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Performance of Grade 12 rural origin health science students supported by the Umthombo Youth Development Foundation

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Background. It has been advocated that to address healthcare worker shortages in rural areas, rural students should be recruited to study health sciences as they are more likely to live and work in rural areas. This poses a challenge, as rural areas in South Africa (SA) are dominated by non-fee-paying quintile 1 - 3 schools that are under-resourced in terms of physical and human resources. Entry requirements for health science disciplines are academically demanding, with good marks required in mathematics, physical sciences and life sciences, while limited spaces are available at universities. National secondary school-leaving examination results are generally poor and are affected negatively by quintile level, with quintile 1 schools performing worse than quintile 5 schools. The Umthombo Youth Development Foundation (UYDF) seeks to address staff shortages at rural hospitals by investing in rural youth.

Objective. To investigate how rural origin learners supported by the UYDF, the majority of whom attended quintile 1 - 3 rural schools, achieved school-leaving results that enabled them to be accepted to study for a health science qualification.

Methods. This was a cross-sectional, retrospective study using a survey developed from UYDF student narratives. The survey was compiled in Google Forms and emailed to 211 UYDF students of the class of 2024, of whom 89% responded. The results were supplemented with extracts from stories submitted by two recent graduates.

Results. There were 81% of participants (n=167) who completed their secondary schooling at a quintile 1 - 3 school, while 13% (n=25) completed their schooling at a fee-paying quintile 4 school, and 2% (n=3) at a quintile 5 school. There were 56% of the respondents who reported having a sufficient number of teachers, whereas 70% reported having sufficient classrooms. More than 90% reported that they had a mathematics and life sciences teacher in Grades 11 and 12, while 89% reported having a physical science teacher in Grades 11 and 12. Sixty percent of students achieved between 76% and 85% in Grade 12 for English, with only 10% achieving ≤70%. Fifty-seven percent of students achieved 81 - 90% for *isiZulu*, with only two students achieving ≤70%. Seventy-two percent of students achieved between 76% and 100% for mathematics in Grade 12, 77% achieved between 76% and 100% for physical science, and 90% achieved between 76% and 100% for life sciences. There were 96% of students who attributed their good results to their hard work and dedication, 90% to working through past examination papers and 78% to having good teachers.

Conclusion. Motivated by their poor family circumstances, students, through their hard work and dedication, good teachers and extra lessons, achieved secondary school results allowing them to meet and even exceed the entry requirements for medical and allied health science study programmes at SA universities. Using past examination papers could be a strategy promoted more widely to help students in quintile 1 - 3 schools to better prepare for assessments, thereby improving their examination results and post-school options.

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It has been advocated that to address healthcare worker shortages in rural areas, rural students should be recruited to study health sciences,[1-5] as they are more likely to live and work in rural areas than their urban colleagues.[6-8] This poses a challenge, as South Africa (SA)'s rural schools generally perform the worst in the country.

SA public schools are classified into five quintiles based on the socioeconomic status of the surrounding community. Average income, levels of unemployment and literacy levels are used to determine the quintiles.[9] Due to the low socioeconomic status of the surrounding community, quintile 1 - 3 schools are classified as non-fee-paying schools and are funded solely by the government, while quintile 4 and 5 schools charge fees to supplement their low government subsidy.[9] In 2023, the National Department of Education government subsidy advisory to the Provincial Department of Education was ZAR1 610 per learner for quintile 1 - 3 schools, ZAR807 per learner for quintile 4 schools, and ZAR279 per learner for quintile 5 schools.[10] Despite the nearly six times investment by the government in quintile 1 - 3 schools, these schools remain under-resourced owing to decades of under-investment[9] compared with quintile 4 - 5 schools, which use fees to provide better resources, often including the hiring of additional teachers. Rural areas in SA are dominated by non-fee-paying, quintile 1 - 3 under-resourced schools, which makes it difficult to recruit sufficient students to study health science disciplines. The entry requirements are high, with good marks in mathematics, physical and life sciences needed, while the number of available places is limited, i.e. there is fierce competition.[11] To address past inequalities regarding access, the majority of universities apply preferential selection to black and coloured students,[2,11] and in some cases, preferential selection to students from quintile 1 - 3 schools, or specifically students of rural origin.[11]

Of the learners entering Grade 1 in 2008, only 60% would have written the Grade 12 school-leaving National Senior Certificate (NSC) examination,

as 40% would have dropped out, 12% would have obtained a Bachelor pass, allowing them to study at university, 6% would have obtained some tertiary qualification (i.e. a diploma or a higher certificate), and 4% would have obtained a university degree within 6 years after completing Grade 12.[12]

Spaull,[13] analysing the Grade 6 reading and mathematics performance of SA children in the Southern and Eastern African Consortium for Monitoring Educational Quality (SACMEQ) III data set to determine the factors that influence learner performance in literacy and mathematics, reported that the socioeconomic status of the school had the most significant effect on learner performance, even higher than student socioeconomic status. Spaull[14] further reported that the performance of Grade 9 pupils from quintile 1 - 2 schools is at least 3 years behind quintile 5 Grade 9 pupils. Likewise, Mpofu[15] reported that students performed according to their school quintile, as there was a correlation between school socioeconomic status and students' academic progress at university. He reported that the likelihood of a student graduating in 4 years (for a 4-year degree), is dependent on the school quintile, with a greater likelihood of graduating for quintile 5 than quintile 1 students. He further highlighted that students from lower quintile schools are more likely to drop out before completing their studies. Further, Van Broekhuizen *et al.*[12] showed that 45% of quintile 5 school leavers enrol at university compared with 9 - 14% of those in quintile 1 - 3 schools. Spaull[14] highlighted that analysis of every data set of educational achievement in SA shows that there are two different public school systems in the country. The smaller, better-performing system accommodates the wealthiest 20 - 25% of pupils, who achieve much higher scores than the poorest 75 - 80% of pupils from environments with lower socioeconomic status, who live in poorer provinces and are second-language English or Afrikaans speakers. He concluded that the performance in this latter, larger category can only be described as abysmal.

Analysing the NSC Grade 12 (matric) class of 2022 results, 69% (n=501 758/725 146) of learners were from non-fee-paying, quintile 1 - 3 schools, while 27% (n=196 034) were from fee-paying, quintile 4 and 5 schools, and 3.5% from independent schools.[16] The NSC results of the class of 2022 indicate that 33 - 35% of quintile 1 - 3 learners achieved a Bachelor pass compared with 37% for quintile 4 and 56% for quintile 5, with the Grade 12 pass rate also increasing from 76% for quintile 1 schools to 90% for quintile 5 schools.[16] Further, only 22% (n=59 450) of learners of the class of 2022 achieved ≥50% in mathematics, while 30% (n=63 457) attained at least 50% in physical science.[16] Forty-nine percent of learners achieved between 40% and 100% for life sciences.[16] These results indicate that the number of Grade 12 learners from quintile 1 - 3 schools eligible for entry into Science, Technology, Engineering and Mathematics (STEM) degrees would be limited.

Van Broekhuizen *et al.*[12] reported that of the quintile 1 - 3 schools' students who obtained a Bachelor pass, relatively high percentages (between 63% and 68%) enrolled at university, and that 45% of those who were enrolled in undergraduate studies had completed their degrees 6 years later, which was similar to the 46% of learners from quintile 4 schools and the 56% of learners from quintile 5 schools.[12]

The Umthombo Youth Development Foundation (UYDF) seeks to address the shortages of healthcare professionals in rural areas by investing in the training and support of rural youth, as they are more likely to live and work in rural areas after graduation.[6-8] The majority of students selected and supported by the UYDF completed their schooling at a quintile 1 - 3 school, as most schools in rural areas are quintile 1 - 3 schools due to the socioeconomic status of the communities. In addition to financial support, the UYDF's main intervention is the provision of academic and social mentoring support to its students.[7] Despite matriculating from some of the poorest schools, the 2008 - 2015 cohorts of UYDF-supported allied health science students exceeded the national statistics in terms of throughput rate and time to completion, and matched the national medical throughput rates, while completing their studies in a shorter time than the national statistics indicate.[17]

This study seeks to investigate how rural origin learners supported by the UYDF, the majority of whom attended quintile 1 - 3 rural schools, achieved school-leaving results that enabled them to be accepted to study for a health science qualification. The results will be valuable for assisting other rural learners, and learners at quintile 1 - 3 schools specifically, to overcome the challenges they face, thus improving their post-secondary school opportunities.

Methods

This was a cross-sectional, retrospective study with a survey developed from themes obtained from UYDF student stories. All students supported by the UYDF are required to submit a story of themselves, highlighting information about their background, the reason they chose to study for a health science qualification, as well as their dreams and hopes once qualified. These stories were used to compile questions for a survey to better understand their background, the type of school they attended, including the resources available, as well as how they were able to achieve school-leaving marks that gained them entry into a health science programme. The survey was compiled in Google Forms and emailed to 211 UYDF students of the class of 2024, providing a brief background of the study and inviting them to participate. It was highlighted that their participation was voluntary and unrelated to the support they currently receive from UYDF or future support. Of the 211 students invited to participate, 188 valid responses were received (89% response rate). The results from the survey are presented and extracts of the stories of two 2023 graduates are included to provide greater insight into the data.

Ethical approval was obtained from the University of KwaZulu-Natal Biomedical Research Ethics Committee (ref. no. BREC/00002918/2021).

Results

Ninety-nine percent of the students were born in KwaZulu-Natal, with 44% originating from the Zululand District, followed by 33% from the Umkhanyakude District. Fifty-three percent of participants (n=99) were male and 47% (n=89) were female. Ninety-one percent of the students completed primary schooling in their district, and 88% completed secondary schooling in their district (Table 1). Eighty-one percent of participants (n=152) completed their secondary schooling at a non-fee-paying quintile 1 - 3 school, 13% (n=24) at a fee-paying quintile 4 school, and 2% (n=3) at a quintile 5 school. Five percent (n=9) completed Grade 12 at an independent school (Table 1). Nine of the 10 independent schools were situated in rural areas.

Students were asked to list the physical resources and availability of mathematics, physical science and life sciences teachers at their secondary school (Table 2). Just over half (54%) of the respondents reported that there were sufficient teachers, and 69% reported that there were sufficient classrooms (Table 2). The availability of science and computer laboratories was low, with only 20% of respondents reporting that their school had

either. Most schools had no career guidance councillor. Fortunately, >90% of respondents indicated that they had a mathematics and life sciences teacher in Grades 11 and 12, whereas 88% reported having a physical science teacher in those grades (Table 2).

Twenty students (11%) (188 - 168 – Table 2) reported not having a physical science teacher for part of Grades 11 and 12, 13 students (7%) (188 - 175 – Table 2) reported not having a life sciences teacher for part of Grades 11 and 12, and 12 students (6%) (188 - 176 – Table 2) reported not having a mathematics teacher for part of Grades 11 or 12. When asked how they managed without a teacher, the following is a summary of their responses: Self-study using textbooks, YouTube videos and past examination papers; attending extra lessons at neighbouring schools; teachers from other schools coming to their school to teach occasionally; teaching one another – the best students would teach the rest; and study groups where they would share knowledge and teach each other.

Table 1. Demographic data

Variable	*n* (%)
Province of birth	
KwaZulu-Natal	186 (99)
Other	2 (1)
District	
King Cetshwayo	40 (21)
uMkhanyakude	63 (33)
Zululand	83 (44)
Other	5 (3)
Gender	
Female	89 (47)
Male	99 (53)
Completed school in the district	
Primary	171 (91)
Secondary	166 (88)
Type of secondary school	
Quintile 1	57 (30)
Quintile 2	60 (32)
Quintile 3	35 (17)
Quintile 4	24 (13)
Quintile 5	3 (2)
Independent	9 (5)

Table 2. List of resources at secondary school

Resource	Agrees with the statement, *n* (%) (*N*=188)
Enough classrooms	132 (70)
Enough textbooks for all learners	59 (31)
Library/resource centre	29 (15)
Computer laboratory	38 (20)
Science laboratory	39 (21)
Flush toilets	59 (31)
A career guidance counsellor	10 (5)
Sufficient teachers	105 (56)
Mathematics teacher for Grades 11 and 12	176 (94)
Physical science teacher for Grades 11 and 12	168 (89)
Life sciences teacher for Grades 11 and 12	175 (93)

Despite the obvious lack of resources (Table 2), the students in this study did remarkably well in their Grade 12 examinations (Figs 1 and 2). Regarding their Grade 12 results for English, which was their first additional language, 60% achieved 76 - 85%, with only 10% achieving ≤70% (Fig. 1). Regarding, *isiZulu*, which was their home language, 61% of students achieved 81 - 90%, with only two students achieving ≤70% (Fig. 1).

Seventy-four percent of students achieved between 76% and 100% for mathematics in Grade 12, 80% achieved between 76% and 100% for physical science, and 90% achieved between 76% and 100% for life sciences (Fig 2).

Breaking down the mathematics results by quintile, students from quintile 1 - 3 schools did relatively well: 64% of quintile 1, 75% of quintile 2 and 76% of quintile 3 students achieved between 76% and 100% for mathematics compared with 82% for quintile 4, 67% for quintile 5, and 88% for students attending independent schools (Fig. 3).

Students were asked how they achieved their marks in Grade 12, especially as the majority attended resource-poor schools. Ninety-six percent attributed their good marks to their hard work and dedication, including going through past examination papers (90%), whereas 78% ascribed their success to having good teachers and the extra lessons their teachers provided (66%) (Table 3). Only 47% of students rated participation in study groups as a reason for their achievement. Excellent family support, as well as a lack of education within their families and therefore a desire to improve their socioeconomic status, served as motivation for nearly 60% of the participants (Table 3).

The stories of two 2023 graduates are presented to supplement the abovementioned data. One matriculated from a quintile 2 rural school with seven distinctions from nine subjects, enrolled to study medicine at the University of KwaZulu-Natal and completed his degree *cum laude*. He described his situation as follows:

> 'There were 107 students in our matric class, and not enough textbooks, if it weren't for the teachers, I would not have gotten the marks I did. During the extra lessons, they [the teachers] spent more time on various topics and even introduced new concepts.'
>
> 'I was motivated to do well by my home situation – no one was working as my father was retrenched in 2014, so we lived off social grants. I am the eldest, and so I was motivated to bring about a positive change. I knew I had to study hard to go to university and get a qualification so I could get a skilled job. When I arrived at university senior students told me about getting your degree *cum laude*, and that students who achieve it are acknowledged above others at graduation by people standing and clapping for them. That's when I decided I wanted to complete my degree *cum laude*.'

The other graduate reported being unhappy with her life and situation and so returned to Grade 10 at a quintile 2 secondary school to improve her Grade 12 marks, and subsequently completed Grade 12 with seven As. She enrolled at the University of KwaZulu-Natal and completed her pharmacy degree *summa cum laude*.

Discussion

This study sought to understand how rural origin Grade 12 learners currently supported by the UYDF, the majority of whom attended quintile 1 - 3 rural schools, achieved Grade 12 results that allowed them to be accepted to study for a health science qualification at an SA public university. It is clear that the majority of schools that the students attended were resource poor, having a lack of textbooks, no libraries or computer

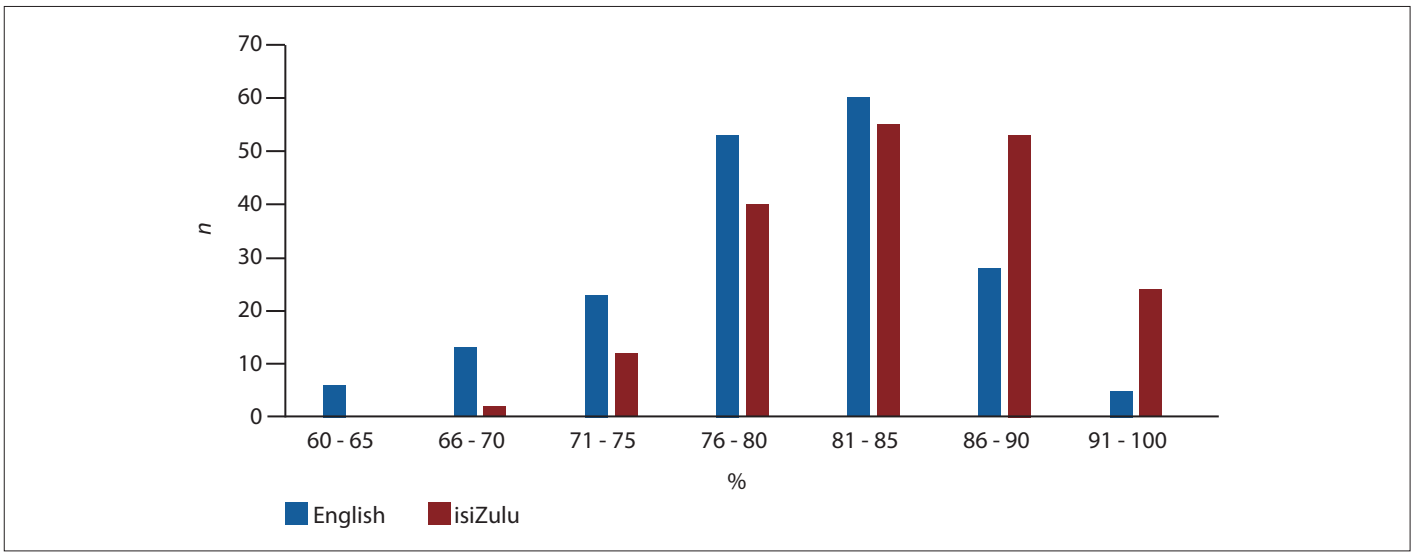


Fig. 1. Grade 12 English and isiZulu results.

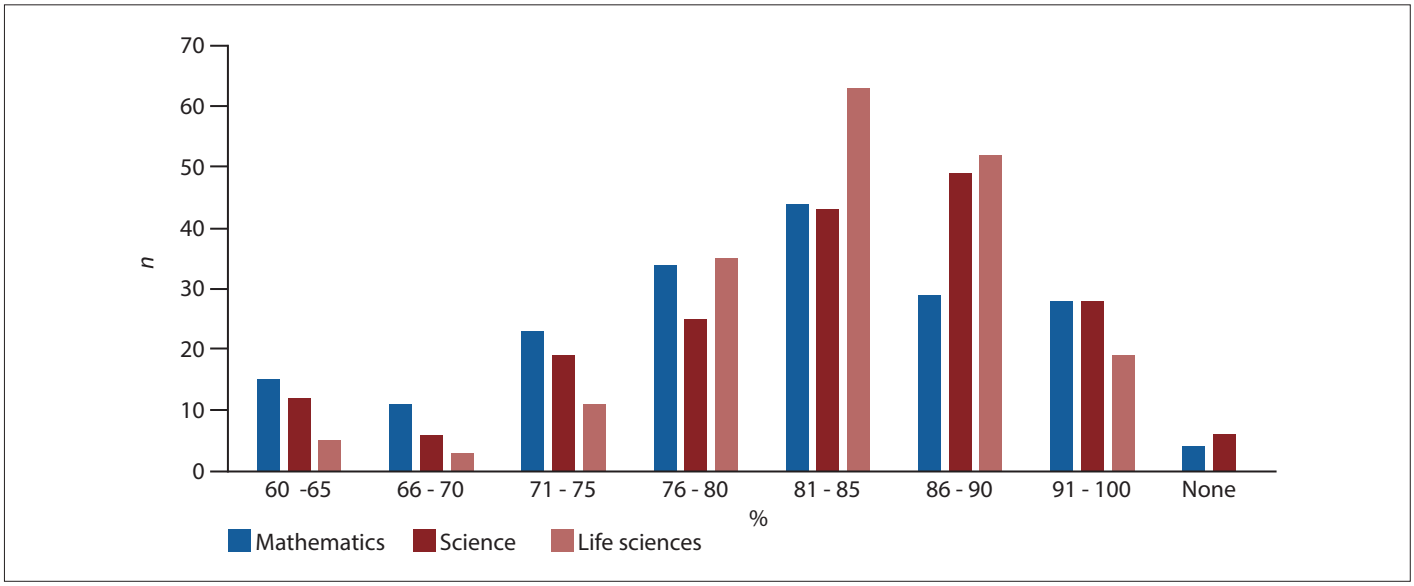


Fig. 2. Grade 12 mathematics, physical science and life sciences results.

centres, including shortages of teachers, especially for physical science (Table 2). Despite the lack of these critical resources, their Grade 12 results were good (Figs 1 and 2). There were slightly more male students (53%) than female students (47%), but the Grade 12 results presented were not analysed by gender. The NSC Grade 12 class of 2022, of which 69% of learners were from quintile 1 - 3 schools, reported that only 22% (*n*=59 450/233 315) of learners achieved ≥50% in mathematics, while only 30% (*n*=63 457) attained at least 50% in physical science,[16] highlighting that in comparison, the students in this study, of whom 81% were from quintile 1 - 3 schools, were exceptionally high achievers. The academic performance in the NSC examination, and for some universities the National Benchmark Test (NBT) results, are the main criteria used in the selection of medical students.[11] These are complemented in some cases by non-academic factors, such as leadership, sport, cultural aspects, community engagement and service, measures of disadvantage such as family income, school and rural origin, personal reports and interviews, that contribute 10 - 25% to the selection score.[11] The minimum academic requirement for medicine is at least a level 5 (60 - 69%) NSC mark in English, mathematics, physical science and life sciences.[11] The NSC results of the UYDF students who participated in this study (Figs 1 and 2), and highlighted above, show that academically all of them would have met the minimum requirements to study medicine, although the selection is not based on academic merit alone (medical students comprised 65% of the survey participants, while the others covered 12 different health science disciplines).

The students attributed their success primarily to their hard work and working through past examination papers, which indicates a self-motivation to take control of their own lives, ostensibly inspired by the desire to improve their home situation. The role of teachers and the extra lessons they provide cannot be overlooked in terms of their success, as highlighted by the medical graduate who indicated that the teachers assisted them, which contributed to his excellent Grade 12 results, despite the lack of textbooks and the large number of students in a class.

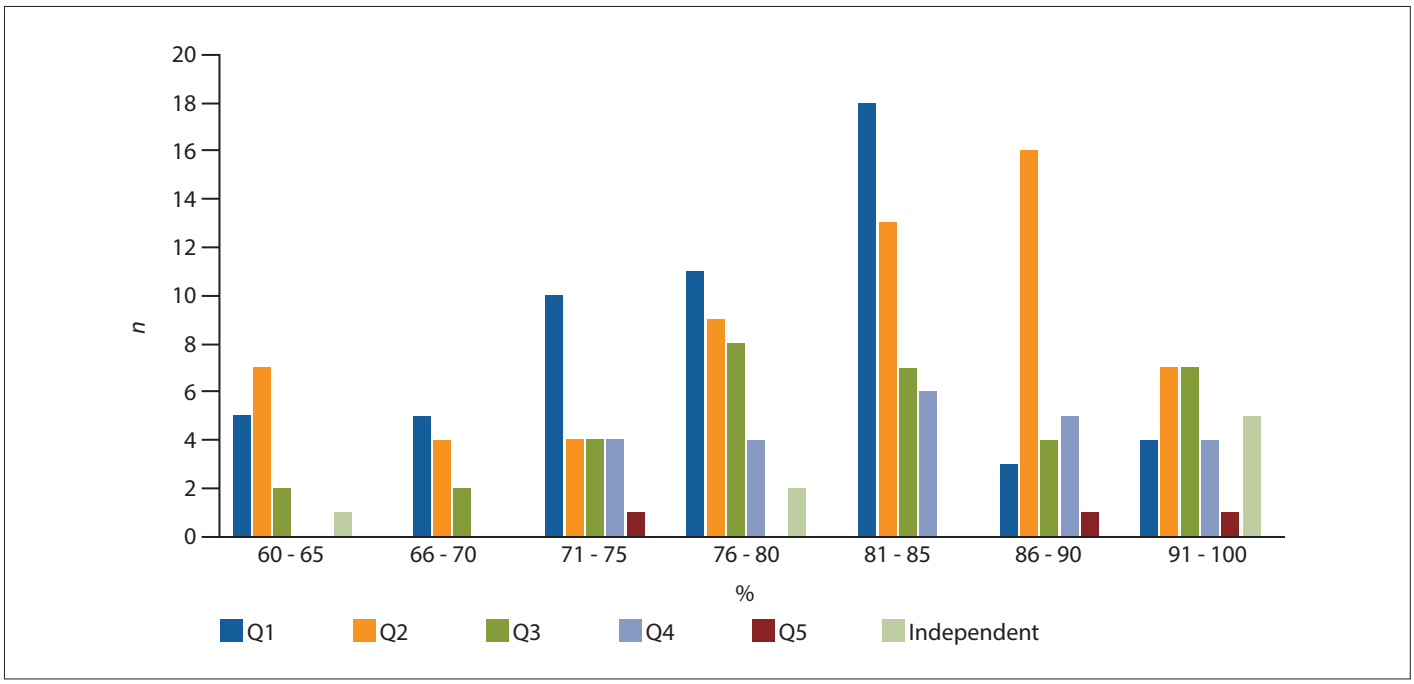


Fig. 3. Grade 12 mathematics results by quintile. (Q = quintile.)

Table 3. Participants' ranking of the reasons for Grade 12 success

Reason for school success	*n* (%)
Hard work and dedication	181 (96)
Going through past examination papers	170 (90)
Good teachers	147 (78)
Extra lessons provided by teachers	124 (66)
Excellent family support	112 (62)
Lack of education in your family and your desire to improve the situation	106 (56)
Participating in study groups	84 (47)
Excellent role models – teachers, past pupils, professionals, leaders in the community	77 (41)
An environment that encouraged you to excel at school	62 (33)
Excellent resources at your school	7 (3)

These results underline an inherent drive among these young school learners to improve their situation and maybe the 'grit' and maturity that employers seek. Ismail *et al.*,[18] in a study investigating the motivation of Grade 12 learners in a quintile 3 school in the Western Cape Province, reported that some participants indicated that their unsatisfactory home situation motivated them to learn and better themselves to change these circumstances. The medical graduate mentioned above, who matriculated from a quintile 2 school in KwaZulu-Natal with 7 distinctions (including 95% in physical science, 93% in mathematics, and 85% in life sciences),[19] cited his family's situation of unemployment and his role as the eldest sibling as key motivators for working hard at school and university to bring about positive change. This is further highlighted by the other UYDF graduate mentioned above, who was unhappy with her life and situation, and therefore returned to secondary school for 3 years to obtain Grade 12 results that would allow her to study pharmacy, and subsequently graduated *summa cum laude*. Furthermore, Ismail *et al.*[18] conclude that motivated learners have realised that studying at school is the only viable and realistic hope they have of avoiding the hardships of their parents' lives and escaping their current circumstances. These two graduates were not the only exceptional students to achieve impressive results, as 15% of students in this study achieved between 91% and 100% for mathematics, with 54% achieving ≥81%. Likewise, 15% achieved between 91% and 100% for physical science, with 64% achieving ≥81%.

Ismail *et al.*[18] and Letsoalo[20] have shown that parental involvement is a strong motivator for learners, which was confirmed in this study, where 62% of students reported that 'excellent family support' motivated them to do well, despite the family being poorly educated.

Ismail *et al.*[18] also highlighted that recognition by parents, peers and teachers serves as motivation to do well, often captured as 'I want to make my parents (mother, grandmother, father) proud'. One of the participants in the study reported that he wanted to make his family proud because they played a large part in his high school success by encouraging and helping him, while the medical graduate, after learning that by completing one's degree *cum laude*, one is acknowledged highly at graduation by people standing and clapping, decided he wanted to complete his degree *cum laude*, confirming that recognition can be a powerful motivator.

Study limitations

There is no way to establish what percentage of learners excelled at the schools represented by the students in this study, and therefore whether these students were the exceptional few or part of a larger group. Also, this study does not link the Grade 12 success reported here with their success at university.

Conclusion

Despite matriculating at non-fee-paying quintile 1 - 3 schools, students through their hard work and dedication, good teachers and extra lessons, were able to achieve Grade 12 results that allowed them to meet and even exceed the entry requirements for medical and allied health sciences study

programmes at SA universities. Students were motivated to work hard to gain university entry because of their poor family circumstances and their desire to improve the situation. Using past examination papers could be a strategy promoted more widely to help students in quintile 1 - 3 schools better prepare for assessments, thereby improving their examination results and post-school options.

Data availability. None.

Declaration. No artificial intelligence (AI)-assisted technologies have been used in the preparation of this work.

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Conflicts of interest. None.

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