Student recruitment for transformation at the University of Cape Town: a spatial analysis of the Alternative Admissions Research Project, 2000 – 2005

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Abstract

In an effort to attract a greater diversity of students to the University of Cape Town (UCT) the Alternative Admissions Research Project (AARP) has researched and developed a set of tests that are used in conjunction with school-leaving results to identify students with potential to succeed in university studies. The research reported on in this paper studies the geographical distribution of students admitted to UCT having written the AARP tests as part of the application procedure.

The school attended by each student is recorded in the UCT database, and was used in this study as a proxy for a home address to place each student on the map. The raw data were summarised by school. Spatial databases of South African schools were collated from all available sources and address-matching was used to geocode the schools. Since standard Education Management Information System (EMIS) numbers were not consistently applied in the source data, the use of geocoding routines supplemented by online searches for some schools enabled most of the students' schools to be geolocated.

The distribution of the current 25 test centres was analysed in terms of accessibility to AARP writers. It was determined that most schools from which writers came were within 50 km of a test centre. To identify possible gaps in coverage, the best performing schools were mapped, based on recent matriculation results.

The results of this research suggest a more detailed study of KwaZulu-Natal which appears under-served by the current test centres, and possible relocation of a test centre in Limpopo Province.

1. Introduction

Following about four decades of formal racial segregation in the education sector as legislated during the apartheid period (1948-1994), there are very large differences in the quality of schooling and access to higher education by racial group in South Africa. Although the University of Cape Town (UCT) resisted this strongly, it was classified as a "white" university during the apartheid period. In seeking to redress past imbalances and attract students from all population groups to study at UCT, there are complex and difficult issues that need to be tackled. Access to higher education in the sense of gaining admission to a university, as addressed in this study, is but one

consideration. Making university education accessible to all includes consideration of the institutional culture or ethos, content of curricula and style of teaching, and addressing financial

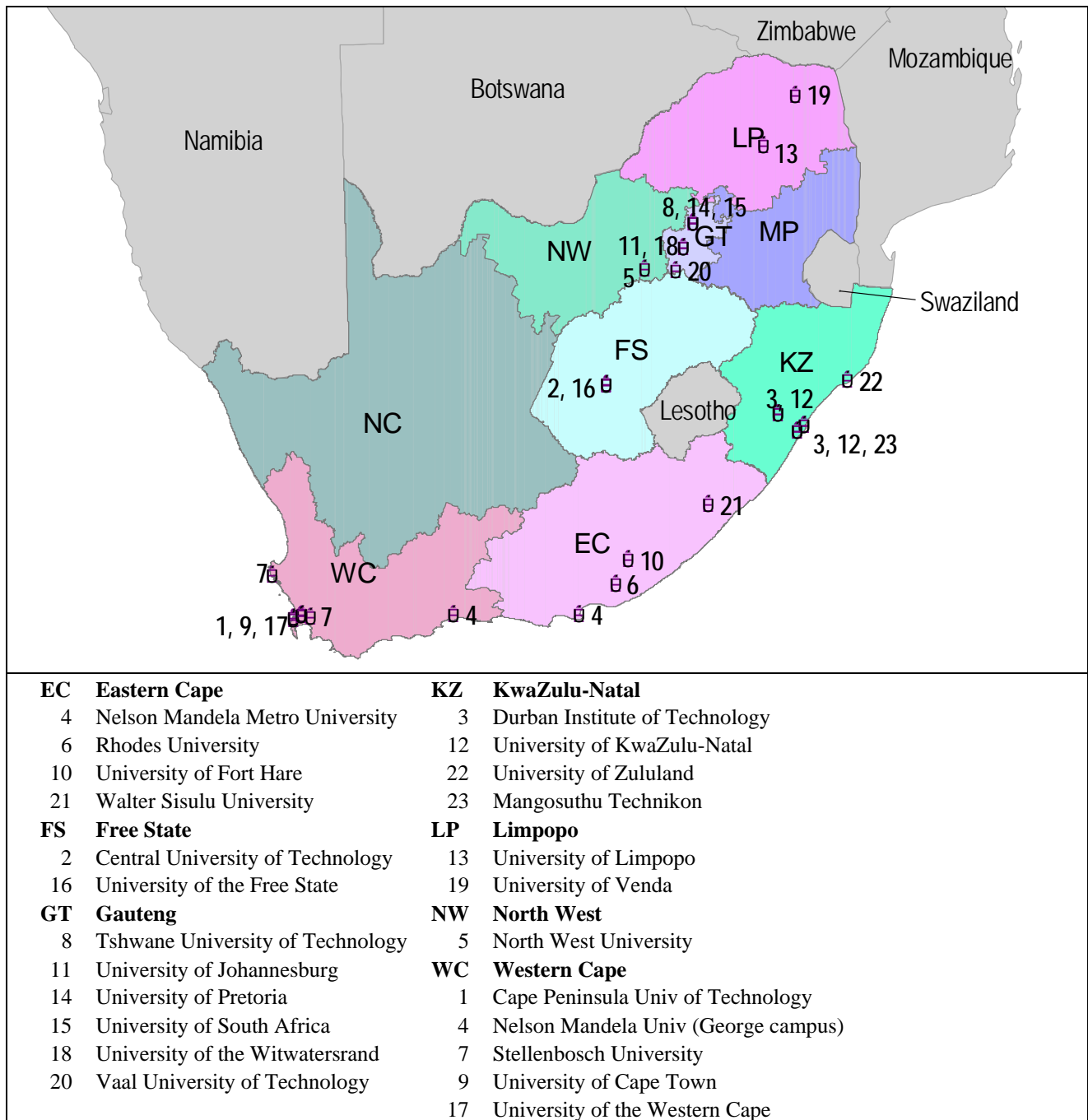| EC	Eastern Cape	KZ	KwaZulu-Natal
4	Nelson Mandela Metro University	3	Durban Institute of Technology
6	Rhodes University	12	University of KwaZulu-Natal
10	University of Fort Hare	22	University of Zululand
21	Walter Sisulu University	23	Mangosuthu Technikon
FS	Free State	LP	Limpopo
2	Central University of Technology	13	University of Limpopo
16	University of the Free State	19	University of Venda
GT	Gauteng	NW	North West
8	Tshwane University of Technology	5	North West University
11	University of Johannesburg	WC	Western Cape
14	University of Pretoria	1	Cape Peninsula Univ of Technology
15	University of South Africa	4	Nelson Mandela Univ (George campus)
18	University of the Witwatersrand	7	Stellenbosch University
20	Vaal University of Technology	9	University of Cape Town
		17	University of the Western Cape

Figure 1: Distribution of Universities and Technikons in South Africa

issues. The importance of higher education for the prosperity of a country is widely accepted and the process of transforming institutions of higher education to meet the challenges facing South Africa is multi-faceted and complex (Wolff, 2003).

The Alternative Admissions Research Project (AARP) was initiated in 1986 in an effort to admit a greater diversity of students to UCT. Over time, this project has researched and developed a set of tests that are used in conjunction with school-leaving results to identify students who have potential to succeed in university studies. The tests mainly assess English language, numeracy and reasoning

skills. Many of the students who write these tests would have gained admission to university based on their school-leaving results, whereas a small proportion are offered a place based on potential identified in the AARP tests. This paper analyses the geographic distribution of students who wrote the AARP tests and enrolled at UCT over the period 2000-2005.

UCT is located in the south-western tip of South Africa – the main campus is on the slopes of Table Mountain, not far from the Cape Town city centre. There are 23 universities and universities of technology in the country, well distributed across the country as shown in Figure 1. UCT was established in 1829 and is the oldest university in South Africa. According to the 2007 Times Higher Education Survey, UCT and the University of the Witwatersrand (Wits) in Johannesburg are the only universities on the African continent that rank within the top 400 universities of the world, ranked 200 and 282 respectively (Times Higher Education – QS World University Rankings, 2007). This makes these institutions competitive and attractive to students. UCT and Wits universities are of similar size with total enrolment of roughly 22000 and 24000 students respectively in 2007. Two more South African universities, namely the universities of KwaZulu-Natal and Pretoria, achieved rankings in the 401-500 range.

2.   Distribution and characteristics of the South African population

A brief digression into the population distribution of South Africa will demonstrate the challenge to UCT in transforming its student body to reflect the demographics of the country. The universities in the Western Cape (UCT, University of the Western Cape, University of Stellenbosch and Cape Peninsula University of Technology) are furthest from the most populated areas of the country. Apart from the City of Cape Town, the population is relatively sparsely distributed in the Western and Northern Cape. The majority of the population of South Africa is located to the north and east of the country, relatively far from Cape Town (Figure 2).

The racial composition of the population as depicted by municipality in Figure 3 shows the geographic separation between the Coloured and Black population groups, with the minority status of the White population group evidenced by the blank area in the lower right of the triangle in Figure 3. Whites are not dominant in any municipality and contribute at most 25%-36% of the municipal population in municipalities of class 7 in Figure 3. Whites are present in relatively large numbers in the major cities where they constitute roughly 20% of the metropolitan population. The 169 municipalities in which the Black population accounts for more than 75% of the population (class 8 in Figure 3) collectively represent 27 million of the estimated 48 million South Africans in 2007 whereas the 26 municipalities in which the Coloured population is over 75% of the municipal population (class 10 in Figure 3) account for only 1.3% of the total population of the country, or just over 0.6 million persons.[1] In order to attract a diverse student population with significant numbers of black (African) students, it is necessary for UCT to recruit throughout the country, particularly in the more populous provinces of KwaZulu-Natal, Gauteng, and the Eastern Cape.

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[1] Figures 2 and 3 were done using PhilCarto software by Dr Philippe Waniez – freely available from http://perso.club-internet.fr/philgeo. This software is particularly useful for thematic mapping and exploratory data analysis, and uses Adobe Illustrator format input files.
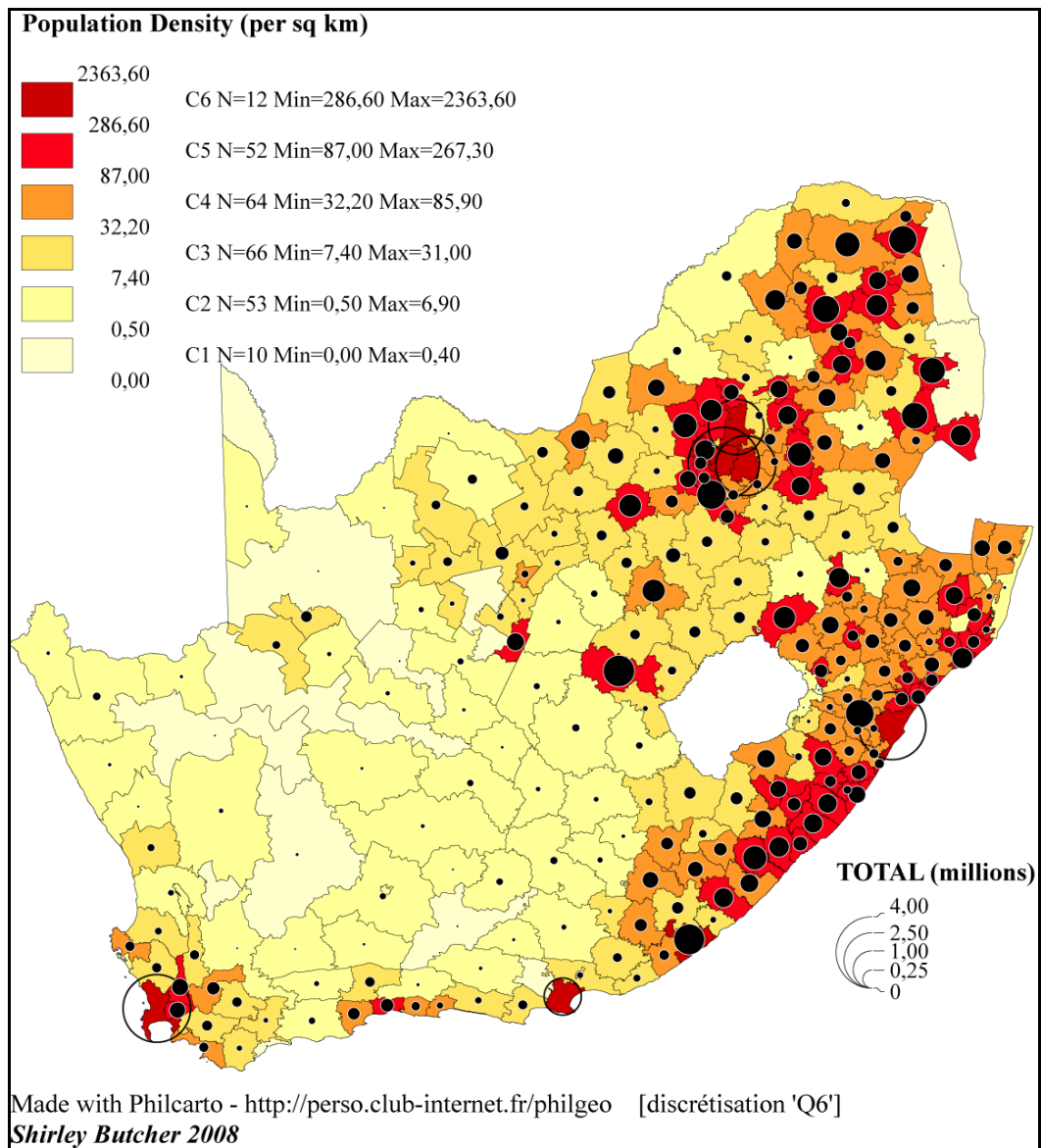
Figure 2. Population distribution in South Africa
Data from Statistics South Africa, Community Survey 2007; www.statssa.gov.za

3.   Recent trends in enrolment at UCT

Enrolments at undergraduate level (including first time entering students and transferees from other institutions) have fluctuated slightly around 4000 students per year over the period 2001-2008. Black and Coloured students together have increased slowly but steadily from 30% of intake in 2003 to 40% of intake in 2008. There has been growth in the number of applicants between 2001 and 2008, most notably in the number of Black applicants, which were over 5500 for the 2008 academic year. In all except Indian population groups the proportion of offers to applicants dropped between 2001 and 2008. This is most marked for the Black population group where only 31% of applicants were offered a place and only 19% of applicants enrolled in 2008, compared to 45% of White, 37% of Coloured and 27% of Indian applicants who enrolled (Figure 4).
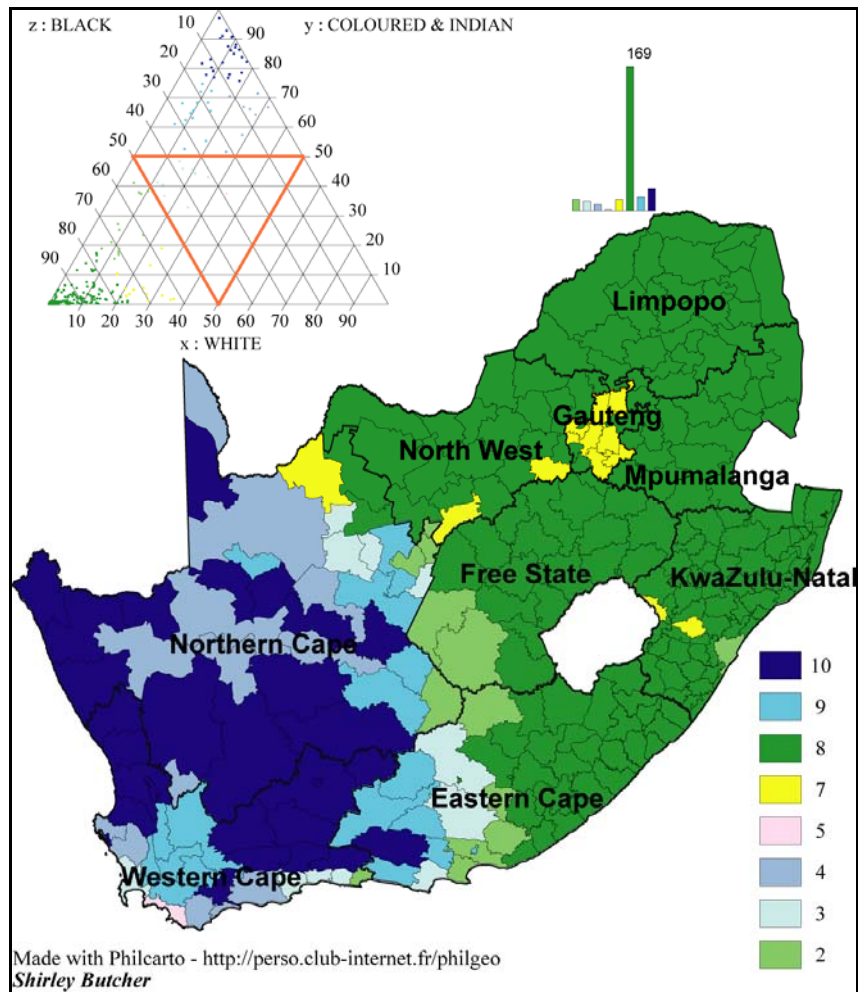
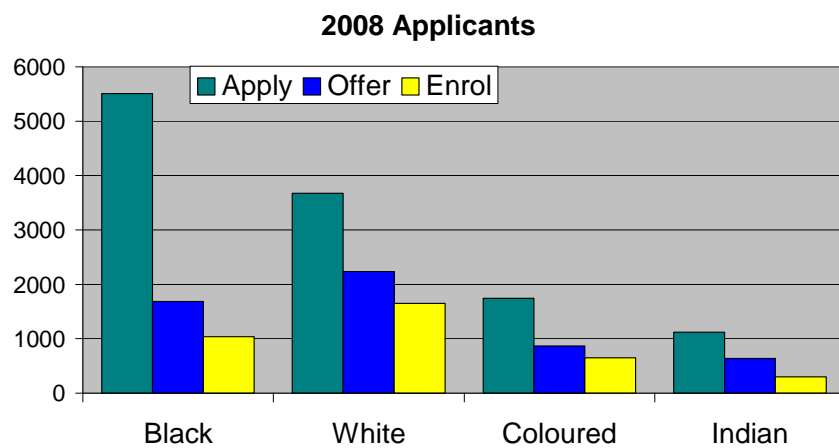Figure 3. Racial composition of South African municipalities

Figure 4. Applications, offers and enrolments for entering and transferring undergraduates in 2008

4.   Geographical distribution of applicants and test centres

At present there are 25 test centres distributed around South Africa as depicted in Figure 5. There is a good distribution of test centres in the major cities of the country. The green points in Figure 5 show the coverage of schools from which students in the study population have come. The preponderance of purple dots in the Eastern Cape, KwaZulu-Natal and Limpopo province indicate schools whose matriculants have <u>not</u> both written AARP tests <u>and</u> enrolled at UCT during the study period. Over the period 2000-2005, a total of 10970 students from a total of 1671 schools were admitted to UCT, having written the AARP tests. This represents roughly half of all undergraduate admissions over that period. There was a 53% increase in the number of enrolled students who wrote the AARP tests between 2000 and 2005, from 1445 in 2000 to 2212 in 2005.

The AARP tests are administered by UCT on behalf of several universities, i.e. not all AARP writers apply for admission to UCT.

For the purpose of this study we studied only students enrolled at UCT who had written the AARP tests. This is a small subset of AARP writers and gives only a partial picture of the geographic reach of the AARP testing programme. Many students who were offered a place at UCT may have declined as shown in the trends depicted in Figure 4. However, this geographic study shows trends over space and time that are of interest for recruitment and transformation purposes.

5.   Geocoding applicants by school

Choosing the means of mapping the students raises a number of considerations. Every student has several addresses in the university database, including a home address, postal address, and term-time address. None of these addresses is necessarily stable over time nor correctly reflects the place from which the student wrote the AARP tests. Furthermore, South African address formats are diverse and notoriously difficult to geocode using current software algorithms[2]. The South African standard includes 11 address formats as reported by Coetzee and Cooper (2008). Furthermore, the use of personal home addresses raises ethical and privacy concerns. It was decided to use the school attended by each student as a proxy for their address. This had the major advantage of reducing the number of addresses to be geocoded from 10970 individuals to 1671 schools and provided sufficient spatial accuracy for the purpose of this study. The UCT database of students was thus reduced to a simpler summary by school which removed the personal element and the need for ethics clearance. The underlying assumption was made that the school was accessible from the student's home and the accessibility of a test centre could for practical purposes be assessed relative to the school.

Contrary to expectation, it proved cumbersome to map the schools. Several schools share the same name, but are located in different cities or provinces. This had to be taken into account when producing the summary tables. Schools are allocated unique reference numbers in the national Education Management Information System (EMIS); however EMIS numbers were not consistently recorded in the spatial databases of the different provinces. UCT had independently generated a set

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[2] We do not know of any Open Source software for bulk geocoding of SA addresses and used ESRI's ArcGIS 9 for this purpose, using the single field option to match school names with names in mapped school databases (shapefiles) from various sources.

of school codes for their admissions database which predated the introduction of EMIS numbers. Had the databases been clean and consistent, it would have been a simple matter to perform a relational join to map the AARP subset of schools. However, because of the inconsistencies, we resorted to geocoding most of the schools based on their names, using combined mapped databases from SA Explorer and provincial departments of education. Besides obvious spelling errors and language issues, names are abbreviated differently in different databases, for example using H.S., HS, High School or Hoërskool interchangeably makes a large difference to the match score for a text string. Setting the spelling sensitivity too low can lead to unintended mismatches, requiring much interactive double-checking of both unmatched schools and schools matched with low match scores. Not all schools were able to be located, despite supplementing the shapefiles with online searches and directories, and the green dots in Figure 5 show 94% of the schools (representing 98% of the students in the study). This mapped subset of schools is referred to as the "AARP schools".
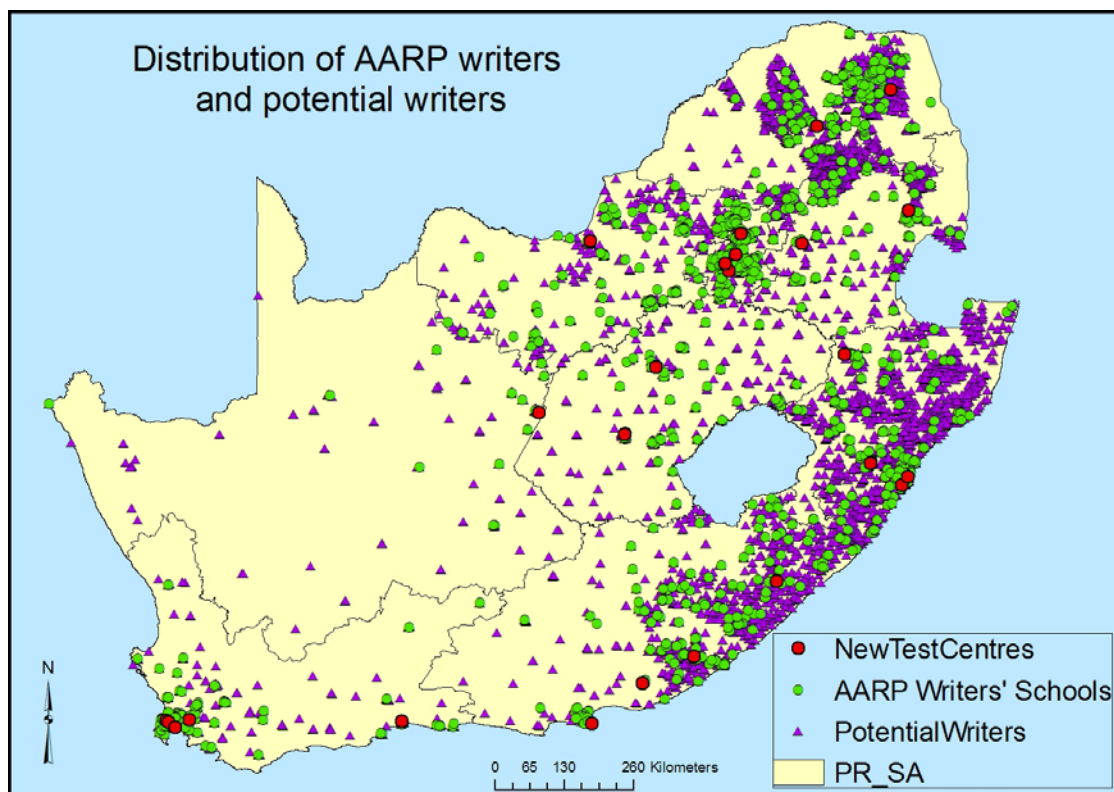

Figure 5. Distribution of test centres in relation to all secondary schools in the country that offer Grade 12 (potential writers) and AARP schools. (Map: T Rambuda)

6. Accessibility analysis

Using a spatial join, the distance from each AARP school to the nearest testing centre was determined. Although the spatial data could be projected on the fly and displayed in the Albers projection, in order to calculate distances in metres between points in the two data sets they had to be saved in projected units[3]. These distances are "as the crow flies" and not network distances, as we did not have a topologically correct and complete road network for the whole country, including all classes of road.

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[3] We used ArcGIS9.2 for the spatial analysis

The distances from AARP schools to the nearest test centres are summarised graphically in Figure 6, which depicts accessibility of schools as a map and relates this to student numbers in the graph. The majority of AARP students had access to a test centre within 50km of their school. The Western Cape has been omitted from this graph since this province accounts for about half of all AARP students and 98% of these writers were within 50km of a test centre. The provinces of interest are those that appear relatively poorly served by the current distribution of test centres. Writers located more than 150km from a test centre were 5.6% of 1206 writers in KwaZulu-Natal, 10.1% of 514 writers in the North West province, 48% of only 60 writers in the Northern Cape and 4% of 939 writers in the Eastern Cape. More than 40% of writers in North West, Limpopo and Mpumalanga provinces had to travel more than 50km to a test centre.
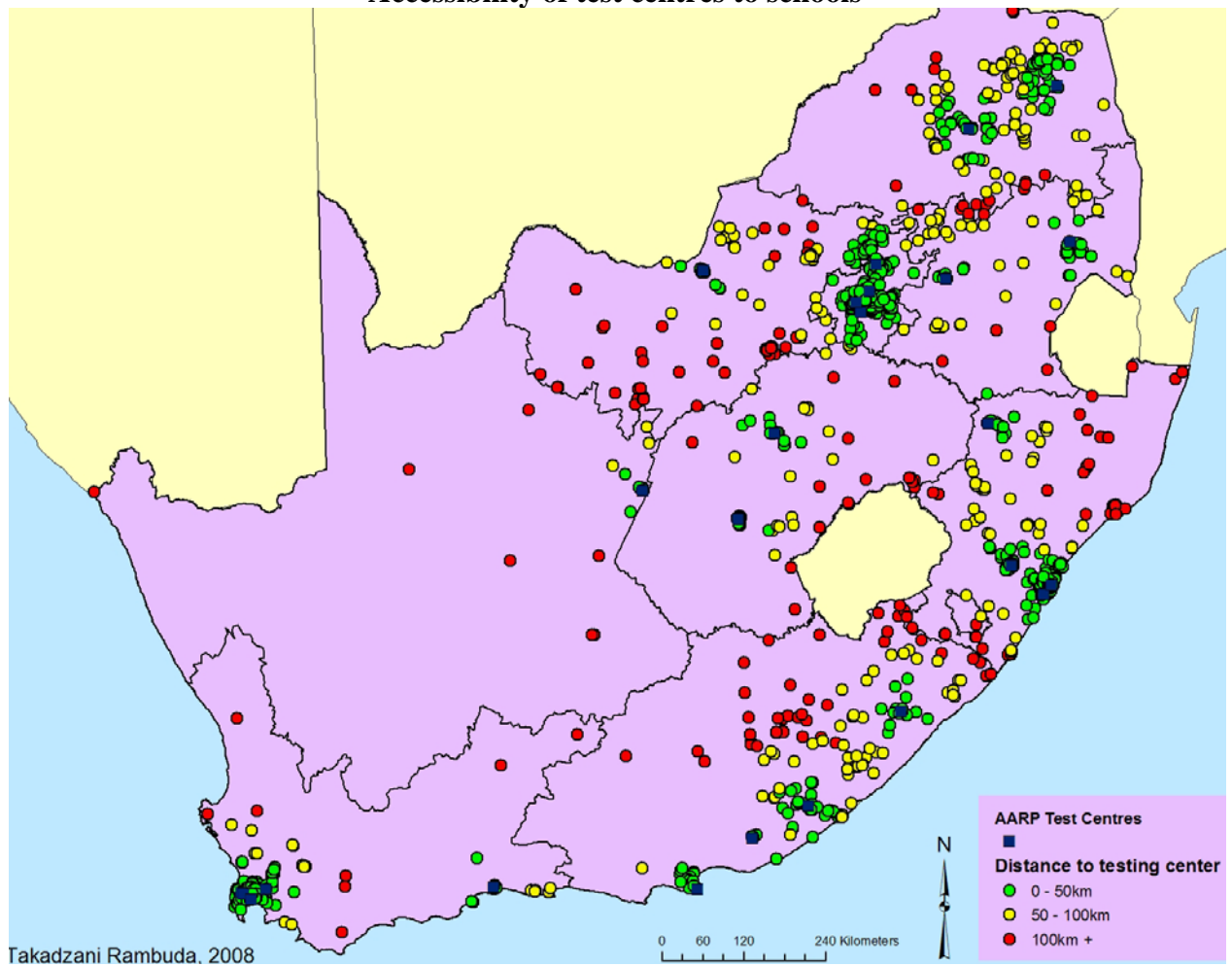
Visual inspection of Figure 5 alongside the distance summary in Figure 6 and the population distribution map in Figure 2 suggests that there might be untapped potential in KwaZulu-Natal, Eastern Cape, Limpopo and North West provinces.

7.   Finding potential applicants

Given the high attrition rate between application and enrolment depicted in Figure 4, we decided to identify the top performing schools in terms of number and percentage of learners who pass the senior certificate examination with matriculation exemption, a basic requirement for entrance to university. From data provided by the Matriculation Board it was found that the four provinces in which we have become interested had overall pass rates below 70% in the senior certificate examination in 2006, although in terms of raw numbers Limpopo, Gauteng and KwaZulu-Natal produced a larger pool of students with matriculation endorsement than did the Western Cape.

From senior certificate examination results, we selected the top 20% of schools in terms of the overall pass rates in the senior certificate examination and good numbers of students with matriculation endorsement. Schools with high pass rates, but not offering subjects leading to matriculation endorsement, were not included in the top 20% list. 1337 schools were mapped. The resulting map is shown in Figure 7, which further corroborates the thinking that KwaZulu-Natal and Limpopo provinces are worthy of further study since there are many good schools (in purple) that are not covered with a green dot indicating inclusion in the AARP data. To a lesser extent there appears to be a scattered distribution of unreached schools in the Eastern Cape, Free State and Northern Cape.
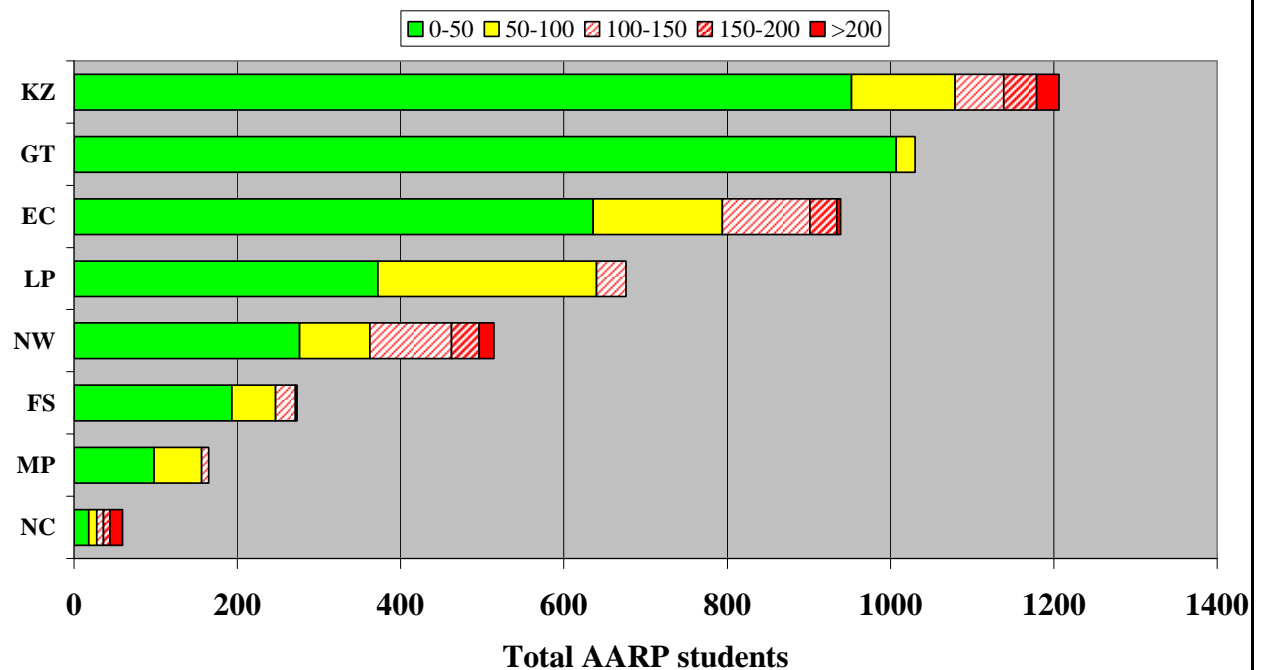
Figure 6. Accessibility summary for all AARP schools and students
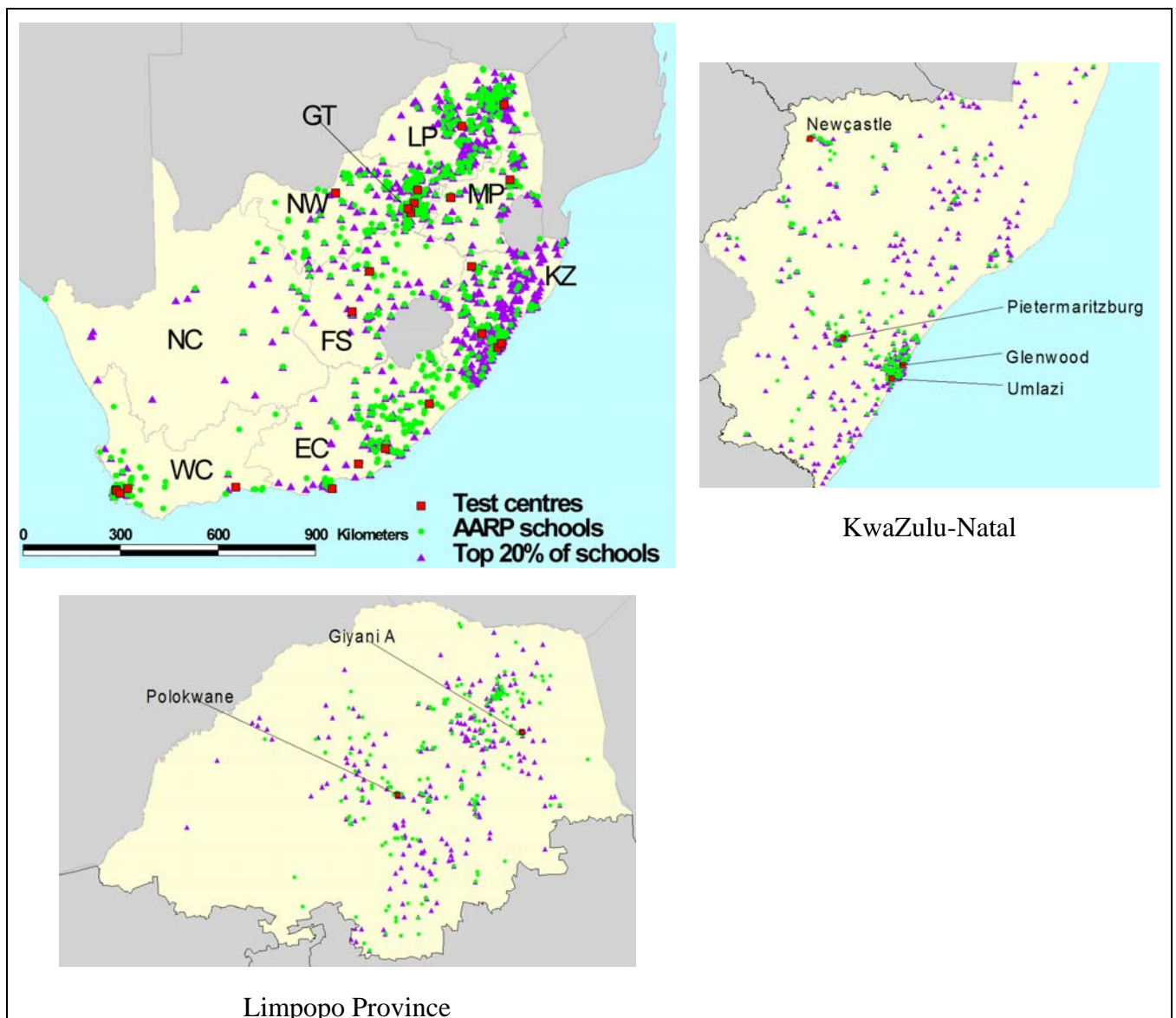
Figure 7. Comparative distribution of AARP schools, top schools and test centres

8.   Results and conclusion

Based on location, UCT competes with other highly ranked universities in South Africa for students from the northern parts of the country. The results of these spatial analyses suggest that AARP consider establishing another test centre in central northern KwaZulu-Natal and reconsider the location of the Giyani test centre in Limpopo province. The study concludes that the major metropolitan areas – which yield the highest number of applicants – are well served.

This research demonstrates that GIS is a powerful tool for summarising large datasets spatially and producing graphical outputs that can aid in planning for student recruitment.

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Acknowledgements