

An Innovative Strategy to address shortages of healthcare personnel in South Africa

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Abstract

Background: In order to improve health in low- and middle- income countries the basic health infrastructure needs to be upgraded. Part of the problem is the shortage of skilled healthcare professionals (HCP) particularly in rural areas. The Umthombo Youth Development Foundation (UYDF) is a non-profit organisation (NPO) established in 1999 to assist in addressing shortage of HCPs in rural areas. The aim of this study is to measure the success of the UYDF bursary scheme in achieving this goal by calculating the cost of supporting rural students and estimating the benefits in relieving the shortage in terms of the financial return on investment.

Methods: The sources of the data were the UYDF organisational records (finance, human resources and procurement), supplemented by the published and unpublished UYDF reports. The return on investment was estimated through the use of an Internal Rate of Return (IRR) calculation.

Results: The UYDF database of beneficiaries showed that by the year 2017 a total of 337 HCPs had graduated and a further 254 were still studying. An average of R17 million was spent every year on the students or R102 015 per student per year. The IRR was 63% higher than interest rates on commercial loans. These graduates are expected to generate an estimated R15 billion in lifetime earnings, which would be equal to R4 billion at current prices.

Conclusion: The UYDF scheme relieved the shortage of HCPs in rural hospitals, and the hospitals were able to retain the service of many of the locally sourced HCPs. The costs of implementing the bursary scheme were outweighed by the income generated from salaries, and taxes contributed to the country's economic development.

Background

The shortage of healthcare professionals (HCPs) is a global problem, and the greatest burden is borne by low-income countries, particularly in sub-Saharan Africa and some parts of Asia.^{1,2,3} This is not only a public health concern but also a concern for the socio-economic development of low-income countries. The shortage of HCPs has not only prevented the achievement of health-related sustainable development goals but has also impacted on the quality of health care especially in rural areas.²

Background to Umthombo Youth Development Foundation (UYDF)

The Umthombo Youth Development Foundation (UYDF), originally called Friends of Mosvold Scholarship Scheme, provides funding to students from rural areas of KwaZulu-Natal Province in South Africa. The UYDF recruits and funds rural students to be trained in the health sciences and provides social and academic mentoring throughout their training. Upon completion of their degrees they return to serve in hospitals near their rural homes.^{4,5} The scholarship scheme started in January 1999 in Ingwavuma, an area with few clinics and schools and limited access to employment opportunities.⁶ Many homes are situated far from major routes, and the roads are bad. The aim of the scheme was to address the

shortage of qualified healthcare workers at rural hospitals through the training and support of rural youth to qualify as healthcare professionals. The scholarship scheme started by supporting four students and the number had grown to 254 students and 337 graduates in various health disciplines by 2017.⁵ After the initial pilot, the scheme was extended to the entire UMkhanyakude district, situated in the north east corner of the province.

The UYDF education and training process involves an integrated model of recruitment at school level, selection of applicants by panels situated at local hospitals, financial support and mentoring during the students' university training. The graduates were required to return to serve in local hospitals for the amount of time they had been supported at university.^{6,7,8} The hospital management team identifies skills required at their facility, and assists with the student selection, training and mentoring. The students were recruited in accordance with the required skills at the participating hospitals and were guaranteed employment on completion of their training in accordance with the Memorandum of Agreement signed by the Foundation and the KwaZulu-Natal Department of Health.

In 2008 the scheme expanded further to neighbouring districts in northern KwaZulu-Natal and part of the Eastern Cape Province. Up to this time the scheme was staffed by volunteer workers, but in 2008 UYDF was able to appoint two fulltime staff members. One staff member worked closely with the district's Department of Education and rural schools in the participating districts to identify and train career guidance teachers. These career guidance teachers taught learners about careers in the health sciences and encouraged suitable candidates to apply for the bursaries and for places at universities. Interested learners were invited to attend the Hospital Open Days, where they would learn more about the specific health science disciplines.

The selection committee consisted of hospital and community representatives, with an UYDF staff member assisting the committee and playing an oversight role. The criteria for student selection were: they should i) come from the area; ii) have obtained a place at a university to study for a health science degree; iii) have done at least one-week voluntary work at the hospital; iv) have financial need; and v) be willing to sign a work back contract to serve an equal number of years to their study years in the hospitals that selected them. Once selected and registered at university, the UYDF assigned a local mentor to the student and they were required to meet monthly. The students at each campus were required to form a group and meet once per term to assist each other academically. The local mentor assisted students to settle down in the new environment and to participate effectively in their academic programme. The mentor also held them accountable to the Foundation's requirements.

As part of the mentoring support, students were required to do at least four weeks' holiday work a year at their local hospital. This was an opportunity to build relationships between the hospital staff and the students. Another component of the mentoring support was the Student Life Skills' *Imbizo* (meeting to discuss crucial issues) which is held at the end of each year. The purpose of the *Imbizo* is to develop the "soft" skills among the students and hence involves topics such as self-motivation; overcoming the pitfalls that youth face such as drugs, early pregnancy, peer pressure; and absorbing the good values and

ethics of committed health care workers. The employment of graduates by government was facilitated by the collaboration between the Foundation, the hospitals and the Provincial Department of Health.⁵

Aims and Objectives

The aim of this paper is to describe the role played by the non-profit organization in addressing HCP shortages in rural hospitals, and the objectives are:

1. To quantify the number of students and graduates that UYDF has produced from 1999-2017 by their demographic characteristics.
2. To use a sample of completed baseline and post-programme data to indicate the socio-economic impact that the organisation has had on its current students, and on the graduates employed in rural hospitals.
3. To assess the cost of the UYDF bursary scheme, showing the components of this investment and to estimate the potential return on investment through the use of an Internal Rate of Return (IRR) calculation.

Methods

A quantitative approach was adopted for this study. Data came from three sources: the student database of the UYDF from 1999-2017; the organisational records (finance, human resource and the procurement department of the UYDF; and secondary data from published and unpublished reports of the UYDF, supplemented by information from other organisations doing similar work. The study was conducted in the province of KwaZulu-Natal, South Africa from October 2017 to November 2019. This is a descriptive analysis to quantify the contribution and evaluate the socio-economic impact of the UYDF model. The UYDF documents were reviewed and supplemented with related literature.

Analysis

The student and graduate data from UYDF were verified and merged in an Excel document. Descriptive analyses were conducted, and the results tabulated. A cost analysis was undertaken for the years 2009 to 2017 from a provider perspective to establish the actual cost of funding the education of the beneficiaries. This involved the identification of all costs related to the educational support of the potential health care professionals in the accounts and administrative records of UYDF. The costing was done across five major categories: recruitment, education support, mentorship, post graduate support and administration. *Recruitment* included the costs of school marketing, hospital open days and selection interviews, and salary costs for activities intended to recruit students. *Education support* included the costs of university fees, accommodation, books, meals, equipment, uniforms, professional registration fees and so forth. *Mentorship* included costs related to the provision of mentoring support to students, such as the salary, travel and accommodation costs for the UYDF's full-time mentor, stipends and associated costs for the network of local mentors at the different universities, and stipends paid to

students on completion of their holiday work. *Postgraduate support* included costs related to additional training and development of UYDF graduates and other hospital staff. Administration costs included: the salaries of three staff, bookkeeping and auditing costs, overheads, office rental, communication and travel.

The costing adopted an economic perspective, meaning that the opportunity cost of resource use was considered. Recurrent costs included items such as stationery, fuel, utilities and personnel time. Capital costs included items such as vehicles, computers and furniture, and other items whose useful life was more than a year and were annualised. The annual economic cost of capital items was calculated using a discount rate of 6% (the Central Bank's annualised rate). Useful life years used were 10 years for furniture, 3 years for vehicles and 4 years for the office equipment and computers. All costs were adjusted to 2015 prices using the Consumer Price Index (CPI).

The costs were aggregated into a total project cost and divided by the number of students in each year to obtain an annual average cost of supporting a student. Average costs are also provided per study discipline.

Return on investment

The purpose of this analysis was to assess whether the programme was a worthwhile investment. The real benefit was the improvement of health outcomes in the rural areas where the graduates work, but this is difficult to quantify and assign a monetary value. For this reason, the researcher took the amount which the state is willing to pay to place a HCP in a rural hospital as a proxy of the social value. The return on investment analysis was done in several stages. First, the cost of gaining an education was calculated. This included the cost of supporting a student through university (the cost of the bursary as described above) and the opportunity cost of education, which was considered to be the wages forgone in the period that a student stayed at the University. The annual salary of clerks and cashiers coming straight from school was used as the proxy for wages. Secondly, the annual wage streams for the various cadres of health personnel produced by UYDF were estimated. The wage streams were calculated over the expected working life of all graduates. An assumption was made that the average graduate will leave university to start work at 22 years and retire at the age of 65. The salary data for public health workers in 2015, obtained from the Department of Public Service and Administration, were used to calculate wage streams, assuming an annual increase of 5%. The combined wage streams during this period were used as the proxy for the benefit to the economy and society at large.

Using the costs and wage streams as calculated above, the internal rate of return (IRR) on the UYDF bursary and the net present value (NPV) of the expected benefits were calculated. The IRR measures the efficiency of an investment and can be used to assess the profitability of an investment. The higher an investment's IRR, the more desirable it is to undertake the investment. The NPV allows for the expression of future costs and benefits in terms of the current prices. A discount rate of 6% was used for the NPV.

Results

Demographic Characteristics of UYDF students and graduates 1999-2017

This section presents data on students supported by UYDF who were registered in full-time studies in universities, and the total number of HCP graduates from the start of the UYDF up to 2017. This second group includes those who had completed their year by year work back obligation periods and those who had not, those who had joined the private sector or specialized and started their own private practices as well as those who have died since graduation.

Students and graduates from 1999-2017

Since 1999, a total of 335 health science students of rural origin have graduated while being supported by UYDF. Of this total, 113 are medical Doctors. The programme expanded from one hospital in 1999 to 15 hospitals in KwaZulu-Natal province and two hospitals in the Eastern Cape Province by 2015. Student numbers of those supported annually increased from 4 in 1999 to 254 in 2017.^{9,21} The average annual university pass rate over the past five years has been 92% even though the schools in rural areas are generally under-resourced, and this success is probably a result of the mentoring programme. This demonstrates that the shortages of healthcare professionals at rural hospitals are being addressed in the sub-districts where the UYDF is active. Furthermore, 63% of the graduates who have completed their work back obligations, are still working in rural hospitals and a further 6% are working for rural non-profit organizations, indicating a high retention rate of HCPs in the area.

Figure 2 shows the gradual increase in the number of graduates and a jump from four students in 1999 to nearly 350 graduates in 2019 (not shown in this Figure). This suggests that if the funding had increased tenfold, this could have produced 3500 graduates to date, a number which could ease the shortage of health care professionals in the country. Other locally based NPOs have also supported students and some HCPs are being trained abroad in Cuba, Indian, China, Europe and America¹⁰, but the unique advantage of the UYDF model is that it provides a sustainable retention strategy for HCPs in rural areas.

Analyses of the potential costs and benefits of the UYDF approach

In order to examine the financial benefits that the UYDF generates from expenditure on each student at university to graduation, the potential benefits of the UYDF programme to the economy were examined in two scenarios. In the first instance the impact of raising the throughput rates for the students in the UYDF programme was estimated, assuming that pass rates were comparable to the national average. In the second scenario, the UYDF throughput rates were applied to the national student numbers. Total costs, lifetime earnings and the net present value of investments were calculated in order to estimate the average benefit of a bursary provided by the UYDF.

Average cost of the UYDF bursary

In the period 2009 to 2015, the UYDF provided approximately 166 bursaries a year. The estimated annual cost of these bursaries was R17m (Table 1 and Figure 3). About 75% of the total cost was spent on education support, 15% on administration and 8% on mentorship.

Table 1. Total and average annual costs of supporting students, ZAR (2015 prices)

Cost centre	Total cost	Cost per student	Percent
Recruitment	109,821	663	0.6%
Education support	13,022,407	78,583	77.0%
Mentorship	1,221,051	7,368	7.2%
Post graduate support	101,842	615	0.6%
Administration and overheads	2,273,861	13,722	13.5%
Capital costs	176,301	1,064	1.0%
Estimated cost per year	16,905,283	102,015	100.0%

The UYDF supports students of medicine and allied health science disciplines. Money is spent annually on recruitment of new students, students' books, meals, administration fees, post-graduate support and on the mentorship of students at traditional academic universities and universities of technology in South Africa (see Figure 3).

The cost of accommodation varied greatly for students, depending on where the university was situated and, in some cases, was equal to or more than the cost of university fees. The fee structure also differed across universities and disciplines.

Return on investment

A total of 254 graduates had been supported by the UYDF scheme (2009 – 2015). The total cost of training these graduates was estimated to be R186 million (Table 2). Table 2 below is calculated on the assumption that these personnel would remain in their respective professions for the remainder of their working lives, but not necessarily in the same rural area. Some of the medical staff would specialise and perhaps move to a tertiary hospital, where they would serve the broader community. Some might transfer to private practice, but it is unlikely that any will leave the health system entirely, and some are likely to remain in their rural areas.

These graduates are expected to generate an estimated R15 billion in lifetime earnings, which would be equal to R4 billion at current prices (2019). A weakness of the calculations in Table 2 is that it is impossible to calculate what the graduates would have earned without their university qualification. The IRR is 63%, higher than the interest rates on commercial bank loans, showing that the UYDF is a highly efficient programme.⁴ For example, the types of IRR's that would be considered satisfactory in

commercial settings might be 10% for acquisition of a stabilized asset, 15% for acquisition and repositioning of an ailing asset, 20% for development in established areas and 35% for development in an outstanding unproven area.

Table 2. Costs- benefits of UYDF graduates, ZAR (2015 prices)¹

	Disciplines	Graduates	Total cost	Lifetime earnings	NPV	IRR
1	Occupational Therapy	5	3,384,293	198,093,126	56,732,609	46%
2	Radiography	20	13,537,171	798,263,387	228,617,547	46%
3	Pharmacy	19	12,860,312	1,497,155,785	428,775,876	86%
4	Biomedical Technology	14	8,047,815	542,987,675	155,508,210	52%
5	Nursing	32	21,659,474	980,647,587	280,851,220	37%
6	Physiotherapy	20	13,537,171	798,263,387	228,617,547	46%
7	Medicine	79	69,590,138	7,539,302,053	2,159,208,063	81%
8	Dental Therapy	9	5,173,595	329,530,887	94,375,546	50%
9	Dietetics	8	5,414,868	320,499,764	91,789,090	46%
10	Optometry	12	8,122,303	479,754,305	137,398,576	46%
11	Speech Therapy	8	5,414,868	320,499,764	91,789,090	46%
12	Social Work	14	9,476,020	431,033,007	123,445,106	37%
13	Psychology	7	4,738,010	578,601,746	165,707,853	90%
14	Environmental Health	1	676,859	39,980,080	11,450,040	46%
15	Nutrition	1	676,859	41,804,317	11,972,490	48%
16	Clinical Associate	1	574,844	37,667,577	10,787,754	51%
17	Dentistry	4	3,115,493	380,556,795	108,989,041	90%
	Total	254	186,000,091	15,314,641,244	4,387,131,017	63%

To calculate the present value of the future income, the research team assumed that 20-30% of this will be paid in tax, then the present value of future tax is R4 Billion and this would more than pay for the programme. Had beneficiaries not been involved in the programme they would have nonetheless gone on to work and pay taxes. It is unlikely, however, that if we were able to consider their earnings, without these qualifications, that they would be sufficiently high to change the conclusion that this programme will pay for itself.

Given that once the graduates are working as qualified professionals, they will pay a significant amount of tax over their lifetimes (20–30%, estimated here as R4 billion), the costs of the UYDF investment will be

paid for several times over as shown in Figure 4. Thus, the money spent on a student can be viewed as an investment and not an expense. The returns from each individual graduate including their taxes and the private practices of those who specialise and open their own surgeries and other things are the good returns on investment.

Definitions

NPV is the acronym for net present value. Net present value is a calculation that compares the amount invested today to the present value of the future cash receipts from the investment. In other words, the amount invested is compared to the future cash amounts after they are discounted by a specified rate of return.¹¹

Internal rate of return (IRR) is the "annualized effective compounded return rate" or rate of return that makes the net present value of all cash flows from a particular investment equal to zero, in other words, the rate at which an investment break even. It is used in capital budgeting to measure and compare the profitability of investments. This excludes external factors such as inflation.¹¹

The return on investment for UYDF graduates is presented in the following sections based on the calculations made for each of the cases. First the costs and benefits of the mentoring programme and secondly the UYDF model is extrapolated to the national scale.

Costs and benefits of the mentoring programme

The UYDF has been successful in assisting many underprivileged youths to graduate from university, achieving a pass rate of 93% in the last four years. In comparison, the throughput rates for undergraduate students in South African Universities are quite low. A Department of Higher Education and Training (DHET) report¹², which followed cohorts of first-time undergraduate entrants between 2000 and 2008 showed that in the 2008 cohort, the throughput rates were 42% after four years and 61% after 6 years.

This shows that the low throughput rate in the system could be quite costly. The UYDF model provides an example of how these losses can be minimised. The pass rate achieved by UYDF-supported students has been mainly attributed to the UYDF mentorship programme, which provides students with sufficient support to enable them to cope with both the academic and social pressure. The potential loss associated with non-graduating and failing students was estimated by applying the throughput rates provided in the DHET report to the UYDF cohort of 254 graduates: assuming pass rates of 19% after three years, 42% after four years and 61% in year six.

In the analysis provided in Table 3, if the pass rates are adjusted according to the DHET throughput rates, this would imply that only 114 students would have graduated (about 45% of the 254 cohort). Thus, instead of the potential lifetime earnings of R15 billion estimated in Table 2, society would only realise R7.7 billion (or R2 billion instead of R4 billion at today's prices).

Table 3. Analysis applying DHET pass rates to UYDF graduates

	Graduates	Total cost	Lifetime earnings	NPV
Occupational Therapy	2	1,184,502	70,607,451	20,221,524
Radiography	7	4,738,010	280,686,129	80,386,719
Pharmacy	7	4,501,109	526,558,727	150,803,064
Biomedical Technology	5	2,816,735	191,301,708	54,787,590
Nursing	11	7,580,816	344,221,072	98,582,721
Physiotherapy	7	4,738,010	280,686,129	80,386,719
Medicine	51	45,233,590	4,902,215,377	1,403,963,244
Dental Therapy	3	1,810,758	116,519,209	33,370,359
Dietetics	3	1,895,204	113,468,861	32,496,759
Optometry	4	2,842,806	169,207,950	48,460,079
Speech Therapy	3	1,895,204	113,468,861	32,496,759
Social Work	5	3,316,607	151,858,604	43,491,336
Psychology	2	1,658,303	205,177,924	58,761,650
Environmental Health	0	-	-	-
Nutrition	0	-	-	-
Clinical Associate	0	-	-	-
Dentistry	3	1,947,183	239,609,834	68,622,729
Total	114	86,158,838	7,705,587,834	2,206,831,251

The costs were estimated in Rands [ZAR] (31 October 2019) and the exchange rate used is R= US \$ (R15.105 = 1 US \$)

The potential losses are not only in terms of the lifetime earnings (benefits), but also ‘wastage’ of resources that could be spent on supporting students who succeed at university and graduate. In Table 3, a total of 140 students do not graduate. This translates into approximately R100 million that would have been spent supporting students who do not eventually get their qualifications. This R100 million is the opportunity cost to society, as these resources would have been invested in alternative ventures that could yield some future benefits.

Figure 5 illustrates the potential losses associated with non-graduating students. The net present value is halved to about R2 million and society loses about R7 billion in lifetime earnings at lower student pass and throughput rates. Thus, with an investment of approximately R7 400 in mentorship per annum (about 10% of total education support), the UYDF model can result in substantial saving and ensure a higher future earnings potential.

Discussion

Throughout the developing world the provision of health services is often inadequate, and the lack of qualified health care personnel is a major constraint.¹³ Training local people to provide services is an innovative approach that the UYDF has shown to be feasible. The UYDF policy of providing students from rural areas not only with financial support but also with social and academic mentoring, and guaranteed employment in health facilities close to their rural homes has been examined in these cost-benefit analyses. Regardless of financial loss due to a student's slow progress in a university course or for those who do not complete the course, the results of the cost-benefit analysis show that those who graduate and return to work in their rural communities benefit the health services, by providing qualified health care personnel. The analysis shows that is also of benefit to the country's economy, and that their lifetime earnings contribute to the economic development of South Africa.

In the current analysis only 5.7% of graduates either bought themselves out or defaulted, which is, a stark contrast with international finding as suggested below. A review of the Queensland Health Rural Scholarship Scheme, which focused on allied health care professions, reported that 13.7% of the participants had broken their service bonds either before graduation or before completion of their service period.¹⁴

Besides the shortfalls documented above, the findings in this paper demonstrate that most rural students from schools serving very poor communities (categorized by the Department of Education as having non-fee-paying schools) can succeed at university if provided with the necessary financial, academic and social mentoring support, and that graduates will return to work in their local hospitals if it is a condition of that support.¹⁵ Furthermore, many students of rural origin graduates remain at work in rural areas after completing their work back obligations. This confirms that investing in rural youth to address rural hospital staff shortages is indeed a cost-effective strategy.^{16,17}

Policy implications

Policies formulated and implemented to retain HCPs in rural public health facilities, should consider the role played by organizations like the UYDF to assist governments with sustainable HCPs' retention strategies in rural areas. To improve health services in developing countries requires strategies that take account of improving the health facilities, improving the supply of equipment and medication, and improving access to the facilities for communities in rural areas but a key requirement is the adequate number of skilled health care professionals able to attend to the patients' needs.^{18,19} Funding is required

to sustain such a programme and the Departments of Health and Education should be encouraged to contribute. A controversial suggestion perhaps, could be that public health facilities should consider using a portion of their budget allocation to support organizations that train HCPs from rural areas to serve their communities so that after completion of their studies these students return to work in these rural facilities.

The success of the UYDF programme indicates an approach that other low- and middle-income countries could emulate in order to improve the health services in their countries. The critical factor is the attention to detail, as acknowledged and implemented by the UYDF. The organization has recognized the potential of the country's youth and the capability of this cohort of young people to contribute to the country's health services but has also identified the support that is required for such students to succeed. The UYDF mentorship programme therefore is an important contribution that should be used towards reducing the lack of HCPs in rural areas in developing countries.

South Africa is in the process of implementing a National Health Insurance (NHI) policy, which will require a sustainable supply of competent and committed HCPs willing to live and work in underserved areas. The UYDF model has shown itself to be effective for this purpose.

Limitations

There was potential author bias due to the first author's previous affiliation to the UYDF. Data collected at the initial phases of the UYDF (1999 to 2008) had shortcomings so the author confined the sections of analysis only to the years for which sufficient data was available. The recorded data did not include details of the students that did not complete their studies and did not indicate how long each student took to complete his or her training.

Conclusion

The UYDF has made a notable contribution to the reduction in the shortage of HCPs in rural areas in northern KwaZulu-Natal, South Africa. The contribution has not been limited to healthcare facilities but benefits development in rural communities in general and the families of the graduates in particular²⁰ by encouraging the HCPs to remain in their jobs, thus providing regular health services. It has also indirectly contributed to the economy of South Africa as the majority of graduates now work in public health facilities or own their own private practices, and thus are active tax contributors.

List Of Abbreviations

DHET – Department of Higher Education and Training

HCP – Healthcare Professionals

IRR – Internal Rate of Return

NHI – National Health Insurance

NPO – Non-profit organisation

NPV – Net Present Value

UYDF – Umthombo Youth Development Foundation

Declarations

Ethics approval and consent to participate – Ethical clearance was given by the University’s Humanities and Social Science Ethics Committee. The gatekeeper’s letter, given by the Umthombo Youth Development Foundation (UYDF) director, gave permission to use the records of the UYDF for publication as part of the first author’s Doctoral studies (Gatekeepers letter included). Consent to participate is not applicable.

Consent for publication – The authors were given the permission to publish the findings to any journal of their choice or that will be approved by the university as the first author’s is a Doctoral candidate and the permission to use organisation data was given by the Director of the organisation on 28 April 2017.

The data and materials supporting the results can be available from the Umthombo Youth Development Foundation (UYDF) website: <https://www.umthomboyouth.org.za/> and the Director of the UYDF can be contacted for any information that is not available on the website.

Competing interests – The authors declare that there are no competing interests and the views expressed in this paper are not necessarily the views of the UYDF but of the authors.

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Figures

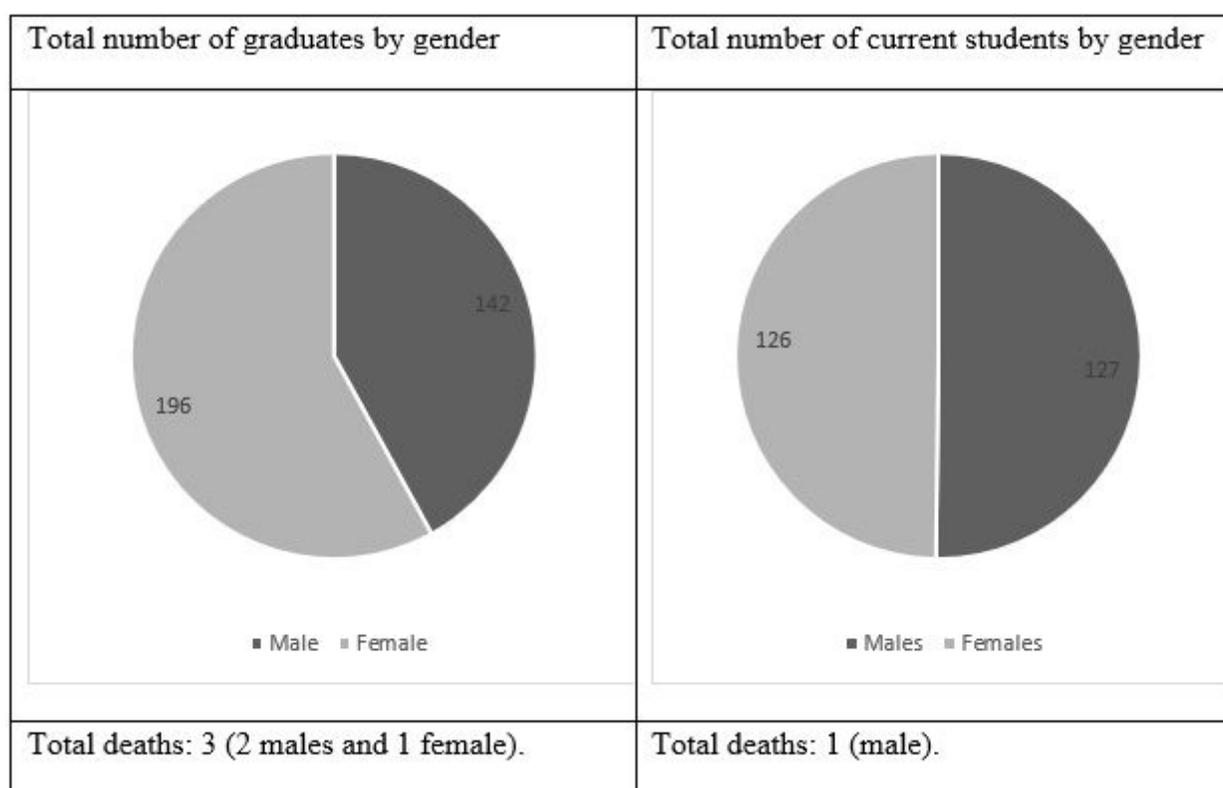


Figure 1

Total number of graduates and total number of students by gender (1999 – 2017)

STUDENT & GRADUATE NUMBERS 1999-2017

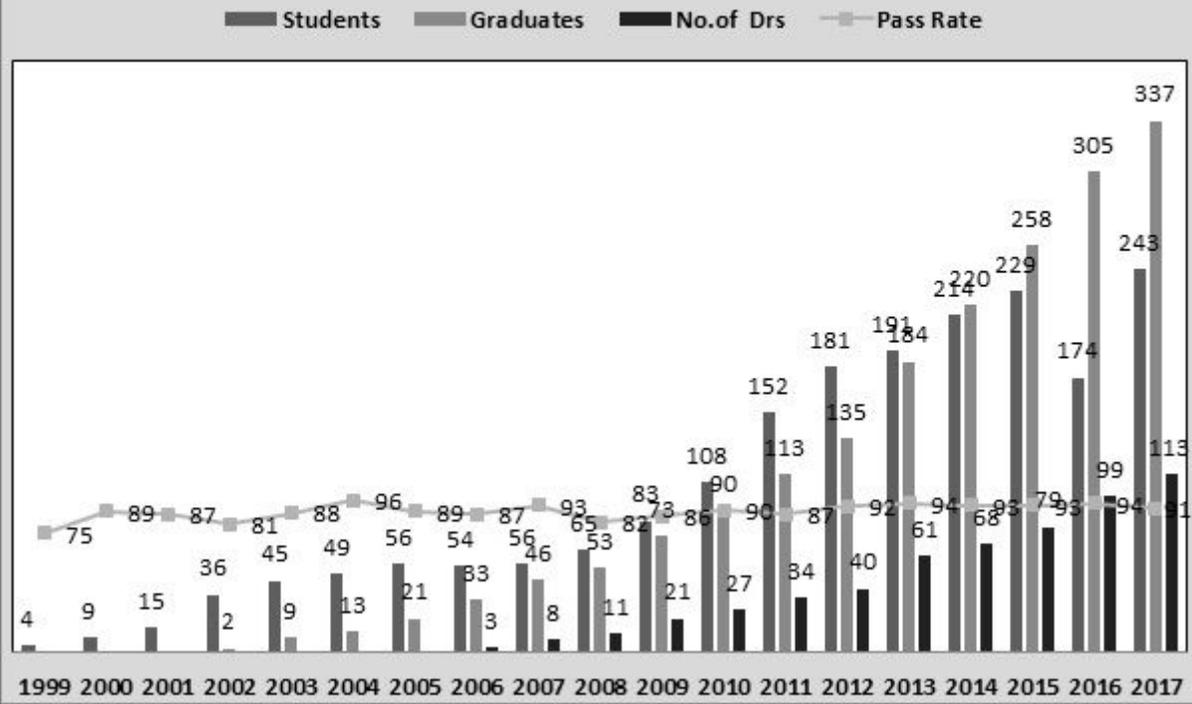


Figure 2

Student and graduates' numbers plus annual pass rate (1999-2017)

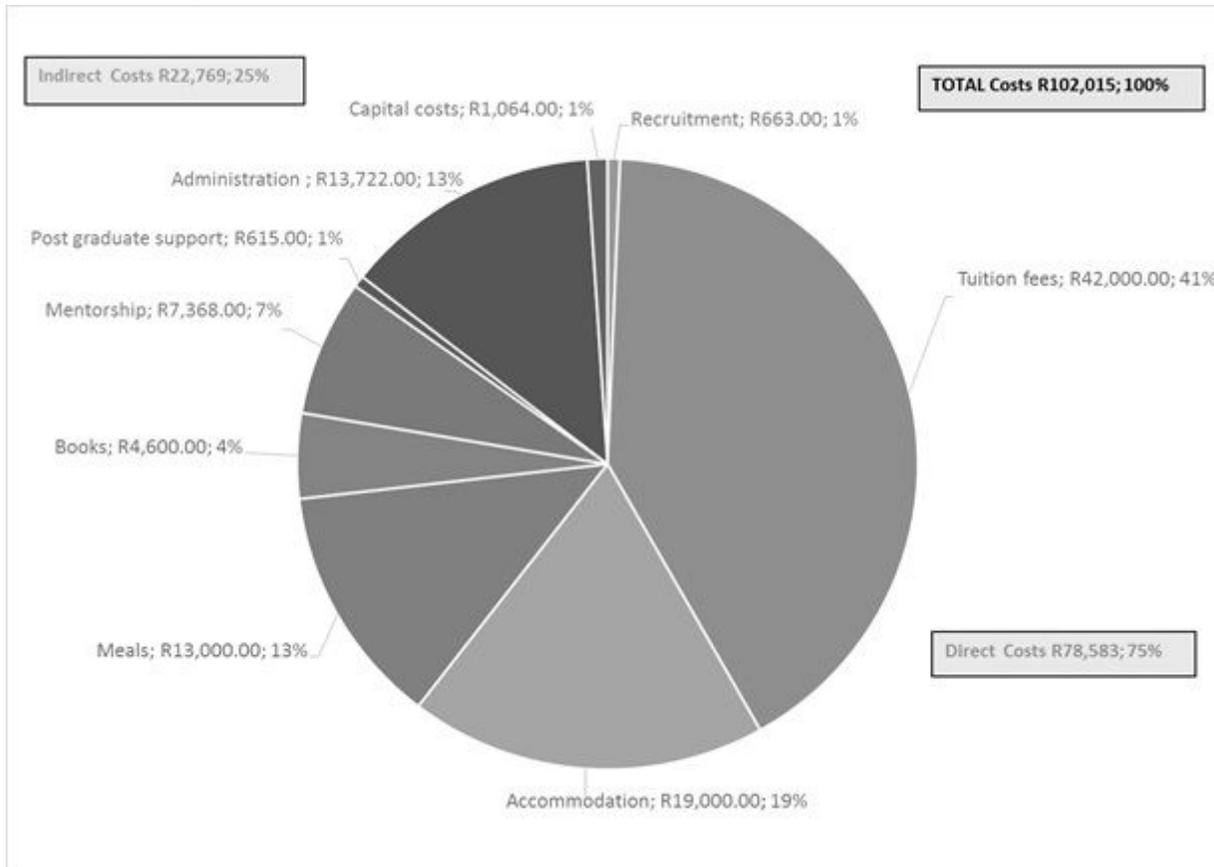


Figure 3

Analysis of the average annual cost structure for a health science student – 2015

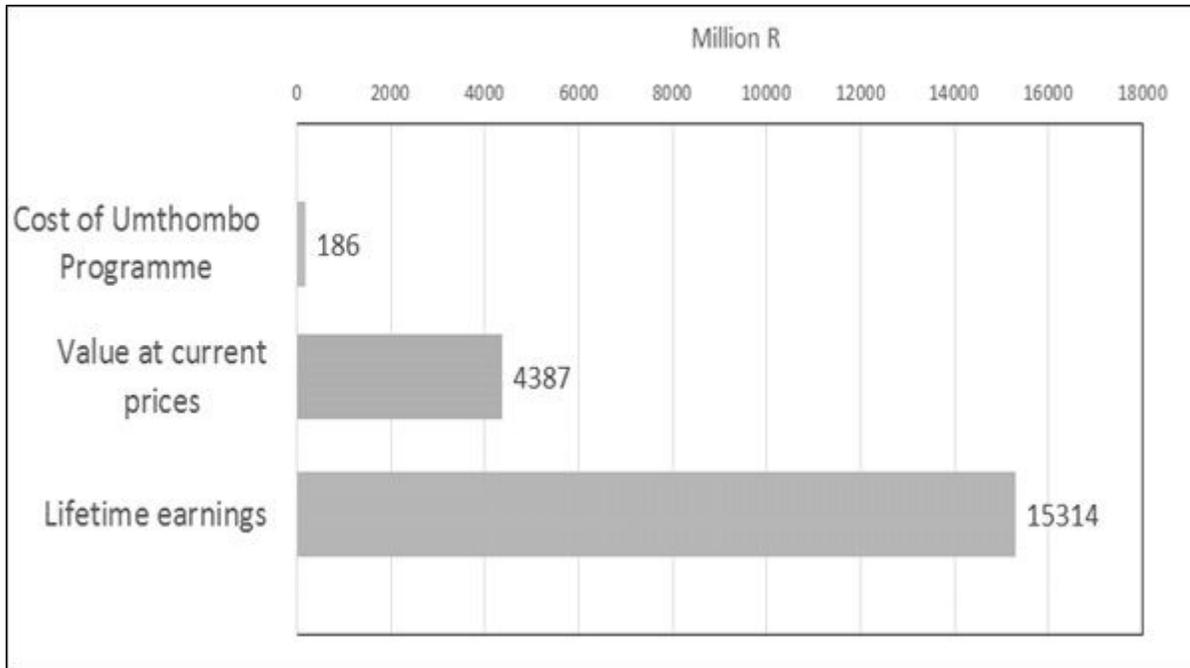


Figure 4

Return on investment for UYDF graduates

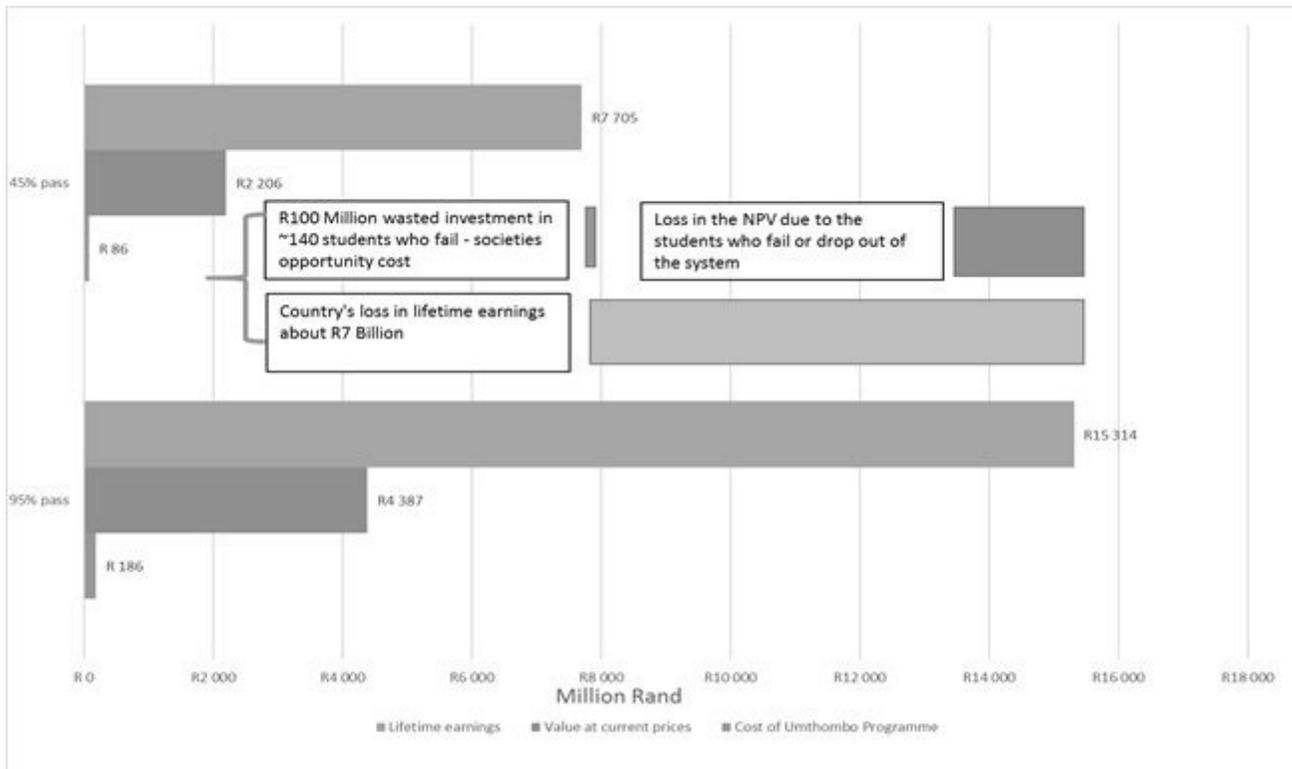


Figure 5

Potential losses associated with non-graduating students