

The Jagged Tear

Human capital, education, and AIDS in South Africa, 2002–2010

Charles Simkins

South Africa in 2010: a 'paradise lost'?

Since the 18th century every developed society has undergone the same major demographic transition. At a certain period in a country's development – when mortality has dropped and children no longer play a role in production – members of the society realise that their future can be secured more effectively by means other than producing numerous children. Urbanisation, rising hygiene levels, better nutrition and improved medical care ensure that virtually all children survive infancy, receive more education and live up to (and beyond) an economically productive age. Fertility rates drop – indeed they often plunge. And parents' emphasis shifts from the number of children to the physical care, education and quality of life that can be provided to the two or three children they do have. The society enters a completely new demographic phase, usually associated with rising productivity and better standards of living.

The noted demographer Massimo Livi-Bacci characterises the demographic transition from high fertility and high mortality to low fertility and low mortality as a transition from waste to efficiency.¹ In a 'wasteful' regime, women have to bear half a dozen children simply to achieve replacement of father and mother in the next generation. Between a third and a half of infants perish before reaching reproductive age. An 'efficient' demographic regime is characterised by life expectancies at birth in excess of seventy years and total fertility rates of two children per family, or fewer. As fertility drops, the emphasis falls increasingly on the quality of life afforded to children rather than simple numbers conceived.

By the end of the 20th century most of the South African population had proceeded through this demo-

graphic transition, without as yet all receiving the benefits of their changed behaviour. White South Africans reached the middle of the transition by the 1950s; Asians in the 1960s; Coloureds in the 1970s; and Africans in the 1990s. The African fertility transition began in the late 1970s and has proceeded rapidly since then. Whereas the African total fertility rate (TFR) was above five children per woman as recently as the early 1970s, the Actuarial Society of South Africa put the overall African TFR at 2.85 in the year 2000. Given that the rural fertility rate is higher than urban fertility among Africans, this means that the urban African fertility rate is now not much above replacement level.

At the same time, falling birth rates were paralleled by longer life. Until the mid-1990s, life expectancy rose steadily for all South Africans. But the effect of falling fertility has been even stronger on population growth, which slowed from 2.85% p.a. between 1960 and 1970 to 2.53% p.a. between 1970 and 1980, 2.27% p.a. between 1980 and 1990 and 1.46% p.a. between 1990 and 2000.²

The stage reached by any country in this demographic transition has implications for its educational system. Just before the transition, population growth usually accelerates and the educational system has to struggle to keep up with increasing enrolment as well as demands for greater retention of young learners in the system. As the transition progresses, enrolment growth slows and there is an opportunity to devote more resources to improving the quality of education. Simultaneously parents demand more of the educational system as they seek to improve the quality of life of their children.

The South African stage was set for an entirely new paradigm, as the country was poised to go from a

Charles Simkins, Helen Suzman Professor of Political Economy at the University of the Witwatersrand, is a senior consultant to CDE. This report is based on work for CDE's projects on jobs and growth, and maths and science, and on his forthcoming book on South Africa's human capital.

situation of 'waste' to one of 'efficiency', in demographic terms. Indeed, in quantitative terms, South Africa has made a very large investment in education and training in the last forty years, thus achieving an increase in aggregate human capital for the nation. Between 1960 and 1996, embedded human capital in South Africa, measured in completed school years, rose from 48 million to 230 million – an average sustained annual increase of 4.45%. However, the quality of what was delivered was often low. The future could be expected to see smaller increases in quantity and greater increases in quality, as is appropriate for the late stages of the demographic transition.

AIDS – destroyer of human capital

In the 1990s, AIDS in South Africa began to make a quite separate and different impact on human capital. On a superficial reading, AIDS mortality might be assumed to accelerate the demographic transition described above, by further reducing overall population growth, albeit in a horrible and very traumatic way. Indeed, simple percentages of growth in population could seem to support this profile. Annual population growth dropped from 2.85% in the 1960s, to 2.53% in the 1970s, to 2.27% in the 1980s, to 1.46% in the 1990s and to a projected 0.46% in the period 2000 to 2010. The total South African population is expected to begin to decline in absolute terms from 2007 onwards. Such dramatic reductions in population growth could have had beneficial outcomes in terms of improved quality of life for the smaller population – if achieved through falling fertility rather than rising mortality.

But, in reality, the very specific pattern of AIDS mortality will have a sharply negative effect on human capital. Infant and child mortality is already rising, as a result of mother-to-child transmission of AIDS. Children who survive will not become sexually active for at least 12 years and then, if they do contract the virus, could survive for a further 8 – 10 years. Accordingly the next peak of deaths will be people older than 20 and younger than 40. This is

precisely the group in which investments to develop human capital will already have been made and these investments will be lost before any real benefit is realised for the society.

AIDS will reduce human capital in two important ways:

- The personal and economic returns from years of investment in schooling and higher education are cut off before any returns have accrued to the individual, family or society.
- Mortality among parents weakens families, a critical resource for acquisition of human capital by children. Children will lose material support as well as emotional help and the motivation they might have received from their parents while at school.

AIDS will have an additional negative impact on human capital formation through broader social and economic mechanisms, particularly if the government's strategy to deal with it remains sub-optimal. Foreign investors and commentators display increasing anxiety about this aspect. The Economist's *The world in 2002* contains the following note on South Africa:

To watch: HIV/AIDS. There is a growing concern about the epidemic in South Africa. Owing to the paucity of data, it is difficult to know how badly the economy will be affected. Government efforts to fight back will be only slightly better in 2002.³

And we can anticipate serious social effects of increasing infection and mortality rates. There will be increased pressure on the government by growing groups of desperate people. This will be accompanied by diffused social pathology as people lose prudential and moral restraint in the face of impending death, or succumb to the dementia which sometimes forms part of full-blown AIDS. The greatest number of South African AIDS sufferers will not die quietly in villages, as was the case in other parts of Africa. Urban suffering and despair will be a very visible political pressure.

South Africa thus stares at a paradoxical human capital future. Demographic transition trends were

Until the mid-1990s, life expectancy rose steadily for all South Africans

AIDS: demographic waste and human tragedy

AIDS mortality is demographic waste with a vengeance, and will take a heavy toll on South Africa's human capital. Infant and child mortality will rise, though this can be alleviated if measures are taken to prevent infection during birth and then re-infection after that. However, most heavily hit will be young adults, especially young Africans. By 2010, the probability of dying within a year

will have risen sharply for this entire group aged over 20. At age 30 this chance will exceed 6% for African men and women. Elevated mortality continues to age 60 for women and 70 for men. By 2010, African life expectancy at birth is projected to drop to 38 years for men and 39 for women, down by more than 20 years from their 1995 levels.

The views expressed in this report are not necessarily those of CDE.

poised to deliver to the country the transition from waste to efficiency that has preceded rapid economic growth phases in all developed countries. By the mid-1990s a shift to a substantial rise in human capital per individual was in sight, with all the associated developmental benefits.

Across this has come the jagged tear of AIDS mortality. It has the potential to reverse the positive human capital developments of the four decades since 1960. This article assesses the balance between progress and setback to 2010. Much can be done to manage the situation and specific measures are identified to minimise the adverse effects of AIDS on human capital development.

Impact of the demographic paradox on the education system

School enrolments

Falling fertility has already had an effect on school enrolments. Total school enrolment growth actually exceeded population growth between 1980 and 1995 because school retention increased over that period. In fact, the average years of education completed by successive birth cohorts increased steadily among all population groups throughout the twentieth century. Whites born in 1885 completed about seven and a half years of education on average; all other population groups completed fewer than two. Of those born in 1970, Whites and Asians achieved nearly twelve years of education and Coloureds and Africans just over nine. Neither the imposition of apartheid nor the unrest of the 1976–1994 period arrested this increase.⁴

The average annual rate of increase in school enrolments between 1980 and 1985 was 3.63%. Between 1985 and 1990 it was 3.78% p.a. and between 1990 and 1995 it was 4.21% p.a. However, between 1995 and 2000, the overall rate collapsed to just 0.05% p.a. Primary enrolments dropped by 0.74% p.a., but secondary enrolments rose by 1.74% p.a. The drop in overall enrolments over this period can be attributed to falling fertility rates and to rising infant mortality, a result of AIDS.⁵

It is projected that school enrolments will decline in the period 2000–10. In 2000, there were 11 827 000 pupils in school (including Grade 0). In 2005, enrolments are projected at 11 624 000 and in 2010 they are projected at 11 366 000. This is a result of two factors:

- low fertility, and
- relatively little room for improvement in school retention. In 2000, 91% of learners who had been in Grade 9 in 1999 proceeded to Grade 10;

86% of Grade 10 learners proceeded to Grade 11; and 70% of Grade 11 learners proceeded to Grade 12. The projected figures for 2010 are 95%, 92% and 83%. In other words, by 2010 virtually every secondary school learner will be completing grade 12.

The main impact of AIDS on school enrolments is by way of increased infant mortality, reducing the number of children entering school at ages six or seven. Because of the sexual transmission of AIDS, few learners entering school without being infected will actually die of AIDS while at school, except for some over-age learners in Grades 10 to 12. However, a substantial number of secondary school pupils – perhaps of the order of half a million – will be HIV positive and likely to die before the age of 30, having received 12 or more years of expensive education.

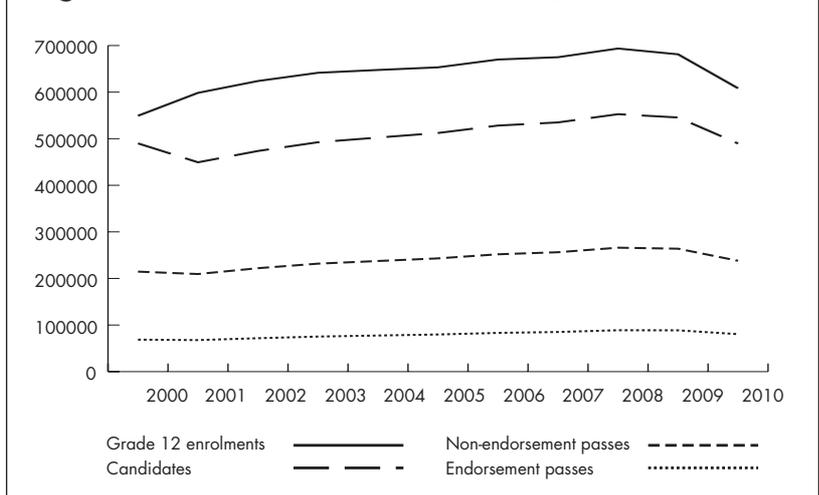
Senior Certificate results

The number of full-time Senior Certificate passes dropped marginally from 283 742 in 1995 to 277 206 in 2001 (-2.3%). However, the number of passes with endorsement for university entrance dropped from 78 821 to 67 707 (-14%). The number of candidates presenting themselves for the examination is expected to fluctuate between 450 000 and 550 000 between 2001 and 2010.⁶ Improved candidacy and pass rates are assumed to sustain an increase in Senior Certificate passes. **Figure 1** sets out the projected number of Grade 12 enrolments, candidates and passes from 2000 to 2010.

There is at present a large gap between the achievement of African first language Senior Certificate candidates and English and Afrikaans first language candidates. In 2000, the average aggregate mark for the African first language group was 727;

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Figure 1: Senior Certificate statistics, 2000–2010



for the others it was 1022.⁷ The minimum aggregate mark required for a Senior Certificate is 710 and for an endorsement 940.

The necessary condition for a sustained increase in the Senior Certificate pass and endorsement rates is substantial improvement in achievement in predominantly African schools. This is by far the single most important goal facing the educational system during the next decade.

Higher education

Because of the drop in Senior Certificate passes with endorsement, university undergraduate enrolments dropped from 308 118 in 1995 to 256 892 in 2000. They are projected to reach 285 266 in 2010, which is just 92% of the figure 15 years earlier. These projections are premised on a slow rise in the proportion of Senior Certificate candidates passing at the endorsement level (from 15.1% in 2000 to 16.4% in 2010).

Postgraduate enrolments fell from 70 315 in 1995 to 61 911 in 2000 but are projected to rise to 71 602 in 2010, mostly because projections assume a slow rise in the overall ratio of postgraduate to undergraduate students (from 24.0% in 2000 to 25.1% in 2010).⁸

The number of first degrees granted is projected to rise from 32 647 in 2000 to 36 921 in 2010, allowing for a modest increase in efficiency within the higher education system. To achieve this, universities will have to pay more attention to why students in good academic standing drop out before completing their qualifications and must take steps to reduce this drop out rate. Retaining students able to proceed will become even more important as AIDS mortality rises among undergraduates. The number of higher degrees (Master's and doctorates) is projected to rise from 4 631 in 2000 to 6 285 in 2010, reflecting a policy of encouraging more postgraduate study and more rapid completion of higher degrees.

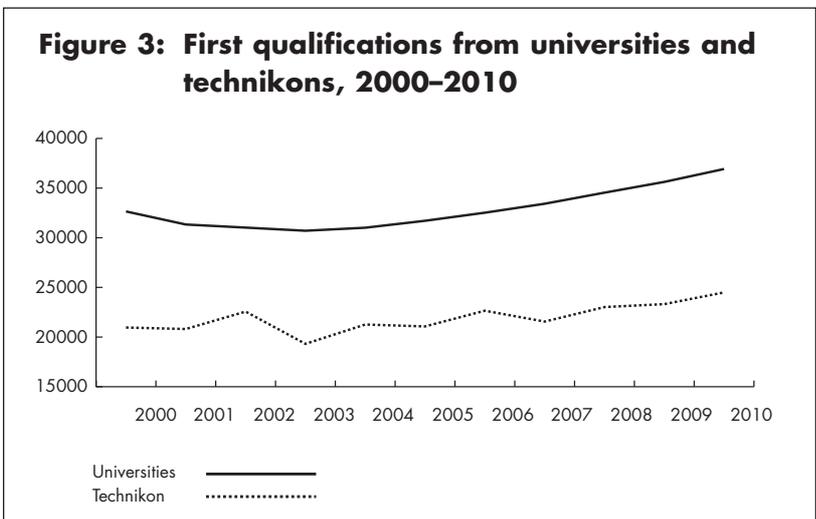
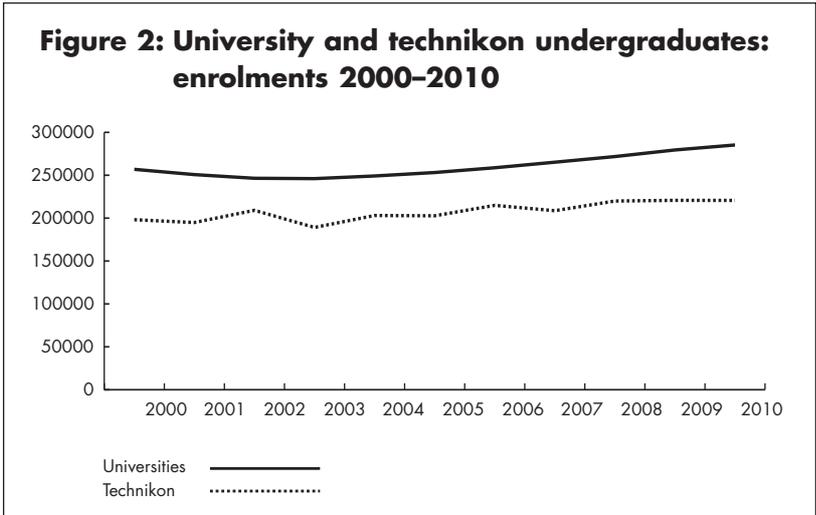
Levels of enrolment and qualification at technikons are harder to project. Technikons have not existed for as long as universities and in the mid-1990s they introduced a dual structure of diplomas and degrees, the full consequences of which still have to work themselves out. Technikon pre-diplomate enrolments rose from 164 580 in 1995 to 181 905 in 2000 and are projected to rise to 200 079 in 2010. Technikon undergraduate enrolments rose from 3 633 in 1995 to 15 850 in 2000 and are projected to rise to 20 594 in 2010. Post-diplomate enrolments shrank from 9 718 in 1995 to 3 916 in 2000 and are projected to shrink further to 3 296 by

2010. The emphasis is being placed instead on post-graduate enrolments which rose from 132 in 1995 to 1 125 in 2000, and are projected to rise to 1 668 in 2010. Some technikons aspire to change their status to technological universities within the next decade. The number of first diplomas and degrees awarded by technikons rose from 13 836 in 1995 to 20 960 in 2000 and is projected to rise to 24 496 in 2010.

Figure 2 displays real and projected university undergraduate and technikon undergraduate and pre-diplomate enrolments between 2000 and 2010. Figure 3 displays real and projected first qualifications from universities and technikons (excluding post-graduate degrees).

It is more difficult to predict the composition of university and technikon output by field of study, but it should be noted that the National Plan for Higher Education has announced the intention to use planning and financial incentives to shift the balance of enrolments in universities and technikons between the (a) humanities, (b) business and

Young people are becoming a scarcer resource in South Africa



commerce and (c) science, engineering and technology from 49%:26%:25% to 40%:30%:30% within five to ten years.⁹

South Africa's pool of university graduates

As we have seen, massive increases in mortality rates among young adults are projected for the 2000–10 period, as a result of AIDS. Nevertheless, the stock of university graduates in the 15–64 age range is projected to rise from 466 792 in 1996 to 577 680 in 2000, 678 085 in 2005 and 747 128 in 2010. However, the **rate** of increase will decline from 6.4% between 1996 and 1997 to 4.2% between 2000 and 2001, 2.3% between 2004 and 2005 and 1.7% between 2009 and 2010. This slowing will have a negative impact on the country's capacity to sustain economic growth.

The share of Africans in the pool of university graduates is projected to rise from 23.9% in 1996 to 33.1% in 2010, the share of Coloureds from 4.9% to 5.3%, the share of Asians from 6.0% to 6.5%, while the share of Whites is projected to drop from 65.2% to 55.1%.¹⁰

The average age of graduates in the 15–64 range was 36.9 years in 1996 and 36.8 years in 2000. It is expected to rise to 38.4 years in 2010.

The 1999 October Household Survey yields an estimate of 4.7% unemployment among university graduates in the 15–64 age range on the strict definition (which includes the requirement that the respondent must have been actively looking for work) and 6.6% on the expanded definition. This compares with a strict rate of 25.8% and an expanded rate of 39.4% among people with (at most) a Senior Certificate or equivalent. In a skills-short country this pattern is not surprising. Nonetheless, if economic performance is poor in the coming decade, rates of graduate unemployment may rise.

The possible impact of migration on the stock of university graduates can only be sketched in broad outline, given the lack of relevant data and uncertainty about the evolution of policy in this field as well as broader political developments. Built into the demographic projection is net emigration of 12 000 per year among minorities between 2000 and 2010. The proportion of graduates among emigrants is assumed to be the same as for the minority population as a whole. This is not a particularly valid assumption, since people who move from one country to another are likely to be better educated than the general population of the country of origin. Suppose instead that the proportion of graduates among emigrants is double that of the population which remains. The

increase in graduates lost would be approximately 3 600 between 2000 and 2010, reducing the stock in 2010 by 4.8%. If net emigration doubles as well, the stock in 2010 would be reduced by 9.6%. On the other hand, if South Africa takes steps to increase immigration of skilled people, the loss could be offset or even reversed. However, trends in this area are mixed, as several CDE publications have pointed out.¹¹ Losses of human capital from AIDS may well be increased by losses to emigration.

Little is known in the South African context about how the incidence of HIV infection and AIDS mortality varies with levels of education of the population. However, international research allows us to say that the better educated are likely to be better informed about HIV transmission and how to reduce the risk of infection. They are also likely to be better nourished and more able to afford medical care, both factors which lengthen the period between infection and death. However, specific factors cut across these general patterns. For instance, it is known that AIDS in Africa has spread along long-distance truck routes so truck drivers are at particular risk. And some high-income individuals use their incomes to finance a diverse set of sexual relationships, thereby increasing their risk of mortality. It is possible that the teacher corps is in this position. This is particularly worrying because teachers are a vital – perhaps **the** vital – component in improving human capital.

Human capital projections: missing information

Two other elements in a complete set of human capital projections cannot be supplied for lack of information, but the available data are given in the boxes mentioned below. The first missing projection is of people holding post-matriculation certificates and diplomas, apart from those issued by technikons. (See Box: **Missing information: certificates and diplomas at the higher education level.**) This group is clearly a very important component of the human capital of the country and needs to be more specifically studied and targeted by government and the private sector.

The second missing item is a projection of the number of people who have received post-school training. (See Box: **Missing information: training.**) The training system has undergone fundamental restructuring in the late 1990s and Sectoral Education and Training Authorities have been established across all sectors of employment, financed from a 1% levy on the wage bill. Firms

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offering accredited training courses will be able to claim support from the levy income. While ambitious targets have been set for the new system, it is too early to assess its achievements.

Integration of education and training

South Africa's education and training system continues to bear the stamp of its heterogeneous origins. The Ministers of Education and Labour have announced a human resource development strategy (HRDS) with five strategic objectives: improving the foundations for human development, improving the supply of skills, increasing employer participation in lifelong learning, supporting employment growth through innovation and research and ensuring that the four strategic objectives are linked. With the help of the Human Sciences Research Council, they intend to monitor 22 indicators of integration.

The attainment of complementarities between different government policies through the HRDS is expected to create a virtuous circle of increased economic growth and employment, an improved standard of living for all, broadened participation in the labour market and a more educated and trained citizenry.¹³ However, in all of this, it will be important not to let the best be the enemy of the good. The first priority must be to improve the functioning of education and training institutions themselves and elaborate labour market analysis should not be allowed to get in the way of these fundamental goals.

Improvements in the education system

From the perspective of human capital development, a systematic approach to school quality improvement requires:

- A programme of measurement and analysis to relate learner performance to conditions at home, in school and in the community. Publishing lists of schools by performance in matric is an important exercise in transparency. But it is not always fair. It is unrealistic to expect uniform performance in schools when the distribution of parental education levels, household income, school conditions and community resources are all unequal. Instead, what needs to be established is expected learner performance given the levels of all these background variables. This will then serve as a benchmark against which actual learner performance can be evaluated. A start has already been made on analysis of this sort,¹⁴ but a larger effort needs to be made within the public education system itself. In other words, interventions are required to be more focused and specific, even down to the individual school level. This will lead to:
- A focused programme of intervention in schools that are performing below the benchmarked levels, rather than wholesale changes in the system. In mild cases of underperformance, it could be appropriate simply to identify shortcomings and give advice on how to overcome them. Where underperformance is more marked, a programme of supervision of the school by the district educational authority could be instituted. However, severe and sustained underperformance could result in school reconstitution: dismissal of the principal and teachers and employment of new staff. Some provinces have made efforts in this direction, with considerable success, but they need to be strengthened and made more coherent.
- A more differentiated approach to expected achievement, particularly in mathematics. The Quality Learning Project administered grade-

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Missing information: certificates and diplomas at the higher education level

Information on people holding post-matriculation certificates and diplomas, apart from those issued by technikons, is important for a complete set of human capital projections. Such certificates and diplomas are issued by a number of public sector colleges (technical colleges, teacher training colleges, nursing colleges, agricultural colleges and police colleges) and private colleges. Data on the production of these qualifications are missing for much of the public sector and for the entire private sector. No adequate framework exists at present for the collection of this data. The National Qualifications Framework

should fulfill the function when it is more fully developed and if its qualifications awarded registration system works adequately. An estimate of the production of post-matriculation certificates and diplomas can be made once the results of the 2001 census are available, by comparing them with the results of the 1996 census. Among people between the ages of 15 and 64, the 1996 census found 189 270 people with a post-matriculation certificate and 614 532 people with a post-matriculation diploma. These would include people with certificates and diplomas from universities and technikons.

appropriate mathematics tests to pupils in Grade 9 and Grade 11 in 102 schools in 2000. This assessment produced an average result of only 8% at both levels. Even at the 95th percentile, the score was only 25%. A great many pupils in secondary schools are sitting through mathematics classes and getting nothing out of them – a situation which is both pointless and demoralising for pupils and teachers. Evidence from South Africa's participation in the Third International Mathematics and Science Study indicates that the problem starts in primary school.¹⁵ More realistic goals need to be specified for most schools while not constraining pupils with capacity for high level mathematics achievement. This could involve designation of schools that specialize in maths or science education and assistance to parents of learners with appropriate aptitudes to enable their children to attend these schools. An outcomes-based approach to the curriculum ought to be able to cater for such differentiation. (A forthcoming CDE report on mathematics and science education will deal with this issue in more detail.)

Urgent need for teachers

There are grounds for grave concern about the supply of teachers in the years to 2010. The hiring freeze associated with redeployment and retrenchment of teachers has had two consequences:

- closure of some teacher training colleges and static or declining throughput in the rest
- discouragement of matriculants from considering teaching as a career.

The adjustments of the late 1990s were a response to very slow growth in pupil enrolments as well as to new and higher pupil: teacher ratio norms in suburban schools. No attention was paid then to AIDS mortality among teachers. However, Crouch has projected teacher demand and supply for the decade

to 2010 and concludes that about 30 000 extra new teachers need to be trained **each year** for the next eight years to meet the demand.¹⁶ This is a huge figure compared to the present annual output of approximately 20 000 from teacher training colleges, the main source of supply. The shortfall is particularly acute in subjects such as maths and science.

In order to attract and retain well-qualified and experienced teachers, adjustments to their remuneration and/or benefits will be necessary. Crouch has shown that the less well-qualified and inexperienced teachers in South Africa are more than adequately compensated relative to similar workers in South Africa **and** to teachers in developing countries as a whole. But well-qualified, well-educated teachers and teachers in specific subjects must be drawn into or retained in the system by special measures, for the foreseeable future.

The Department of Education has yet to appreciate fully the need for expanding teacher training, let alone communicate the changed circumstances described above to young people considering teaching as a career. It is crucial that teacher training be expanded substantially and quickly. Failure to do so will undermine the assumptions of improved performance at the school level, with knock-on effects for higher education. It is also crucial that South Africa import qualified teachers in the interim, for example from India.

Conclusions

Projections of the sort given here are not predictions. They should not be regarded as Nostradamus-like efforts to foresee the unforeseeable. Rather, projections reflect the ways in which historical patterns and expected trends will work out, given the data available at the time the projections are made. When the real experience begins to depart significantly from projected values, a projection makes it easier to identify reasons and to modify views about system dynamics.

A great many pupils in secondary schools are sitting through mathematics classes and getting nothing out of them

Missing information: training

The only information we have at present on the number of people who have received post-school training is a snapshot from the 1999 October Household Survey. This put the number of men between the ages of 15 and 64 who have received training at 1 432 513 and the number of women at 993 181. The male estimate represents 11.7% of all men between 15 and 64, 18.4% of employed men and 14.1% of unemployed men who have worked before. The female estimate represents 7.5% of

all women between 15 and 64, 14.4% of employed women and 9.7% of unemployed women who have worked before. The probability of being trained rises with prior level of education and with age, up to age 30-34. In 65% of the cases reported in 1999, the last period of training stretched over more than six months. Over 20% of managers, professionals, semi-professionals and technicians, clerks, sales people and skilled service workers and artisans reported having been trained.¹²

For ease of exposition, the results of only one middle-of-the-road projection have been cited here. However, the key advantage of model building is that it enables researchers and policy makers to explore any number of ‘what-if’ scenarios in order to get a feel for the ways in which changes in the relevant variables could affect outcomes.

The key insight from our modeling is that the education and training system must follow the country’s demography in making a transition from quantity to quality. Rapid growth in the numbers of pupils and students in the education system during most of the twentieth century made quality improvements very difficult. This position has now changed and resources for education can be applied more readily to improvements in quality. It is vital that this shift takes place.

Ironically, children and young people are actually becoming a relatively scarcer resource in South Africa and opportunities to build up high levels of human capital in them need to be taken, in their own interests and the interests of national economic growth. Moreover, in addition to gains from the

application of greater resources per learner there are plenty of opportunities for improvements in efficiency in schools and higher education institutions at any given level of resourcing.

But there are significant risk factors in the scenario. The principal risks to South Africa’s human capital stock in the period 2002 to 2010 are:

- HIV/AIDS morbidity and mortality, in terms of the specific patterns described above
- high levels of emigration, made worse by failure to attract highly skilled and qualified people from other countries
- shortages of teachers, as a result of negative images of the profession, AIDS and a lack of incentives to specific groups of teachers
- failure to raise average levels of achievement in schools and higher education institutions.

All these risk factors will need sustained attention at various levels of government, as well as from parents, the private sector and NGOs. The forthcoming Report from CDE on maths and science education will develop specific ideas about the kind of interventions required in those fields.

The first priority must be to improve the functioning of education and training institutions

The projections in this document are built up as follows:

- A background demographic projection is made. This projection is a slightly modified version of the Actuarial Society’s model. (The modifications relate to fertility and migration assumptions. The model’s basis for projecting mortality – including the effects of AIDS – is left as it is.)
- A school enrolment model starts from historical enrolments and applies projections of promotion and repetition rates by grade. New entrants into Grade 1 come from the demographic projection. The school enrolment model yields total enrolments by grade.
- From the number of Grade 12 enrolments, projections are made of full-time Senior Certificate candidates who will complete the examination. Projections of pass rates and the proportion of passes that will be at the endorsement level are made.
- The number of endorsement passes determines the pool available for entrance into universities. A projection is made of the university entrance rate. First-time students are then added to the pool of university students, taken initially from historical data. Qualification rates and dropout rates are applied to the non-first time and all stu-

Projection method

- dents respectively. The remaining pool of students is carried forward to the next year
- The same procedures are applied to technikon students, except that the available pool for entrance is non-endorsement Senior Certificate passes.
- Finally, an age profile by race and gender of university graduates was obtained from the 1996 Census. Between one year and the next, the pool diminishes because of mortality and emigration and grows because of the addition of first-degree graduates.

Key assumptions

	2001	2010
Population size	43.3 million	44.5 million
Senior Certificate candidates as a proportion of Grade 12 enrolments	75.1%	80.5%
Senior Certificate pass rate	61.7%	65.0%
Proportion of SC passes at Endorsement level	32.1%	33.8%
University entrants as a proportion of the previous year’s endorsements	78.0%	78.0%
Technikon entrants as a proportion of the previous year’s non-endorsement SC passes	26.5%	26.5%
Universities:		
First degrees/non-first time enrolments	19.2%	20.1%
Honours degrees/Honours enrolments	42.0%	42.0%
Master’s degrees/Master’s enrolments	17.9%	19.7%
Technikons:		
Diplomas/non-first time diplomates	14.0%	14.9%

Endnotes

- 1 Massimo Livi-Bacci, *A concise history of world population*, second edition, Oxford: Blackwell, 1997, p 112.
- 2 Charles Simkins, *The population of South Africa, 1960-2010*, forthcoming, tables 2 and 4.
- 3 The Economist, *The world in 2002*, December 2001, p 85.
- 4 Charles Simkins, *The archaeology of South Africa's human capital*, forthcoming, tables 1–4.
- 5 Charles Simkins, *School quality*, forthcoming, table 1.
- 6 Charles Simkins, *Educational projections to the year 2010*, forthcoming, table 2.
- 7 Charles Simkins, *Mathematics and physical science results in the Senior Certificate examinations of 1998 and 2000*, forthcoming, table 6.
- 8 Simkins, *Educational projections to the year 2010*, table 3.
- 9 Department of Education, *National plan for higher education*, Pretoria, February 2001.
- 10 Simkins, *Educational projections to the year 2010*, table 5.
- 11 See the following CDE publications: *People on the move: lessons from international migration policies* (June 1997); *People on the move: a new approach to cross-border migration in South Africa* (June 1997); *Response to the green paper on international migration* (June 1997); *Becoming 'the world's most promising emerging market': is government's white paper on international migration good enough?* (May 2000); and *South Africa's skills crisis: is the new Immigration Bill good enough?* (June 2001)
- 12 Charles Simkins, *Vocational education and training*, forthcoming, section 11.
- 13 Departments of Education and Labour, *A nation at work for a better life for all: human resource development strategy for South Africa*, Pretoria, 2001, p 46.
- 14 For example, L Crouch and T Mabogoane, *When the residuals matter more than the coefficients: an educational perspective*, *Journal of Studies in Economics and Econometrics*, 22(2), 1998; *No magic bullets, just tracer bullets: the role of learning resources, social advantage, and education management in improving the performance of South African Schools*, April 1998; and *Statistical identification of over- and underperforming schools in South Africa*, March 1998; as well as Charles Simkins with Andrew Paterson, *The social and economic determinants of performance on the language of instruction and mathematics in Quality Learning Project Schools*, Report of the Joint Education Trust, Johannesburg, December 2001.
- 15 Sarah Howie, *Mathematics and science performance in the middle school years in South Africa: a summary report on the performance of South African students in the Third International Mathematics and Science Study*, Pretoria: Human Sciences Research Council, 1997.
- 16 L Crouch, *Turbulence or orderly change? Teacher supply and demand in the age of AIDS*, Occasional paper, Department of Education, Pretoria, April 2001.



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INTERNATIONAL ASSOCIATE

Professor P Berger (Boston University)

Pilrig Place, 5 Eton Road, Parktown, Johannesburg 2193, South Africa
 PO Box 1936, Johannesburg 2000, South Africa
 Tel 27-11-4825140 Fax 27-11-4825089 e-mail: info@cde.org.za

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