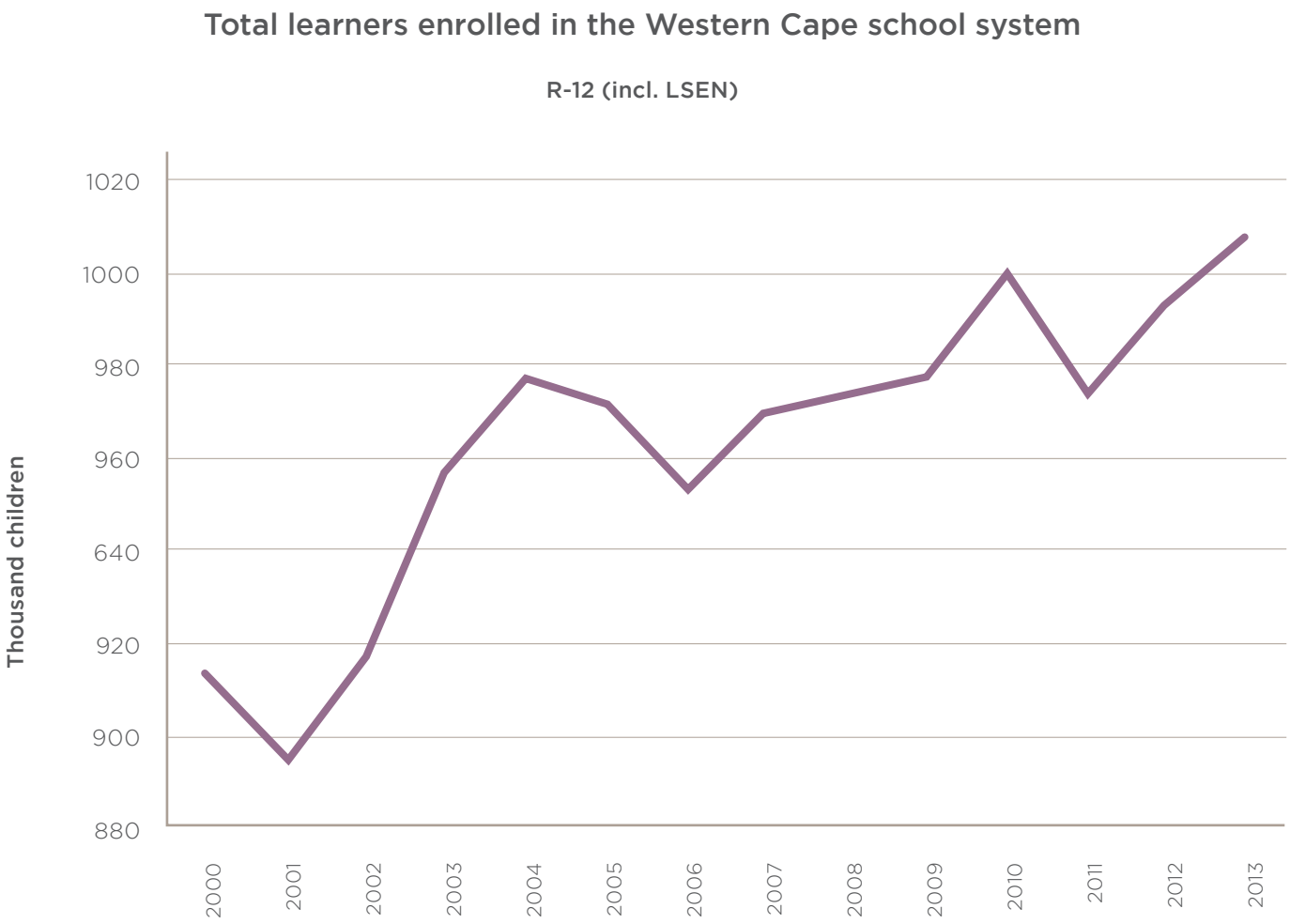
Figure 2: Population of the Western Cape, IFs Base Case



Growth from migration alters a population's structure since it changes the composition of the age groups. In the short term, inward migration can also result in unforeseen shifts in demand on infrastructure, housing and water supply and treatment, straining service delivery. The unrestricted flow of people within national boundaries makes the pressure on services at the provincial level even more pronounced, especially as the inter-provincial movement of people is generally not monitored. Inter-provincial migration can lead to dramatic and often unpredictable shifts in population age structures from year to year. This cascades through every level of education – from Early Childhood Development (ECD) to upper-secondary education – and make planning for the delivery of quality education challenging.

Since 2000, enrolment in the Western Cape school system (from Grades R to12) has grown by approximately 10 per cent, or 100 000 schoolchildren. The highest enrolment was in 2013.[22]

Figure 3: Total number of learners enrolled in the Western Cape school system, Grades R to 12 (including learners with special education needs (LSENs)



According to a survey published by the South African Institute of Race Relations, between the period of 2001 and 2007 a net total of 22 000 school-aged children moved into the Western Cape.[23] The increase in learner totals in the Western Cape for that period was 74 000, suggesting that migrant children may have accounted for almost 30 per cent of enrolment growth in those years. Newly arrived migrant children and time delays in calculating provincial budget shares needed to support the influx will have an effect on the Western Cape Education Department (WCED) for decades to come. It is therefore important to consider inward migration to the Western Cape in any forecast of the province's education profile.

A survey by the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) showed decreases in access to teaching guides in reading (a six per cent decline from 2000 to 2007) and mathematics (a 3,9 per cent decline), as well as a marked decrease in the access of dictionaries (a 15,1 per cent decline) in the Western Cape. SACMEQ's analysis attributed this development to 'unpredictable changes in learner populations due to known movements of learners among schools and across provinces,' and makes the point that difficulties in anticipating migratory patterns could have a serious effect on educational outcomes.[24] It is imperative for school districts to understand recent trends in migration and build a surplus of educational materials to meet short-term bursts in demand driven by migrant children.

An audit of the province's educational infrastructure in 2009 indicated a significant need for new schools to meet the demand of increased learner enrolment, driven in part by incoming migrants. The WCED has since developed a new geographic information system (GIS) tool to respond more efficiently to the changing infrastructure demands across the province. The department has planned and completed 47 new and replacement schools since 2010. The majority of these are in areas that were previously disadvantaged or serve rapidly growing communities. Over the 2013/14 to 2015/16 financial years an additional 72 schools are to be built.

Youth unemployment

While not strictly a meta-trend, youth unemployment is so closely associated with Western Cape education that it bears discussion. In the first quarter of 2014, 44,9 per cent of Western Cape youth aged 20 to 24 years and 35 per cent of those aged 25 to 29 years were not employed, or undergoing education or training (NEET).[25] This NEET rate is well above the province's expanded unemployment rate of 22,6 per cent and is of particular concern for long-term prosperity.[26] Young people who struggle to land their first job experience long-term negative effects referred to as 'scarring', which is manifested in depressed job prospects, earnings, health and life satisfaction.[27,28,29] A study of male youth in the UK estimated that early unemployment resulted in a wage penalty of 13 to 21 per cent on workers as far as 20 years later, even after other factors like education and family income were allowed for.[30]

The education system is one of the main structural drivers of the youth employment profile. As shown in Figure 1, youth with higher levels of education in South Africa experience lower rates of unemployment. Those youth who do not pass matric, constituting over half of that population, have no standardised system for demonstrating to potential employers the skills they have acquired in school, and are therefore unemployed at by far the highest rate. However, even those learners who pass matric face a high unemployment rate of 33 per cent, which is likely partially a result of a perception that the skills of matric graduates are of a low quality. This is reflected in the finding that rates of unemployment among university graduates who had received E to H matric symbols in mathematics and physical sciences were four to five times as high as those who received A to B symbols.[31] This disconnect that exists between the qualifications demanded by South Africa's economy, which is increasingly moving towards skilled and high-skilled jobs, and the qualifications actually produced by the South African schooling system is often referred to as the skills gap.

Western Cape initiatives addressing youth unemployment include the Expanded Public Works Programme and the Premier's Advancement of Youth (PAY) Project, both of which seek to provide temporary work opportunities for youth in the public sector or on publically-funded community projects. Recently, the Employment Incentive Act was signed into law. This provides tax incentives for employers who hire youths between the ages of 18 and 29 years.[32] Meanwhile, the Department of Higher Education and Training has set increased targets for 2014 as regards enrolment in occupational skills programmes. It has also created a mechanism for targeted skills planning.[33]

Forecasting education futures for the Western Cape

Primary School (Grades 1 to 7)

Current outcomes

The WCED tracks key metrics to identify trends in learner progress across time. For primary schooling, these metrics include Grades 3 and 6 numeracy and literacy rates and Grades 1 to 7 pass rates. Changes in the structure and difficulty of the tests in 2011 mean that the results are only comparable either from 2009 to 2010 or from 2011 to 2013. Even so, a steady achievement by learners in numeracy can be observed. Performance in literacy, however, tells a different story, with Grades 3 and 6 literacy rates increasing steadily over the 2009-10 and 2011-12 period, but both experiencing a decrease in 2013.

Table 1: Performance in Western Cape Systemic Language and Mathematics tests, 2009 to 2013

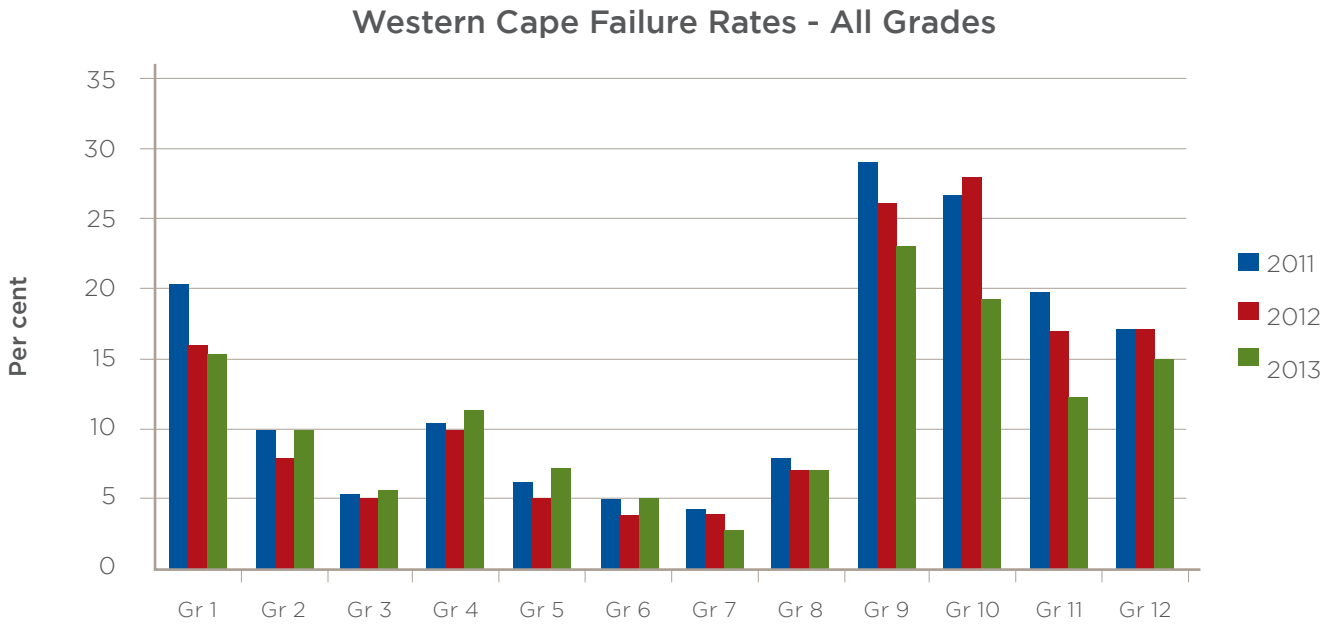
Policy Priority	Performance Area	2009 Performance Levels	2010 Performance Levels	2011 Performance Levels	2012 Performance Levels	2013 Performance Levels
Improved academic performance in literacy and numeracy in Grades 3 and 6 by testing the full cohort	Literacy Grade 3	53,5%	54,9%	*30,4%	38,9%	37,0%
	Numeracy Grade 3	35,0%	48,3%	*47,6%	51,5%	55,0%
	Literacy Grade 6	48,6%	52,3%	*31,5%	36,9%	29,5%
	Numeracy Grade 6	17,4%	24,4%	*23,4%	26,4%	28,3%

** In 2011 the WCED expanded the tests and increased their levels of difficulty to bring them in-line with international experience and best practice. Because of these changes it is no longer possible to make comparisons between past and recent literacy/language and numeracy/mathematics results. For this reason the 2011 results should be seen as a new beginning, rather than contrasting them to the 2010 results.*[34]

With reference to Figure 4, while grade failure rates are significantly higher in secondary schools, primary school failure rates are still significant, especially in Grades 1, 2 and 4. In the Western Cape, 15,3 per cent of Grade 1 learners failed in 2013, while the failure rates in Grades 2 and 4 were roughly 10 per cent.

The rates for Grades 1, 2 and 4 are of particular concern given their occurrence during the mandatory basic education phase. A high proportion of learners who fail these foundational grades will be too young to leave school and are almost certain to repeat them. This suggests that although the Grade 1 failure rate is lower than those seen in the secondary grades, the repetition it results in may actually be higher. According to grade repetition data from the Western Cape Department of Education, Grade 1 repeaters actually outnumber Grade 9 repeaters by a slim margin in both raw numbers and as a percentage of total per-grade enrolments. Across the primary school system, 10,8 per cent (over 100 000 learners) have repeated at least one grade. This is as an excessive burden on the school system's human, physical and financial resources.

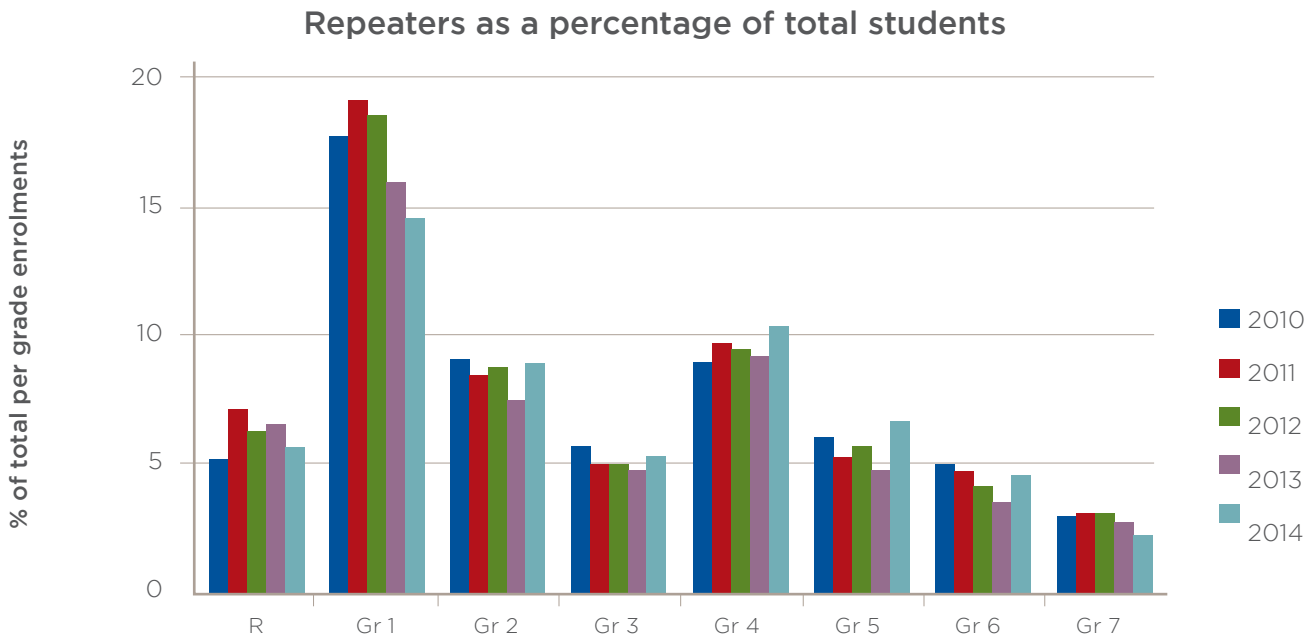
Figure 4: Failure rates in the Western Cape - all grades, 2011 to 2013



The low levels of achievement in the literacy and numeracy tests for Grades 3 and 6 have a clear impact on the number of learners that are able to progress through the primary school system steadily. Using data on repetition and promotion, we calculate that primary school survival has not significantly improved in recent years, having gone up from 78 per cent in 2010 to only 79 per cent in 2013. This measure suggests that roughly 20 per cent of Western Cape learners who enrolled in Grade 1 in 2013 might not be expected to complete their basic education. The long-term impact of repetition on learner achievement forms an important part of this story.

It is worth noting that these figures do not necessarily compare unfavourably to the rest of Africa. International historical data for primary school survival is incomplete in coverage, but we note that Tanzania and Nigeria, for example, have in recent years registered rates roughly equal to those observed in the Western Cape, and that many other sub-Saharan nations have even lower rates. However, North African countries and middle-income countries such as Mexico, Argentina and Indonesia have in the past decade achieved primary survival rates of 90 per cent or above. The example of Morocco, which registered primary survival in 2002 of 76 per cent but managed to reach 92 per cent just ten years later, demonstrates the fact that significant and rapid progress in this measure is within the bounds of possibility.

Figure 5: Percentage of primary school children repeating a grade in the Western Cape



It should also be remembered that the bimodality of outcomes in the Western Cape means that the average outcomes reported mask what are almost certainly even lower survival levels in quintiles 1 to 4. These learners are the ones most in need of rapid systemic progress.

Classroom size in primary schools

Conventional wisdom tells us that more hands-on time with teachers should lead to a greater likelihood of learner achievement. This is an instance where conventional wisdom and reality may tell a different story. Dozens of meta-analyses have been conducted on the topic of the optimal learner-to-teacher ratio but no definitive conclusion has been reached.[35,36] Hanushek's meta-analysis found that there are almost an equal number of studies concluding that smaller class sizes lead to higher achievement as there are those concluding that larger classes correlate with higher achievement.[37]

Case and Yogo determined from South African data that reductions in pupil-to-teacher ratios may exhibit non-linear returns, i.e. larger classes benefit more from reducing numbers; they argue that reducing a class size by one child had a more positive impact on educational returns in a class of 60 than in a class of 30.[38,ii] More recent research in South Africa suggests that the learner-to-teacher ratio plays a 'limited role' but stresses the importance of teacher quality.[39] Other researchers have also argued that that the reduction of learner-to-teacher ratios in the early grades provides a small, positive and lasting effect on learner achievement.[10,41,42,iii] This research indicates that reducing classroom size does not imbue a cumulative benefit to learner achievement as they progress through the grades. As such, a pragmatic policy may focus only on reducing class sizes in Grades R and 1.

However, classroom size is a critical metric for preparing the physical infrastructure to support schoolchildren. The learner-to-educator ratio of the Western Cape in primary schools has remained steady at around 35 since 2005, hovering around the targets set by the WCED. The new Norms and Standards adopted in the Western Cape set a maximum of 40 learners per class.[iv]

IFs Base Case

Trends in failure, repetition and availability of places in the classroom all affect the primary survival rate in the Western Cape, which is a key indicator of the province's success in educating its school-aged children. Using the Base Case projections in IFs displayed in Table 2, the long-term trend for primary survival in the Western Cape is positive. In 2013, survival was comparable to the level seen in Burkina Faso and ranks at only 147th in the world on this metric. However, according to the IFs Base Case, primary survival in the Western Cape is expected to reach 100 per cent by 2040. This outcome will be driven principally by forecasted advances in the province's levels of economic development.

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ii An OECD study on the South African education system also supports this non-linear argument. Refer to Nicola Branson and Murray Leibbrandt, Education quality and labour market outcomes in South Africa, OECD Working Papers 1021 (2013).

iii Case and Deaton (1999) found a positive correlation between smaller classroom size and higher learner achievement in South Africa. However, this study disclosed issues in experimental design that severely weakened the findings. In addition, Wößmann and West (2006) noted that the uniqueness of the South African system during apartheid made it 'unclear' whether the results from Case and Deaton's study were relevant.

iv A mandated ratio of no more than 40 learners per teacher is known internationally as the Maimonides Rule, and has been formally or informally adopted by many nations.

Table 2: Primary survival rate to 2040, IFs Base Case[v]

Primary survival rate (Base Case)				
	2013	2020	2030	2040
Western Cape (ranking in 2013)	78% (147th)	81,8% (135th)	92,1% (107th)	100% (≈ 1st)
Reference countries (2013)	Burkina Faso	Guinea	Trinidad	Japan

Text Box 1: Western Cape Government initiatives in primary education

a. Grades 3, 6 and 9 are tested annually in literacy and numeracy. Over 245 000 learners tested each year.
b. 690 additional teaching posts have been set aside since 2009 for the foundation phase to lower learner-teacher ratios.
c. Increased focus on the role of foundation-phase curriculum advisors by regularly observing classroom practice, specifically learner's levels of cognitive demand, pacing and time on task.
d. Through the year, the WCED offers workshops and seminars that aim to develop teachers' knowledge and skills in the areas of language and mathematics.
e. In 2012, the WCED introduced target- setting and an incentive scheme for primary schools. The target-setting also requires underperforming schools to submit activity plans on how they will achieve their targets.

While this education projection appears to rise quite quickly, the low survival rates in the interim period will still leave the Western Cape with at least a generation of learners that has roughly one in five of their cohort either not in the school system or held back from advancement to the appropriate level of schooling. The following section will look into one of the potential causes of the low achievement rates and considers a potential solution based on evidence for this problem.

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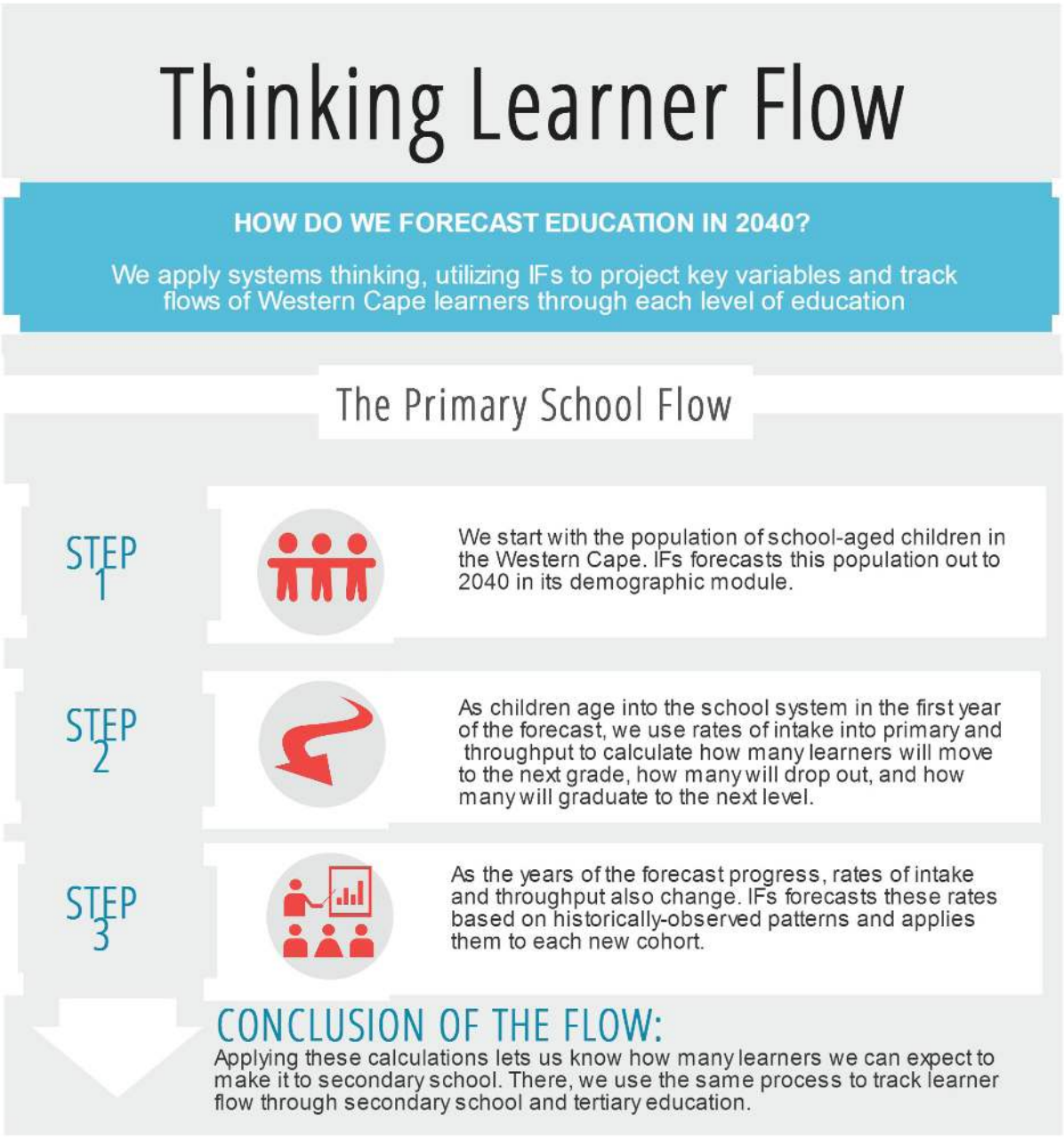
v *Rankings and the Reference countries compare forecasted Western Cape values to 2013 global rankings. Therefore the 2040 column should be read as meaning that the Western Cape's forecasted survival rate in 2040 would place it in 1st place today (in fact tied with a handful of countries) and be comparable to Japan's survival rate today. This method is intended to give readers a more practical idea of what education in 2040 could look like by comparing it to currently observed outcomes across the world.*

Figure 6: Thinking learner flow



Intervention: Early Childhood Development (ECD)

Experiences early in life are formative for brain development, both cognitively and psychosocially. The first years in life can have a long-term impact on physical, mental and emotional development.

In assessing the state of ECD in the Western Cape, equity of access and equity of outcome both need to be addressed. The former is comparatively easier to determine than the latter. The General Household Surveys have found that access to ECD[vi] in the province has gradually declined since 2009 to 56,9 per cent. This suggests that nearly half of Western Cape children may not be receiving regular cognitive stimulation. Whether the 56,9 per cent that do have access to ECD receive quality ECD is of course not fully addressed.

Text box 2: What is Early Childhood Development?

The National Development Plan's diagnostic review of the ECD sector conducted in 2012 concluded that a broader definition of ECD programmes, namely one that covers all aspects of children's development from conception needs to be used. For the purposes of this document, the focus on ECD will primarily be education-focused. Education provision by the WCED has been expanded since 2007 to include the provision of ECD services to Grade R.

Source: NDP Diagnostic Review of the ECD sector, 2012: 39.

While South African research on the cost-effectiveness and impact of ECD service provision is ever-expanding, there is already strong international evidence about the long-lasting beneficial effects of the provision of quality ECD services to children.[44] The quality of a child's early environment in terms of learning opportunities, cognitive stimulation and speech of high complexity has been shown to account for about half of the variation in his or her ultimate cognitive ability, with genetic factors accounting for the other half.[45]

Research has further demonstrated that it is cost-effective to develop these cognitive functions through targeted programmes early in a child's life, and that the programmes contribute strongly to the ability of a child from a disadvantaged background to achieve his or her full potential.[46,47,48] Emotional control and response patterns in children are also largely developed in the first five years and this has numerous effects on behavioural patterns in later in life.[49]

Appropriately stimulating environments are far less likely to be found in poorer households, which lack resources to dedicate exclusively to child development. Those children are less likely to enter the schooling system with the cognitive development necessary to thrive.

Improvements in gender equity and child nutrition have been observed to result from well-planned ECD initiatives in poorer communities, with children receiving appropriate meals and snacks during the day and family caretakers – often mothers and older female siblings – benefiting from the childcare functions of the ECD facilities as well.[50] The provision of high-quality ECD in poorer communities has been identified over the world and in South Africa as well as a strong policy lever for rectifying inequities, both in education inputs and outputs.[51] Spaull (2013) asserts that the evidence shows that there is a significant difference in outcomes between quality and below-par ECD services to children.

Evidence from South Africa confirms that some form of out-of-home care at three to four years of age is beneficial to children in rural informal areas. Studies making use of 2007 SACMEQ III data and the 2008 National Income Dynamics Study (NIDS) have found that exposure to out-of-home care improved test scores at the Grade 6 level in reading, mathematics and health knowledge.[52,53] The non-random distribution of the subject pools is a limitation in both studies, meaning that causality between early learning and test scores cannot be determined absolutely, but both studies represent initial evidence that circumstances unique in the South African context do not render ECD ineffective.

Using data from the National Income Dynamics Study (NIDS) and the numeracy test scores, Gustafson analysed the impact of pre-primary participation on subsequent learning.[54] What appears to be the case is that in better-

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vi Access to ECD is defined in the General Household Surveys as the percentage of children aged from nought to four years who receive some form of development stimulation at home or at an ECD centre. Such centres include day-care centres, crèches, ECD centres, play groups, nursery schools and pre-primary schools.

off communities the impact of prior pre-primary participation may in fact be the effect of home background advantages; the isolated advantage from ECD enrolment is not discernable from this data set. However, in rural informal settings the impact of pre-primary schooling appears positive and significant, even when one controls for home background effects.[55]

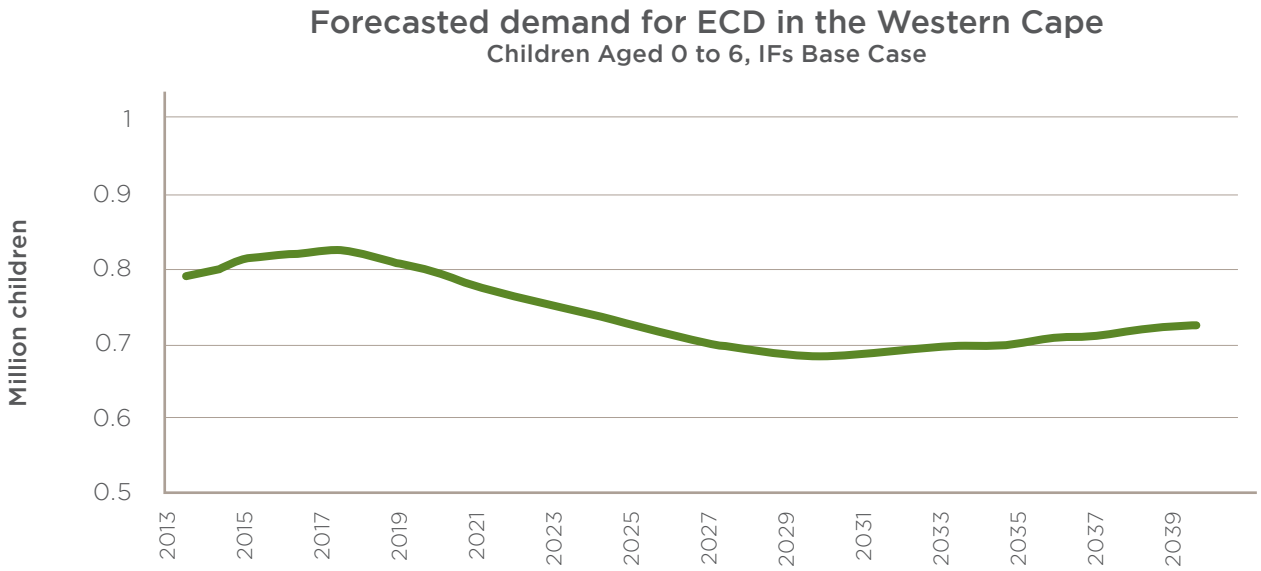
Learners who have not benefited from early developmental stimulation are more likely to drop out, repeat or achieve low scores.[56] If sufficient numbers of such learners enter the schooling system, the investments made in primary education and effective school environments are undermined, self-confidence among learners is affected and costly remedial education programmes become necessary.

According to a 2011 study of over 3 000 learners entering Grade 1, 70 per cent of the children were deemed 'not appropriately school-ready'.[57] While Grade R is now provided as part of the formalised services of the WCED, the lack of sufficient formalised pre-Grade R ECD facilities that go beyond simple child-minding services for the poorest 75 per cent of children undoubtedly has an effect on the Grade 1 pass rate.[58] This will more than likely affect children's achievement rates throughout their primary school years, increase failure rates, unnecessarily raise the number of children in the system through repetition, and negatively affect the survival rate at primary schools in the Western Cape.

The previous section on primary schooling in the Western Cape highlighted the failure rates (Figure 4) from Grades 1 through to Grade 7, the high rate of repetition in the primary school system (10,8 per cent), and the relatively low rate (79 per cent) of progression through the primary grades. Given the evidence of ECD's effect in ameliorating many problems in early and subsequent primary school achievement, and the fact that the Western Cape currently suffers from all these ailments in its primary school education system, it is argued that this provides evidence for a lack of preparation for primary schooling in the province, especially as far as those children who do not have the family resources necessary to receive ECD at home are concerned.

The population of ECD-aged children is forecast to increase to the end of the decade to over 800 000 and maintain a mean of approximately 750 000 children annually out to 2040 (Figure 7). This apparent dip in demand is driven principally by the natural progression of demographic trends; the Census 2011 found that the cohort of persons aged 5-20 in the province was smaller relative to those aged 20-35, and it is this smaller cohort which will primarily be the parents of ECD-aged children in 2020 and beyond. This dip is small relative to aggregate demand on the provision of ECD services throughout the time horizon. Without an increase not only in the quality and provision of ECD services, but also in primary school outcomes, the system could face a further increase in the absolute number of children failing primary school grades.

Figure 7: Forecast of children aged up to 6 in the Western Cape; IFs Base Case[59]



For this reason, the above ECD overview places emphasis on the effect the inadequate provision of quality ECD will have on later educational outcomes. The following scenario, **Head Start**, simulates how an increase in the quality and provision of ECD services will improve later primary school educational outcomes.

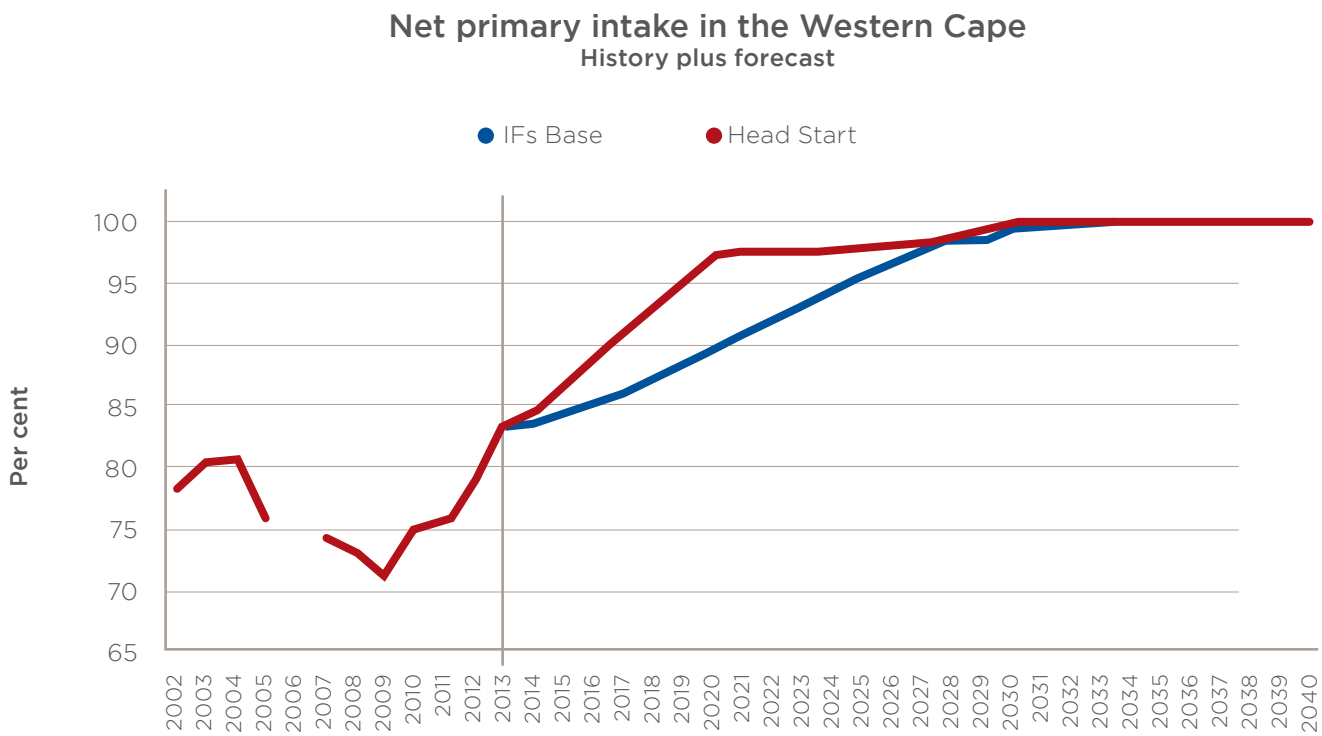
Alternative scenario: Head Start

Head Start seeks to capture the potential results of an improvement in quality ECD services in the Western Cape. The intervention takes the form of improving primary survival by an average of 1,5 percentage points per year over ten years, and improving primary intake by an average of 2,2 percentage points per year over six years, beginning in 2014. This compares to average Base Case improvements of 0,8 points and 1,1 points, respectively. Improvements such as these are seen as essential to achieving the Educating Cape transition by 2040.

Available global evidence suggests these rates of improvement are feasible. For instance, Burundi, Colombia, Guatemala and Tanzania all achieved average annual improvements of over 1,5 percentage points during the decade ending in 2010. Colombia in particular achieved relatively steady and rapid progress, reaching 87 per cent by 2010 after registering a 2003 survival rate similar to that of the Western Cape in 2013 (78 per cent).

Figure 8 illustrates the result of increasing net primary intake rates in the Western Cape. In 2013, only 84 per cent of age appropriate children were entering the primary school system. This low figure reflects both low learner preparedness and the particular characteristics of data calculated from administrative sources (see Appendix B). The Head Start scenario increases intake rates so that almost every seven-year old is enrolled in Grade 1 by 2020 to achieve an enrolment figure of over 97 per cent.

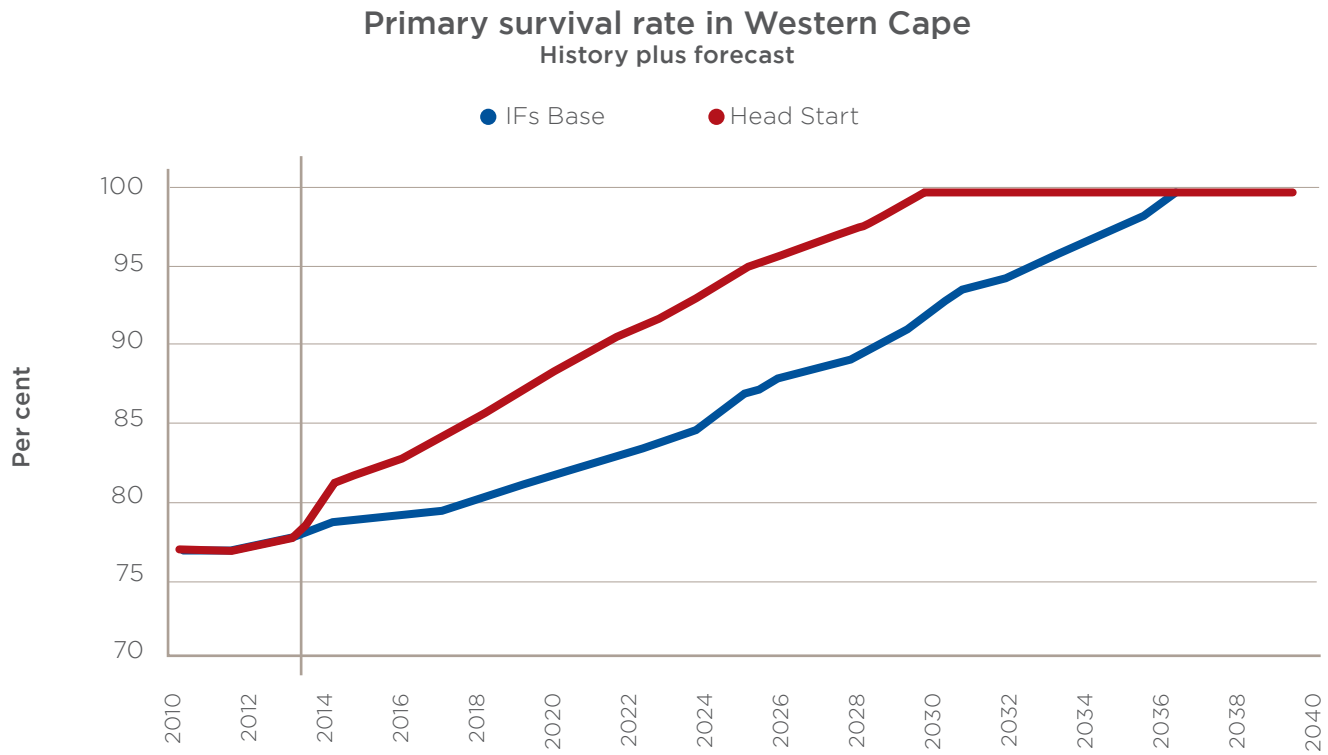
Figure 8: Net primary intake in the Western Cape, IFs Base Case vs the Head Start scenario[vii]



The increase in primary intake is envisioned in the light of an increase in the provision and especially the quality of ECD education in the Western Cape. Improving access to quality ECD programmes will help prepare young learners for primary school demands. Thereafter an attempt was made to establish whether improved access to ECD will have a lasting effect throughout primary school and whether the learner's chances of getting through primary school without failing are improved. The following graph compares school survival rates between the Base Case and the Head Start improved primary school scenario, wherein universal survival rates are achieved by 2030.

vii Raw data received from the WCED included some flaws in the 2006 records. These were not resolved prior to publication and the data point for 2006 is therefore excluded.

Figure 9: Primary school survival rates in the Western Cape, IFs Base Case vs Head Start scenario



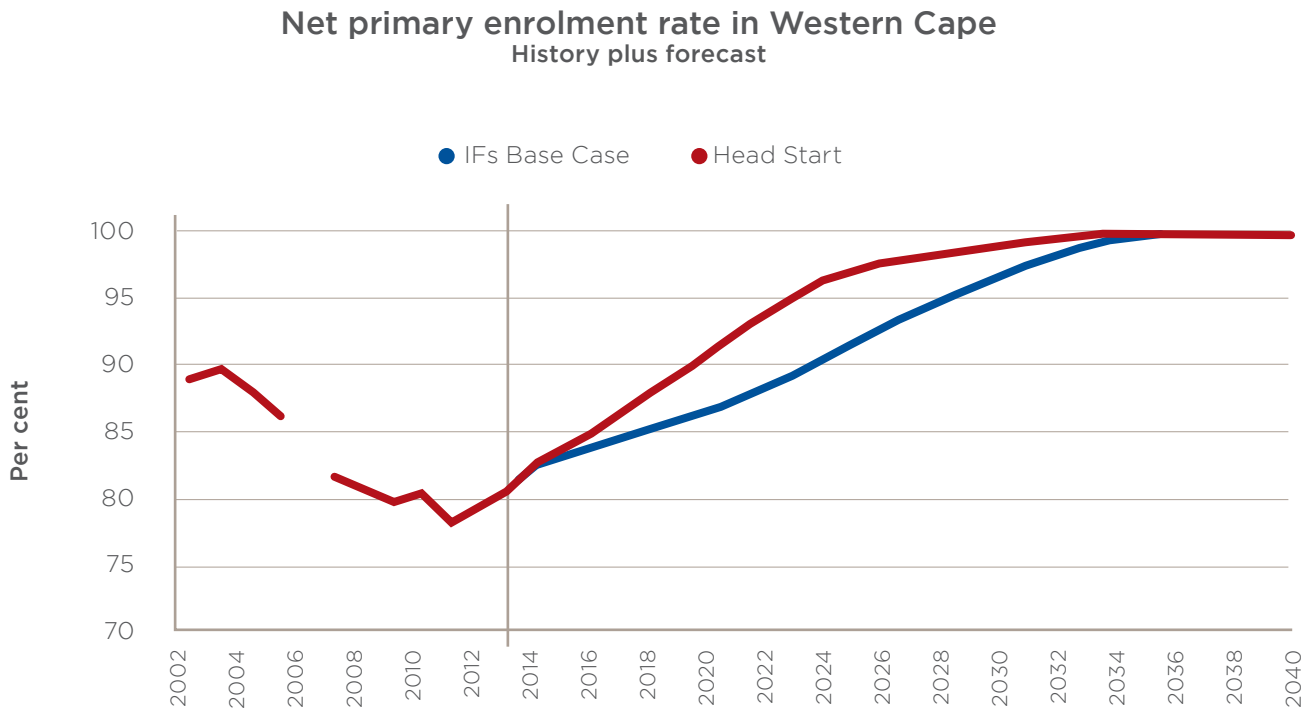
It will be clear that the Head Start intervention is not just about increasing the number of children that enter the primary school education system at the appropriate age, but also about ensuring that they move through the system and do not repeat at the current high rates.

In Figure 9, the Base Case forecast is that survival rates will improve incrementally to 2040. Considering that roughly one in five children will fail at least one grade before reaching Grade 8, this is not a problem to be tackled incrementally; urgent policy attention is required to improve every child's chance of succeeding in the foundational years of schooling. Low survival rates are especially worrying, given that the level of achievement required to pass between grades in South Africa is seen by many as extraordinarily low.[60,61,62]

Head Start simulates an intervention that rapidly improves primary school survival rates and achieves 100 per cent survival seven years earlier than the Base Case. Since South African children spend seven years in primary education, this scenario represents one full cohort passing through the primary system without repeating a grade. A meta-analysis of 17 studies on the correlation between dropout and repetition has shown that learners who repeat a grade during elementary school are at greater risk of dropping out in high school.[63]

What impact does improved intake and survival in the primary system have on enrolment rates? One would expect that the low enrolment rate of 77 per cent in 2013 will increase as a result of the initiatives the WCED is undertaking, and this is indeed the case. Under the Base Case, universal net enrolment is only achieved in 2036.

Figure 10: Net primary enrolment rates in the Western Cape, IFs Base Case vs Head Start scenario[viii]



In the Head Start scenario, the universal primary net enrolment is achieved about six years earlier, significantly improving the number of children that receive a full primary education during the foundational stage of their lives.

viii Raw data received from the WCED included some flaws in the 2006 records. These were not resolved prior to publication and the data point for 2006 is therefore excluded.

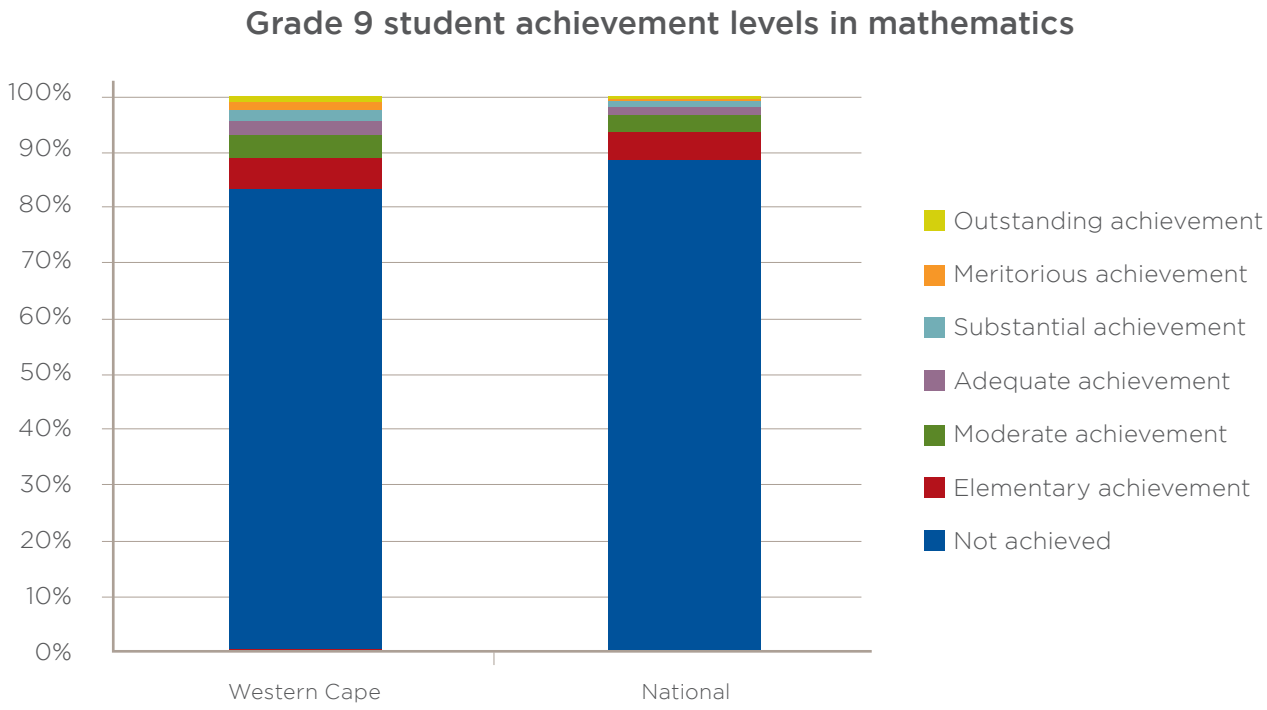
Secondary schooling

Current outcomes

Secondary school education provides young people with the critical skills that can improve their opportunities in life. It establishes a life-long learning perspective that prepares learners for success in higher education and their careers. Quality secondary schooling produces a skills-oriented workforce that enables countries to compete in today's technologically-driven world.[64]

Ordinary secondary schooling in South Africa includes Grades 8 to 12, excluding learners in Further Education and Training (FET) colleges.[65] In this brief, secondary education is further broken down into lower secondary (Grades 8 to 9) and upper secondary (Grades 10 to 12). Sometimes the five grades are referred to as the FET band.

Figure 11: Percentage of Grade 9 learner achievement levels in mathematics, 2013 ANAs



In 2010, the WCED introduced Grade 9 literacy and numeracy testing to assess the state of language and mathematics learning in each school in the Western Cape. In 2011, the level of difficulty of these tests was raised to make the statistics more comparable internationally. Even so, the results have improved in subsequent examinations. Pass rates in literacy increased by 4 percentage points from 44,2 to 48,2 per cent from 2011 to 2012, while numeracy pass rates increased by 3,5 percentage points from 10,4 to 13,9 per cent over the same period.[66] Grade 9 learners received poor marks in mathematics and have shown only a marginal improvement between 2012 to 2013, improving from 16,6 to 17 per cent. The percentage of learners passing with 'acceptable achievement' (a score of 50 per cent or greater) is very low, but still shows an increase from 5 to 7,2 per cent between 2012 to 2013.[67]

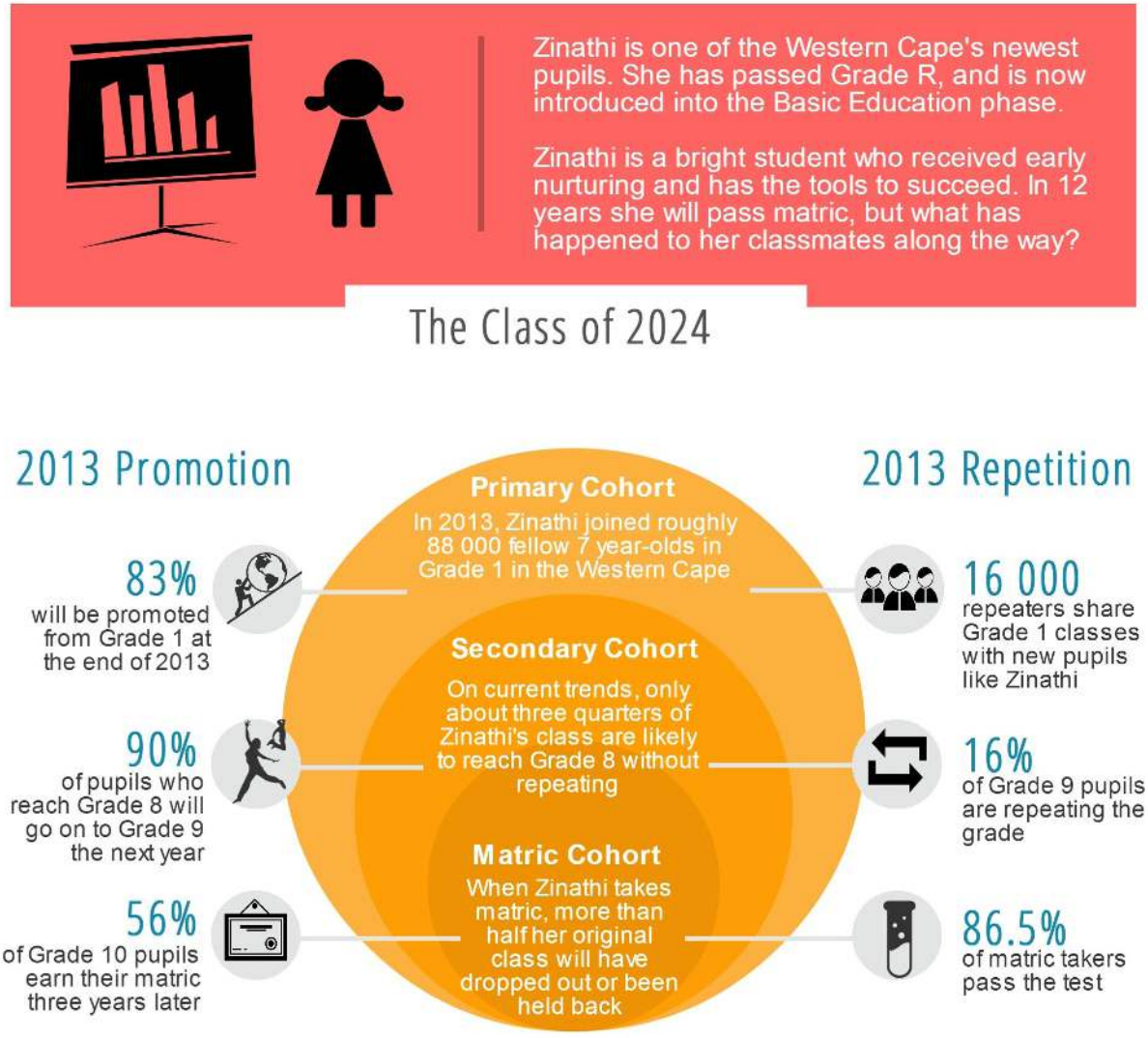


Figure 12: The Class of 2024 in the Western Cape in numbers[68]

This poor performance is further emphasised by the fact that over 90 per cent of Grade 9 learners in the Western Cape failed to achieve 50 per cent in the numeracy examination. Many of the learners in Grade 9 still lack a foundation in numerical competency, which makes it difficult to progress and excel in higher grades. Another challenge is the high failure rates, particularly in Grades 9 and 10. In 2013, Grades 9 and 10 had a 23 per cent and a 19,2 per cent failure rate, respectively.[69] These failure rates contribute to extremely low survival rates in the upper secondary band of education.

Text Box 3: Western Cape Government initiatives in secondary education

a. setting targets for each school (with detailed plans for schools that need support),
b. intensive management support from district offices,
c. subject-specific support for schools with a history of low pass rates,
d. the launch of the "Own your future. Own your success. Study hard to pass your matric" public awareness and motivational campaign,
e. a tutoring programme for underperforming schools in complex areas of the syllabus, a principals' mentorship programme and
f. the delivery of additional textbooks in critical subject areas
g. the delivery of a "Tips for success" booklet to each Grade 12 learner in the province.

The high failure and repetition rates stretch resources thin, placing budgetary pressure on the WCED that needs to find additional funding for extra infrastructure and maintenance, and more teachers. The poor performance of learners in Grade 9 also has a direct impact on lower enrolment numbers in the FET phase and the quality of passes in Grade 12.

A significant number of learners drop out of the schooling system after Grade 9 in the Western Cape (as well as the rest of South Africa). More than half of the learners that enrolled in the Western Cape public school system in 1997 did not reach Grade 12.[70] According to Census 2011, children in the Western Cape start dropping out of school at the age of 12 and this reaches a peak at age 16 (13,7 per cent drop out at age 16, accounting for over 12 000 dropouts annually).[71]

Learners that drop out of school are more likely to face challenges of unemployment and poverty (see Figure 1) since they are not adequately trained to perform in semi-skilled and skilled jobs or to seek further training. The completing of matric is considered an essential requirement for entry into post-school education and the formal job market.[72]

As mentioned earlier, a major meta-analysis has found that failure and subsequent retention rates have consistently been associated with a higher probability of later dropout, concluding that retention is 'the most powerful predictor of [future learner] dropout status'.[73] Children that are held back are two to eleven times more likely to drop out of high school than children that steadily progress through the grades. An abundance of research shows a strong relationship between grade repetition and dropout, even when controlling statistically for other school or family-related factors.[74,75,76] One significant reason retention can lead to drop out is that it results in an age differential in the classroom that can result in the child feeling marginalised and alienated.[77]

Although grade repetition is a strong predictor of dropout, it is not the only contributing factor to the problem. Other socio-economic factors may include poverty, teenage pregnancy, substance abuse, or difficulties in the classroom (both of an academic or a interpersonal nature).[78,79]

Improving the number and quality of passes in the National Senior Certificate (NSC) and reducing the number of underperforming schools is part of the WCG's Provincial Strategic Objective Two (PSO2). In 2009, the WCED launched a range of new initiatives to improve Grade 12 pass rates (see Text Box 3). By 3013, the Western Cape has seen the NSC pass rate increase from 75,7 per cent to 85,1 per cent (from 34 017 to 40 542 learners). The percentage of learners passing Grade 12 who qualify to apply for entrance to university has also increased from 33,0 per cent to 40,9 per cent (from 14 324 to 19 477 learners). This is also the highest Bachelor's pass rate among the provinces.[80,81]

Although the progress in improving Grade 12 pass rates is laudable, the percentage of Grade 12 learners that become eligible to apply to university is still low. Learners that fail to qualify for university are faced with the challenge of labour market entry.

The 2013/14 the WCED Annual Performance Plan set a primary goal of reducing the number of under-performing schools, which is defined as a school failing to achieve a Grade 12 pass rate of more than 60 per cent.[82] Research shows a strong correlation between under-performing schools and the physical, economic and social environment. The Western Cape has made tremendous strides in reducing underperforming schools in recent years. Since 2009, such schools have declined by nearly 70 per cent, from 85 to 26.[84] In response, the WCED has directed the majority of resources to those schools that required urgent attention and support.

IFs Base Case

Using the IFs model, we simulated Base Case development for lower and upper secondary education in the province to 2040.

Gross enrolment rates refer to the aggregate number of learners enrolled in a level of schooling (regardless of their age) taken as a percentage of the population of the standard age for enrolment in that level. These rates can and frequently do exceed 100 per cent, indicating the presence of a significant number of over-aged or under-aged children. The Base Case tells a generally positive story of increasing capacity and coverage in the Western Cape lower secondary system, both for learners of standard age and advanced and remedial learners. As shown in Tables 3 and 4, it is forecast that by 2030 the Western Cape's enrolment figures will be consistent with those of most high-income developed countries.

Table 3: Gross lower secondary enrolment rate to 2040, IFs Base Case

Gross lower secondary enrolment rate (Base Case)				
	2013	2020	2030	2040
Western Cape (ranking in 2013)	79,1% (128th)	98% (83rd)	102,9% (50th)	112,7% (22nd)
Reference countries (2013)	Nicaragua	Romania	Japan	UK

Table 4: Gross upper secondary enrolment rate to 2040, IFs Base Case

Gross upper secondary enrolment rate (Base Case)				
	2013	2020	2030	2040
Western Cape (ranking in 2013)	59,1% (112th)	67,9% (103rd)	75% (88th)	93,3% (46th)
Reference countries (2013)	Algeria	Dominican Republic	China	Brazil

The effects of learners aging-out of mandatory school enrolment can be seen in the sharp drop in gross enrolment in 2013 from lower to upper secondary levels. The Western Cape's secondary enrolment rate of 59,1 per cent in 2013 places it at a level comparable to Algeria. According to the IFs Base Case forecast, gross upper secondary enrolment in the Western Cape in 2040 may reach the same level recorded by Brazil in 2013. However, it is worth remembering that this measure includes many learners who are older than the standard age for grades 10 to12 and as a result can still hide a large number of children who have dropped out. IFs forecasts of net enrolment for secondary schooling, a measure counting only learners of standard ages, suggest that by 2040 the Western Cape will achieve a 86 per cent enrolment of learners aged 13 to 18, but this will still leave hundreds of thousands of children without basic qualifications.

Upper secondary survival rates are forecast to increase from 71,9 per cent in 2013 to 89,2 per cent by 2040. The upper secondary survival rate measures the percentage of learners entering the upper secondary cohort and completing their schooling without repeating a grade. A survival rate approaching 100 per cent indicates a high level of retention and a low incidence of dropout. An increase in the survival rate would play a key role in progressing learners through the system to write the matric exam.

The Base Case paints a positive picture for secondary education in the province. However, as with the Base Case results for primary education, the improvements in the secondary system occur too slowly for the current generation of children who are lost in the system because of high failure and dropout rates.

Intervention: teacher quality and school administration

Teacher performance is among the most-discussed drivers of educational outcomes. A good teacher must possess many attributes, not all of them easily measured, and as a result the question of how to ensure high quality in South African teachers is a matter of great public debate.[85] Common metrics for judging teacher quality include absenteeism, degrees, scores on content knowledge tests, and completion of professional development courses.
Three significant assessments of teacher quality have been conducted in South Africa in recent years. SACMEQ III (2007) measured the content knowledge of teachers and found that 81 per cent of Western Cape language teachers and 64 per cent of mathematics teachers met the 'acceptable' standard of knowledge. Country-wide, only 52,4 per cent of language teachers and 31,7 per cent of math teachers met the 'acceptable' threshold.[86]

The National School Effectiveness Study (NSES) tracked a cohort of South African schoolchildren from Grade 3 to Grade 5 between 2007 and 2009, collecting a large amount of data on teacher quality and school management.[87] NSES administered a five-question mathematics test to the teachers in the study and reported the average numeracy scores of their learners, grouped by how many questions the teacher answered correctly. Only 12 per cent of teachers correctly answered all five questions and the learners taught by those teachers (Group 5) exhibited the highest average numeracy score of 47 per cent, seemingly confirming the benefits of more knowledgeable teachers. However, this effect was not found at any other level: children in Groups 0 to 4 scored averages within a narrow band of 33 per cent to 37 per cent. In fact, the learners taught by the group of teachers who answered none of the questions correctly scored the second-highest average of 37 per cent.

Meanwhile, teacher scores in the literacy test did not strongly affect pupil performance in literacy at all. Similarly, low teacher scores in the SACMEQ III data also showed a low correlation with learner test scores, especially the test scores of poorer children,[88] all of which seems to suggest that improving teacher knowledge in the Western Cape will not by itself improve the scores of learners or the equity of outcomes.

This finding may seem counterintuitive. However, as the NSES study points out, research by Hill, Rowan and Ball in the US also found weak correlations between improved mathematical knowledge among teachers and higher learner scores.[89] By contrast, pedagogical content knowledge (PCK) of mathematics, meaning knowledge about methods of teaching and communicating mathematical concepts to learners effectively, was found to be strongly correlated with high performance.[90,91] Another study by Baumert et al in Germany echoed the finding that PCK in teachers was more determinative of learner performance than overall mathematics content knowledge, though the two have a high degree of interrelation.[92] Put another way, improvements in teacher content knowledge are likely to produce only marginal results, whereas intensive, high-quality training of teachers in mathematics pedagogy is likely to have more long-lasting beneficial effects.

Additional evidence from the NSES study points to equally critical variables related to administration and planning. Learner scores improved when schools could demonstrate an elaborated curriculum plan, when a certain threshold number of topics from workbooks had been covered during the school year, and where school assessment records and inventories of resources were accurate and up to date. The results were significant, even taking into account prior learner performance and socio-economic status.[93] The study also found a positive impact on scores in schools where the principal and all teachers were present on the day the survey was administered. These results indicate that management practices that produce efficient schooling environments for teachers and learners can seriously affect overall success. 'No resource is more poorly used in South African schools,' the author of the NSES summary report commented, 'than time'.[94]

Finally, the 2012 Report of the National Education Evaluation and Developmental Unit (NEEDU) sought to evaluate the complicated internal ecology of a limited number of South African schools, and develop explanations for why they perform in different ways.[95] Such findings are of necessity subjective, but they are important from the view of considering how policy can intervene to improve teaching and management. The study agreed that lack of PCK in teachers was a serious deficiency and echoed the finding in Baumert et al that the development of PCK in teachers must be considered as inter-related with the improvement of general content knowledge. NEEDU's report noted that in the schools it studied, lack of content knowledge would seriously hinder most efforts to develop PCK. The study further discussed the persistent problems of teacher absenteeism, lack of accountability, and mismatches between the professional training teachers and administrators received and the kinds of training they needed to improve performance.

Western Cape budget allocations for the professional development and training of educators have been increased from R79 million in the 2009/2010 financial year to R112 million in the 2013/2014 year. The Cape Teaching and Leadership Institute offers a variety of in-service teacher development training programmes and about 13 000 educators have received training on this campus in the last four years. The WCED has also provided various training programmes for educators, not only in numeracy and literacy teaching, but also on the new Curriculum and Assessment Policy Statement (CAPS) for educators.[96] These developments are an encouraging step in the right direction, but a sustained commitment to quality teaching and school management will be critical to future successes in the Western Cape system.

Alternative scenario: Training for Matric

Though the IFs Base Case expects some improvements in secondary school education outcomes, significant gaps remain even in 2040. To address the challenges in the secondary education system, we created the Training for Matric scenario. In this improved scenario, we increase the survival rates from Grades 8 to 12, where a high frequency of dropouts is experienced. In addition, the Training for Matric scenario models an increase in the tertiary intake rate, simulating improved Bachelor's pass rates in the province.

In Training for Matric we envision a period of concentrated intervention to improve administrative functioning and teachers' pedagogical knowledge. We accelerate Base Case improvements to the transition rate from lower secondary to upper secondary education by roughly 0,5 percentage points each year from 2014 through to 2020. While historical data on the improvement of transition rates across the globe is incomplete, countries as diverse as Botswana, Venezuela, Ukraine and Lesotho have comfortably achieved these transition rate improvements when starting from a similar base.

From 2014 to 2020 the improved education scenario also accelerates survival rate improvements in the upper secondary grades by roughly 0,9 per cent per year above the Base Case, and boosts the rate of upper secondary graduates who qualify for university by about 0,3 per cent per year. As a result, the average incremental yearly improvement in the Western Cape's upper secondary survival rate reaches 1,4 percentage points, a rate that has been achieved in the past by many African countries, including Senegal, Swaziland and Namibia. Under this scenario, by 2040 the upper secondary survival rates in the Western Cape will stand at 93,3 per cent as against 89,2 per cent in the Base Case.

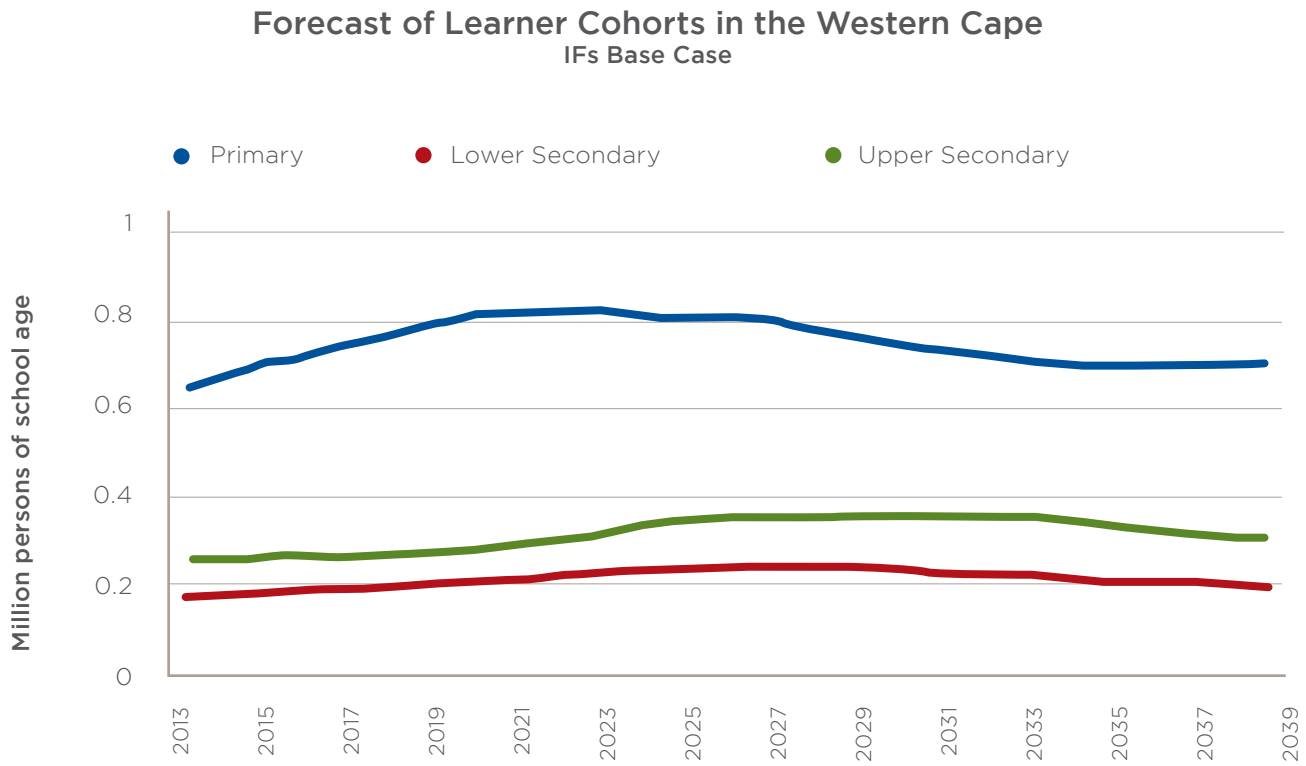
The cumulative result of these interventions would be that whereas in the Base Case the Western Cape in 2040 achieves the gross upper secondary enrolment level of Brazil today, the same level is reached in Training for Matric by 2035, two years earlier. Gross enrolment in universities increase to 39 per cent compared to 19 per cent in 2010 as a result of a higher number of matriculants entering the university system.

Issues of access to, survival in and quality of FET colleges and higher education institutions are outside the scope of this analysis. Enrolment in FET colleges in 2013 stood at 71 595, while the four universities of the Western Cape had over 100 000 learners enrolled. These are crucial structures that support skills development in the Western Cape and will be addressed fully in the next brief in this series on the Enterprising Cape transition.

Strategic demand planning for education

The Base Case forecasts a continuing trend of population growth in the Western Cape, driven by sustained inward migration and natural population growth. The education system must adapt to meet the increasing needs brought about by population growth. The growing demand for education must be met with adequate schooling infrastructure, commensurate staffing of qualified teachers and principals, and a sustained stock of teaching materials to ensure that quality and standards are not sacrificed. Figure 13 is a forecast of learner population sizes for primary, lower secondary and upper secondary schools.

Figure 13: Forecast of learner cohorts in the Western Cape, IFs Base Case



According to the IFs Base Case, which assumes relatively stable rates of inward migration to the Western Cape, an average of 750 000 children each year will be of primary school age from 2014 to 2040.[97] Just to maintain the current average classroom sizes the province will need about 21 500 educators at the primary level in 2040 – that is about 4 500 more teachers than currently employed at this level by the WCED today.[98] Assuming that the learner-to-classroom ratio remains constant, our forecasts show that the province will need an additional 5 500 classrooms for primary school learners in 2040.[99]

Given the low current rate of secondary school completion and the fact that the enrolling in school past Grade 9 is not compulsory, it is possible but unlikely that complete enrolment in this phase will be achieved by 2040. The Base Case forecast is that by 2040 enrolment in Grades 8 and 9 will have increased by about 66 000 learners and enrolment for the Further Education and Training phase by 100 000, representing an increase of approximately 34 per cent of the current size of secondary schools. To maintain the current classroom size of 32 learners per teacher, the province would require about 13 800 educators, some 3 500 more than today. Furthermore, an additional 3 500 classrooms would be required to meet the growing demand.[100]

These teacher figures do not make provision for another factor critical to meeting education demand: teacher attrition rates. Recent figures from the WCED show that between three and four per cent of teachers leave the profession each year. The Western Cape could face rapidly growing demand for qualified teachers over the next few decades if training and recruitment does not keep pace. These systemic challenges require strategic foresight and a comprehensive plan to allocate necessary funds to meet the growing demand for quality education.

The Educating Cape platform

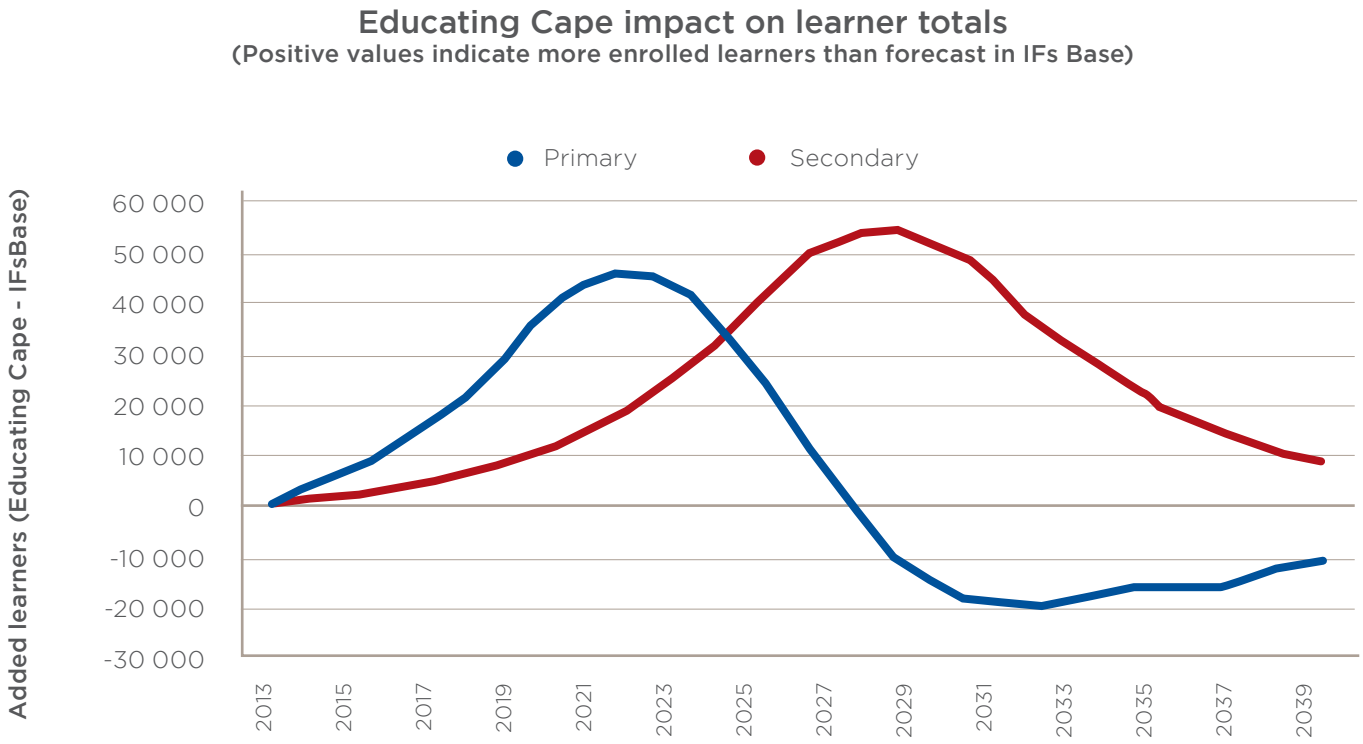
Combining our primary and secondary education scenarios in IFs allows the system-wide effects of the targeted interventions described in this analysis to be examined. The consequences of learners enrolling in greater numbers, progressing to higher levels and eventually graduating with matric will feed back into the entire system in synergistic ways when combined into one scenario, demonstrating that the value of a combined programme of targeted interventions will often be more than the sum of its parts.

In the **Educating Cape** future scenario, the interventions to improve learner preparedness and teaching quality rapidly boost total learner numbers, so that by 2025 the province could be educating an additional 65 000 children above the Base Case forecast. The consequences for planners, teachers and school administrators are not uniform throughout the time horizon, however. By 2040 increased survival throughout the system will have reduced the learner load impact of the Educating Cape future scenario such that 3 000 fewer learners will be in the Western Cape school system by 2040. This suggests that apart from the investment required to implement the necessary interventions, schools will also require a short-term influx of resources to operate effectively.

It is also important to understand that the increases in learner numbers are not distributed evenly throughout the education levels (Figure 14). Primary schools initially take on the largest increase in pupils because of higher intake rates. However, over time, the increases in survival mean these children repeat fewer grades and progress more rapidly through the grades. By 2030 this effect causes the aggregate number of primary children enrolled to drop below that of the Base Case. Despite this, the period of increased primary learner load from 2014 to 2029 will need focused attention. At the peak of the increase, the Western Cape would be educating an additional 45 000 learners in primary schools in comparison to the Base Case forecast. To keep the average 34,9:1 primary learner-to-teacher ratio as a benchmark, Educating Cape would need to add an estimated 1 300 additional teachers with accompanying classrooms and materials during the peak period of primary school learner growth (by 2025). As demand for primary schooling eases, these resources could be shifted elsewhere.

By contrast, the aggregate number of secondary learners will increase against the Base Case throughout the course of the interventions, and from 2025 on they represent the largest cohort of additional learners in the system. These increases represent children who on the current path would be held back in primary school. Instead, under Educating Cape more of them would exit primary school on time and enter secondary schooling prepared to succeed.

Figure 14: Total enrolled learners in Western Cape schools (Educating Cape minus IFs Base)



By 2040, increases in secondary school learner survival rates will also have begun to reduce the pace of growth in learner totals, but these changes to secondary learner flow remain the largest lasting impact on the education system through to 2040. Roughly 50 000 more learners would be in Western Cape secondary schools at the peak of the intervention (Figure 14).

Both scenarios forecast primary learners to exceed secondary school learners (Figure 15). By analysing the Educating Cape scenario relative to Base Case results, it becomes clear that school failure rates (or on the other hand, survivorship) has a tremendous impact on enrolment forecasts.

Figure 15: Secondary learner enrolments in the Western Cape, Educating Cape scenario

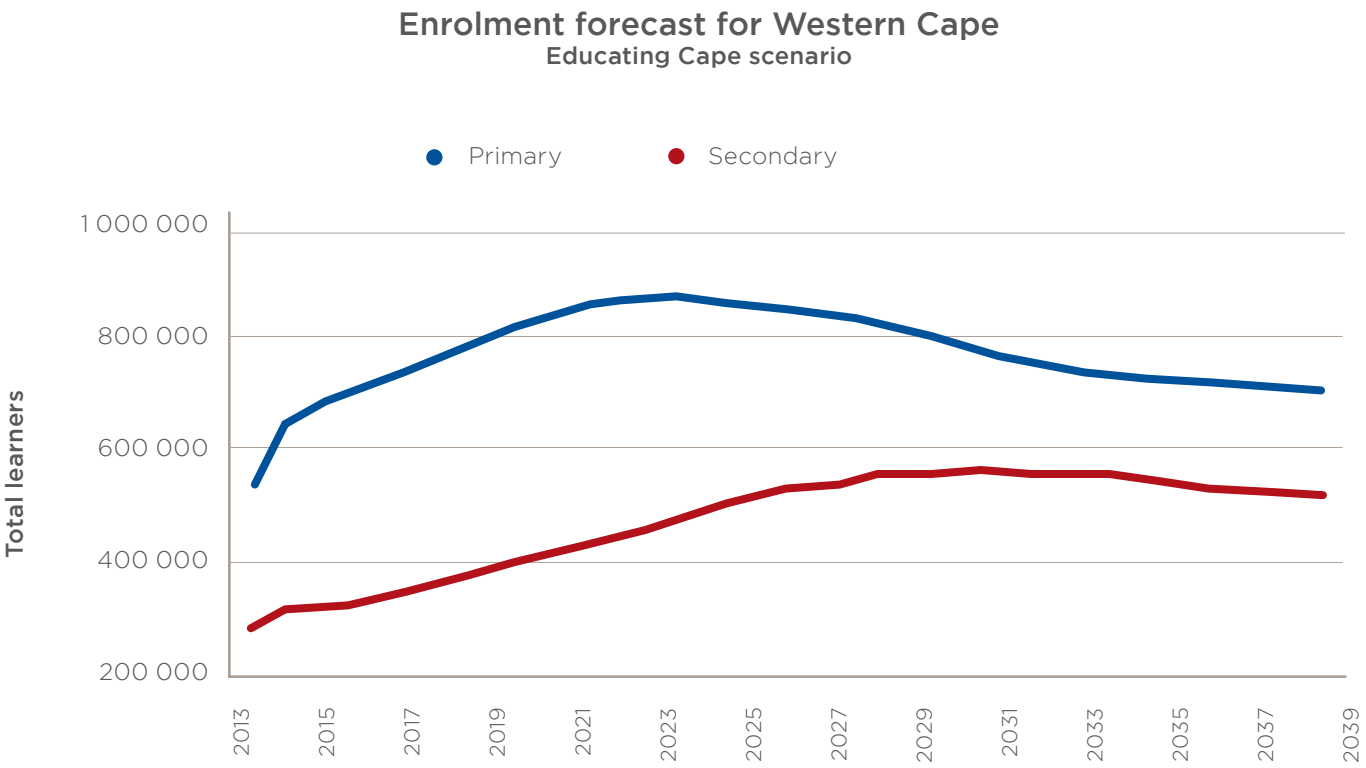


Table 5: School life expectancy to 2040, Educating Cape scenario

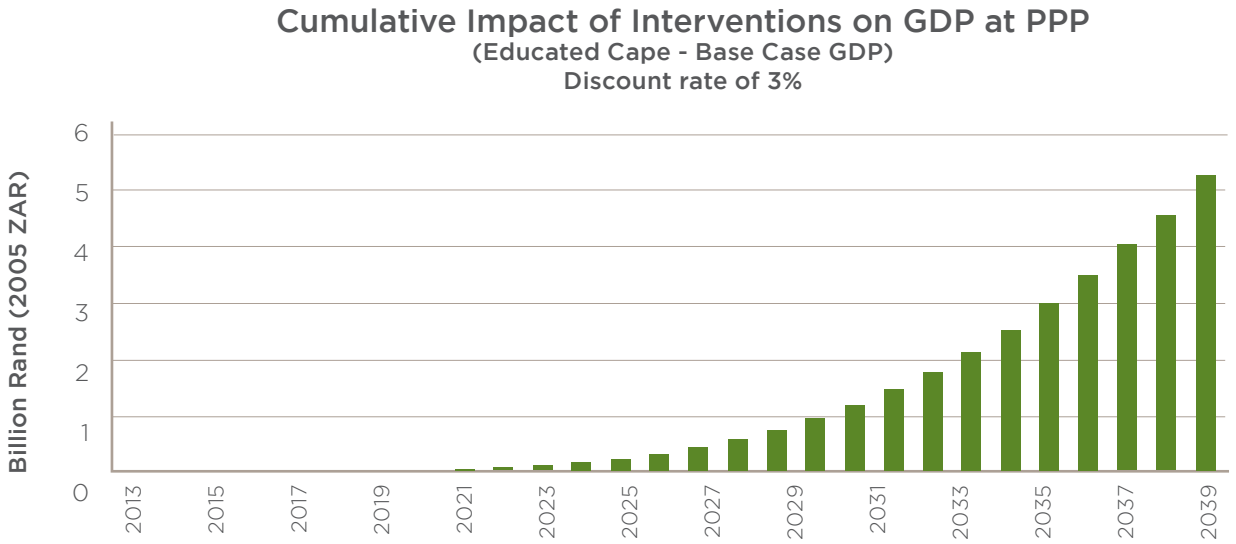
School Life Expectancy (Educating Cape)				
	2013	2020	2030	2040
Western Cape (ranking in 2013)	11,2 years (128th)	12,8 years (92nd)	14 years (61st)	14,5 years (53rd)
Reference countries (2013)	Vietnam	Panama	Taiwan	Algeria

As indicated in Table 5, learners who entered the Western Cape education system in 2013 are expected to complete about 11 years of schooling, a level on par with Vietnam. The IFs Base Case expects welcome improvements to occur in the next decades, with a child's school life expectancy reaching about 13,5 years in 2040. In the Educating Cape scenario, however, the Western Cape could achieve a school life expectancy of 13,5 years by 2024 – 7 years earlier than in the Base Case – and climb to over 14 years by 2040. While the quality of the years of schooling a child receives is likely to remain a concern for some time, the accumulation of human capital represented by children staying in school longer is strongly linked with improvements to their ultimate incomes and life satisfaction.

The investments in the future of Western Cape children augment the already-considerable efforts of the WCED and could therefore be expected to be comparatively limited in forward-looking impact. In the IFs Base Case, the Western Cape grows briskly from a GDP at purchasing power parity of R750 billion in 2013 to R1,8 trillion in

2040.[ix] The Educating Cape future builds on these advancements in human productivity and economic output of the province. In 2040 GDP per capita is nearly R1 400 (in 2013 ZAR) higher than Base Case forecasts, and the cumulative additions to annual GDP resulting from the human capital advancements in Educating Cape have climbed from over R30 million in 2020 to over R6,5 billion 2040.

Figure 16: Impact of Educating Cape on Western Cape GDP



With boosted growth comes a greater ability for government and civil society to address troubling levels of poverty and ill health in the Western Cape. Throughout the time horizon, rates of extreme poverty (defined here by the standard international definition of living on less than $2 or R23 per day[x]) decline in the Base Case, driven in part by advances in education. The Educating Cape scenario accelerates this trend, resulting in 10 000 fewer Western Cape residents living in extreme poverty by 2040.

Advancement in a population's levels of education and per capita income has a direct historical relationship with that population's ability to access critical infrastructure, such as sanitation and clean water. Under our scenario, roughly 1 200 fewer persons rely on unimproved sanitation sources like pit latrines in 2040 than in the Base Case, and 2 200 more persons are connected to wastewater treatment. Better education, higher income and greater access to infrastructure also has a direct effect on the ability of vulnerable citizens to avoid communicable diseases. The Western Cape has already moved to a state of development in which death from non-communicable causes like heart disease or cancer outnumber those from communicable causes such as AIDS, and this trend continues across the time horizon. However, the prevalence of preventable communicable diseases continues to burden the lives of many residents. The Educating Cape scenario results in more than 1 000 cumulative deaths from communicable diseases through to 2040 being averted relative to the Base Case.

Poverty and lack of infrastructure remain a problem for many Western Cape residents even in the brighter future illustrated by the Educating Cape scenario. Because of the long-term nature of investment in education, many of the positive impacts of Educating Cape will only just have begun to take effect by 2040. However, the rewards will continue to manifest themselves long thereafter, and the investments in education must be viewed as a necessary building block to achieve a more inclusive future. Children poised to enter the primary schooling system in the coming years will be working and raising families in Western Cape communities long after 2040 has come and gone. The education they receive will have a direct impact on the contribution they are able to make, and therefore on the long-term success of the OneCape 2040 vision.

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ix All rand values in this analysis are expressed in 2013 terms with a three per cent discount rate on future growth. This discount rate represents an opportunity cost to the future rewards reaped from present-day public investments, considering what the same amount of money might have yielded if put to other use.

x The conversion is based on the average exchange rate for 2013.

Conclusion

In this brief we have presented a Base Case forecast for the development of the Western Cape school system to 2040 that builds on present trends and demographic and economic inputs in an integrated way. The view of the future revealed in this analysis is generally positive. Expectations of universal primary education should be achieved well before 2040 and there should be great improvements in the retention and graduation of secondary learners. South Africans in general and Western Cape residents in particular are often deeply pessimistic about the ability of their schools to reform and deliver, but while the country's education context is unique, similar problems have been faced and overcome elsewhere in the world. The example of the Atwood Primary School, where the Hanover Park community banded together to monitor the school after-hours to prevent vandalism, demonstrates that few things motivate families and communities as much as does the advancement of their children.

Yet the future is far from certain. Policies can fail, management can fall short, opportunities for reform can be squandered, and with them the hopes of schoolchildren for a productive, successful life. The Educating Cape scenario models a future in which strategic interventions in child development and teacher training help to shift the education system onto a more optimal path. Learners enter school better able to learn and progress more rapidly into high schools where their teachers are equipped with the tools to communicate advanced literacy and numeracy skills. More learners are able to enter university and more will eventually join a labour market where their skills and productivity are in high demand.

The small, actionable interventions offered by Educating Cape can ensure that the groundwork is laid for the follow-on transitions of the OneCape 2040 vision. More than that, the interventions can help ensure that the Western Cape continues to establish itself as a hub of innovation and opportunity in decades to come.

Appendix A

Understanding International Futures: a tool for exploring the future of education

The International Futures (IFs) tool models relationships across variables from a wide range of key global systems for 186 countries from 2010 to the end of the century. Relationships are structured in the model in two interconnected ways: first, by leveraging a very large set of historical data series from many renowned international data collection organisations (nearly 2 500 series in the most recent version of the model), and, secondly, by relying heavily on academic literature. IFs should not be thought of as purely a forecasting tool, but a dynamic scenario-building tool that allows for the modelling of long-term futures concerning development across human, social and natural systems. It is important to think of IFs forecasts as highly contingent scenarios – not predictions.

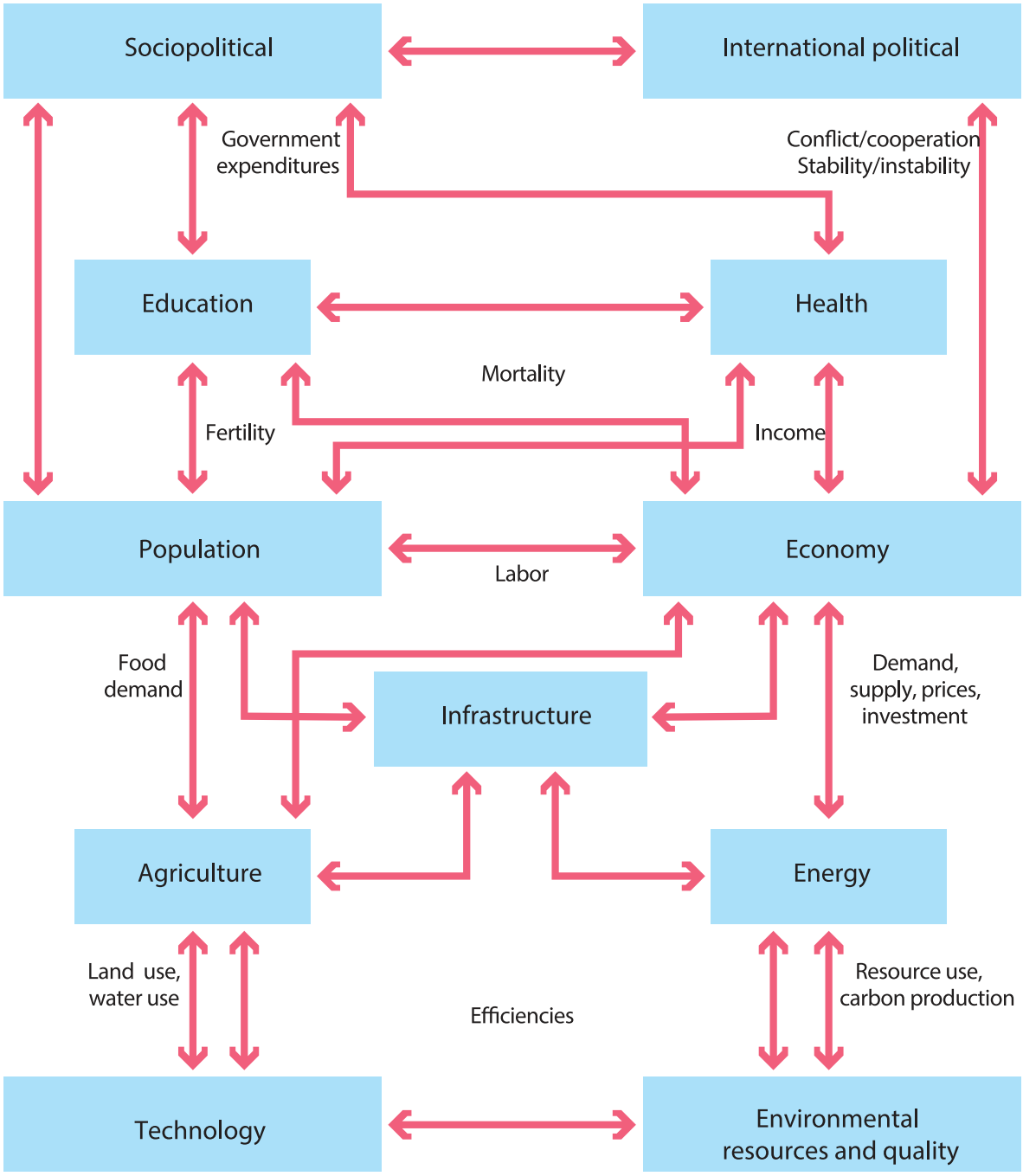
IFs allows users to perform three types of analysis. First, historical trends and relationships can be analysed to understand how a country has developed over time. Secondly, these relationships are formalised in the model to produce Base Case forecasts. These initial forecasts, which are integrated across all systems covered in IFs, are useful indicators of where a country seems to be heading under current circumstances and policies, and in the absence of major shocks to the system (wars, pandemics, etc.). Thirdly, scenario analyses that augment the Base Case analysis by exploring the leverage that policymakers may have to push systems to more desirable outcomes.

The IFs Base Case is a collection of central tendency forecasts that represent a scenario of how the future may unfold. The Base Case assumes no major paradigm shifts, policy changes or 'black swans' (very low probability but high impact events, such as a global pandemic or a nuclear war). Although the Base Case generally demonstrates continuity with historical patterns, it provides a structure that can also generate a wide range of non-linear, dynamic and endogenous forecasts rather than just a simple linear extrapolation of historical trends.[101] Given that the Base Case is built from initial conditions of all historical variables and is periodically analysed and assessed in comparison to many other forecasts, it can be a good starting point to carry out scenario analysis and construct alternative future scenarios. Users can build their own alternative scenarios to the IFs Base Case or other forecasts by altering parameters within the system.[102]

The education module is a highly integrated social system within IFs. The model forecasts intake and survival rates across each level of formal education for male and female learners at primary, lower secondary, upper secondary and tertiary levels (with attention to FET or vocational schooling). Improved educational attainment interacts with other systems in IFs in important ways. Fertility rates decrease as education attainment improves because education changes the childrearing calculus of individuals (typically by increasing the opportunity cost of having a child). A more educated populace leads to an increase in human productivity, which feeds through to greater economic output. Greater attainment also leads to an increasing demand for good governance. Finally, better health outcomes are realised as people become more exposed to wellness practices and connect to the health care community. Each of these interactions has powerful effects on poverty reduction in IFs forecasts.

Trade-offs are a key component of public policy, as there is always a limit to available resources. Public investment in education increases access and quality of education. However, such investments reflect a policy choice to spend money in one place at the expense of another. IFs represents government expenditure by destination and allows users to alter future spending patterns to reflect these policy choices. Figure 17 is a visual representation of the integrated structure of IFs.

Figure 17: Visual representation of the IFs structure



Links shown are examples from much larger set, and technology elements are dispersed throughout the modeling system.

Within the framework of collaboration with the WCG, the African Futures Project produces integrated forecasts for all nine provinces of South Africa. The WCG is taking the lead in utilising the model in its policy research and planning processes. IFs allows decision-makers to assess policy impacts across key human, economic and natural systems, and shape reasonable expectations about long-term strategic planning initiatives aimed at promoting human development across the Western Cape.

The initial work for this project involved data gathering, cleaning and organisation at the provincial level. In doing so, we have incrementally constructed a database of major international indicators for policy-makers and the academic community in the Western Cape. This database houses many different kinds of data under one roof, which allows users to analyse trends and understand change across a broad range of categories.[103]

Appendix B

Data

Throughout this brief we have utilised data gathered and distributed by official Western Cape (or in some cases national) government entities for our forecasts and analysis. For example, enrolment rates by level are calculated using enrolment data provided by the WCED and population figures provided by Statistics South Africa's mid-year estimates. This is done for the explicit purpose of contextualising the situation in the Western Cape as represented by its records, and facilitating harmony with international reporting standards.

However, it must be acknowledged that in many cases alternative estimates or methodologies for gathering key data series yield different results. Some researchers have argued that household surveys provide a more accurate picture of enrolment statistics, for example, than official enrolment numbers combined with population estimates.[104] These differences can be significant. Furthermore, many assumptions underlie the calculation of standard international education figures, meaning that each trend displayed in the data should be interpreted with care.

Despite these caveats, we believe there are significant lessons to be drawn from the use of official WCG data. Employing this as well as major international data to calculate rates of intake, enrolment, transition, survival and figures allows us to construct a model of expected educational progress in the Western Cape and in 185 countries. From this model we can then draw cross-country comparisons, construct scenarios to simulate policy intervention and investigate outcomes in GDP and other measures in a systematic way.

Appendix C

The African Futures Project

The African Futures Project (www.issafrica.org/futures) is a collaboration between the Institute for Security Studies (www.issafrica.org) and the Frederick S Pardee Center for International Futures (www.pardee.du.edu) at the Josef Korbel School of International Studies, University of Denver. The Institute for Security Studies is a widely recognised Pan-African think-tank specialising in issues of human security. The Pardee Center is the home of the International Futures modelling system, an integrated approach to exploring and understanding human development and the broad implications of policy choices. These organisations leverage each others' expertise to provide forward-looking, policy-relevant material that frames uncertainty around human development in Africa.

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98. Ratios taken from the Annual Report 2011/2012 of thr Western Cape Department of Education http://wced.pgwc.gov.za/documents/annual-report12/WCEDAnnualReport11-12.pdf (accessed May 2014).
99. Ibid.
100. Ibid.
101. Barry B Hughes, Mohammod T Irfan, Jonathan D Moyer, Dale S Rothman and José R Solórzano. Exploring future impacts of environmental constraints on human development. Sustainability 2012, 958-994.
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[103] For a case demonstrating the importance of relational databases in education, refer to: Phlip A Streifer. Using data to make better educational decisions. Lanham, Maryland: Scarecrow Press.2002.

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