

Cancer and the NHI: Cost Constraints and Opportunities

With the advent of the AIDS epidemic and given South Africa's quadruple burden of disease as discussed in NHI Note 2, cancer is not often mentioned as being of great importance in the provision of healthcare. The reality is however that cancer is a leading cause of death in South Africa; with indications being that the specific issues relating to the domestic situation might be underestimating the magnitude of the problem.

This research note provides an important case study of how the prevalence, detection and cost of treatment of an illness like cancer may increase under a NHI with comprehensive cover. It also illustrates the potential efficiency gains and savings associated with public/private partnerships, by referring to an example of such a partnership in South Africa

1. Cancer Incidence in South Africa and Potential Implications for an NHI system

The Cancer Association of South Africa (CANSA) is quoted as saying that one in six South African men and one in seven women will get cancer during their lives.¹ In South Africa, and elsewhere in Africa, the incidence of cancer has been steadily increasing as the populations urbanise and adapt different lifestyles.

More specifically, in the case of cancer, an aging population will experience a higher incidence.

While the data over the full population are very limited as to cancer incidence in South Africa, two relatively recent studies point out that while incidence is in line with other developing countries, this is probably due to underestimation.² The Medical Research Council (MRC) gives a total cancer incidence

of 148.9/100,000 in males and 134.9/100,000 in females, but it finds dramatically different incidence rates between the race groups. White South Africans have cancer incidence of 277 and 230/100,000 for males and females, but only 97.1 and 103.7/100,000 for black males and females, respectively.³ International experience has shown that when similar levels of care are available there is not such a significant difference in incidence between race groups.⁴

1. IMSA, *National Health Insurance Policy Brief 5*, 2009

2. Medical Research Council, *Chronic Diseases of Lifestyle in South Africa: 1995-2005.*, GLOBOCAN 2002

3. Medical Research Council, *Chronic Diseases of Lifestyle in South Africa: 1995-2005.*, GLOBOCAN 2002

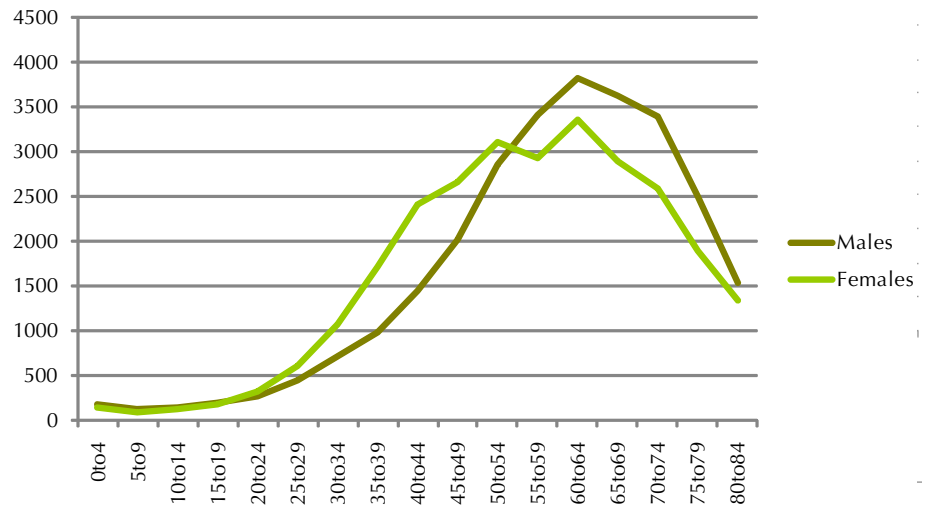
4. "Cancer in Indigenous Africans- burden, distribution and trends" (page 685) published in *The Lancet*, Vol 9 July 2008

This research note forms part of a series of special National Health Insurance (NHI) notes which can be accessed on the Econex website www.econex.co.za. In the interest of constructively contributing to the NHI debate, the Hospital Association of South Africa (HASA) has commissioned a comprehensive costing and human resource research project with Econex. HASA has given Econex and its partners at Stellenbosch University academic independence with respect to this project. The results of the project will be placed in the public domain in order to foster constructive debate.

Note that the available data on cancer incidence are severely restricted and these are therefore not necessarily accurate. Data on deaths from cancer are collected by StatsSA, but data limitations and availability make it very difficult to use. However, the most recent and accurate source of cancer incidence data for South Africa is that prepared by Prof. Heather McLeod for IMSA. Using various sources, but specifically the GLOBOCAN estimates, a set of incidence rates was prepared for South African cancer incidence by age and gender. The GLOBOCAN incidence rates are measured using only five age intervals and this is not ideal for detailed modelling. Adjustments were made to the GLOBOCAN incidence levels (for the perceived underreporting), but it is not known whether this potentially also includes the lower levels of diagnosis mentioned by practitioners in the field.

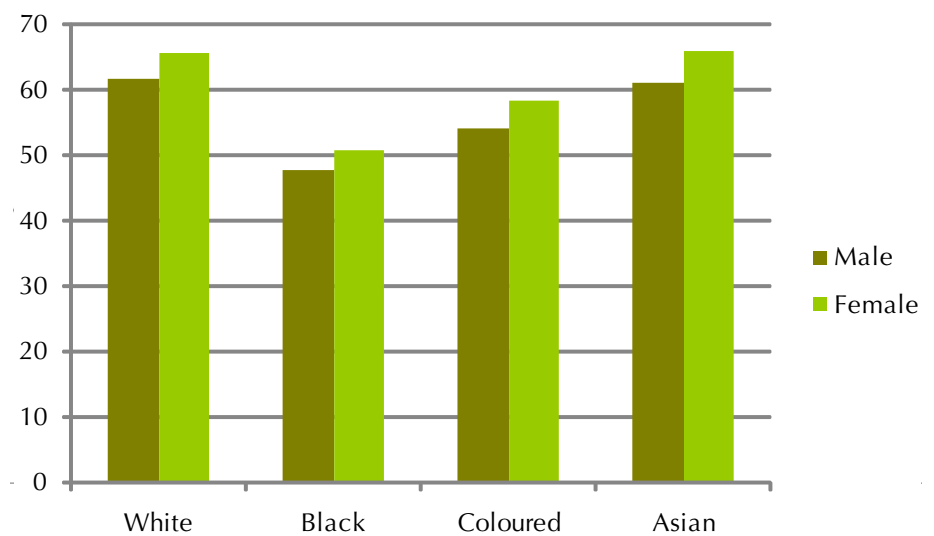
According to Dr Leon Gouws⁵, one of South Africa's foremost experts on cancer care, the incidence data could be severely under reported in South Africa due to two main reasons. The first is simply that in many parts of the country, there is limited access to medical care and that the diagnosis is often not made and many patients die without a proper diagnosis ever being made. Secondly, the fact that the registry data was pathology based meant that only cases histologically confirmed were included, and in many instances a tissue diagnosis is not pursued in advanced diseases where there are limited treatment options available. Diagnosis could be

Figure 1: Cancer Incidence by Age Group: South Africa, 2001



Source: StatsSA and CANSA, 2002

Figure 2: Life Expectancy at Birth: South African Population, 2004



Source: Health Systems Trust, South African Health Review 2008

skewed towards the reporting of those cases occurring in patients who have more ready access to medical care.

Nevertheless, South African data are quite similar to international age specific data on the incidence of cancer that is

5. Personal correspondence, September 2009.

About ECONEX

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biased towards much higher incidence in later years. Figure 1 clearly indicates the dramatic increase in cancer incidence with age in South Africa.

It is apparent that the older the population becomes, the higher the relative incidence is likely to be. As was mentioned, the incidence of cancer among age groups has been well researched and it is clear that there is increased risk of contracting cancer in the later stages of life.

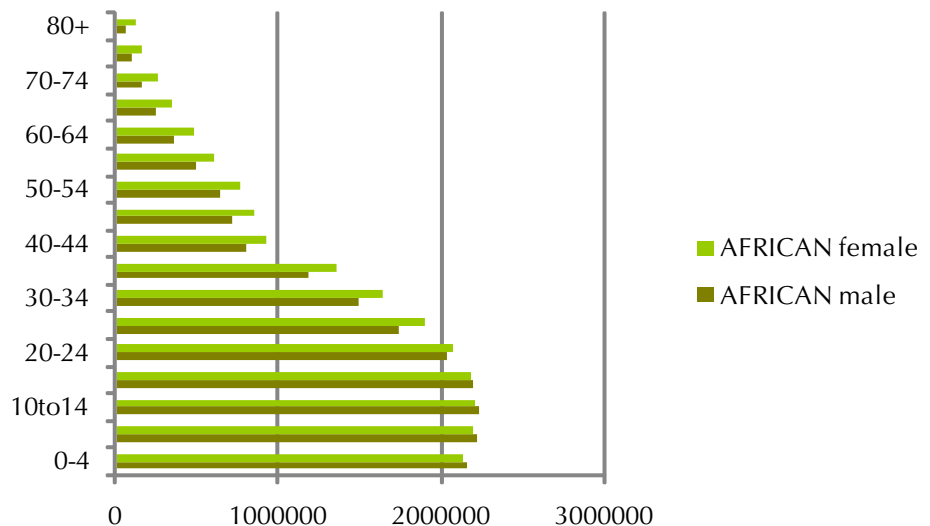
South Africa is faced with the grave reality that life expectancies across racial groups still differ dramatically⁶ and therefore also the likely cancer incidence among specific groups. Figure 2 shows the difference between race groups regarding life expectancy at birth in South Africa.

The black community has by far the shortest life expectancy at birth. In addition, the age structure also differs substantially among the race groups. For example, Figure 3 illustrates a black population with a large number of very young people. The lower life expectancy and relatively young profile of this group may explain the lower total incidence of cancer among black South Africans.

1.2 Potential Effects of a Successful NHI

It is important to keep in mind some of the key features of the proposed NHI system that was described in NHI Note 1, when considering the potential impact thereof on the incidence, detection and treatment of cancer in South Africa. The NHI promises comprehensive medical insurance to all citizens with zero co-payments at the point of service. Assuming the effective implementation of this policy, and given the expected increase in the demand for

Figure 3: Age Structure of the Black South African Population, 2009



Source: StatsSA, June 2009

healthcare (detailed in NHI Note 3), as well as South Africa's demographic profile, the anticipated success of the system will result in radically different social and medical outcomes for large portions of the population. The fact that the majority will now have access to quality healthcare could imply dramatic improvements in general medical outcomes, as well as increased life expectancies.

The authors of a recent article in *The Lancet* indicate experience elsewhere in the world where perceived cancer incidence increased dramatically, from similar levels to South Africa's, following the introduction of proper diagnostic facilities such as a screening programme.⁷ A comprehensive implementation of a NHI programme and the associated infrastructure might therefore have the effect of increasing demand for cancer treatment due to proper diagnostic facilities being available (a slightly perverse supply-induced-demand situation).

The basic assumption for much of what follows is that the implementation of

the NHI will be successful; potentially leading to higher levels of detection – and therefore presumably treatment – of cancers in the non-covered population, than what is currently the case. Specifically it might mean that the total incidence of cancer in South Africa might increase dramatically while some of the ethnic specific differences in cancer incidence in society might become less pronounced. Thus, even assuming the most optimistic scenarios and ratios, it is acceptable to state that South Africa will be significantly under provided for when it comes to oncologists and radiation facilities should the entire population be covered under a NHI programme.

2. Supply Side Constraints

Demand side issues as discussed above, are not the only factors influencing the market for cancer care. The South African reality of severe supply side constraints in the provision of healthcare was highlighted in NHI Note 4, and the supply of Radiation

6. Note that life expectancies and age profiles are also heavily influenced by fertility levels, so care needs to be taken when interpreting the data.
 7. "Cancer in Indigenous Africans- burden, distribution and trends," *The Lancet*, Vol 9, July 2008. (p. 685)

Table 1: SA Population Demographics and Current Radiation Oncology Workforce, 2009

Province	Population estimate	% Share of the total population	Total oncology workforce	% Of total oncology workforce	Ideal number of accelerators ¹⁰	Accelerators in private sector	Accelerators in public sector	Shortfall in total sector
Eastern Cape	6,648,600	13.5%	12	9%	20	3	3	14
Free State	2,902,400	5.9%	12	12%	9	2	3	4
Gauteng	10,531,300	21.4%	35	25%	32	13	11	8
Kwazulu Natal	10,449,300	21.2%	21	16%	32	5	6	21
Limpopo	5,227,200	10.6%	2	2%	16	1	2	13
Mpumalanga	3,606,800	7.3%	2	1%	11	1	0	10
Northern Cape	1,147,600	2.3%	2	1%	4	0	0	4
North West	3,450,400	7.0%	4	2%	11	2	1	8
Western Cape	5,356,900	10.9%	39	33%	16	9	5	2
TOTAL	49,320,500	100.0%	129	100%	151	36	31	84

Source: StatsSA, 2009 and Econex research

Oncologists certainly also reflects this. The latest estimate is that there are 129 active radiation oncologists in South Africa (see table 1). It is also acutely reflected in the availability of the associated workforce such as radiographers, oncology trained nurses and physicists.

The provincial distribution of cancer care facilities points to substantial discrepancies in the provision of oncological services. If one assumes a relatively conservative figure of only 3

accelerators per 1 million⁸ inhabitants as the base case, the shortage of facilities across the entire country is evident (see Table 1). There are 36 accelerators working to cover the private healthcare needs of South Africa's 7.8 million privately insured population – it implies a ratio of approximately 5 per 1 million. International experience has shown this to be on the lower side of the spectrum. Currently there are only 31 accelerators for the rest of the population or a dismal ratio of less than 1 per 1 million people.

A typical practice utilizing one accelerator will have a staffing component of around 20 people.⁹ It is important to highlight the fact that this total only includes the professional personnel component and that the supply of the various categories of workers is severely restricted within the South African context. Should one assume that an additional 84 accelerators are required to service the entire population under a comprehensive NHI model (see Table 1), then this implies that the additional required Radiation

8. *The international norm is that there should be 6 to 8 accelerators per 1 million inhabitants. An accelerator is a type of radiation treatment machine. Dr Leon Gouws and ICON is of the opinion that 3 per million is the minimum that can be used give the level of cancer incidence and age profile in South Africa. This view is further reinforced by international guidelines and the International Atomic Energy Agency.*
9. *Based on figures from the ICON network.*
10. *Please note that this is based on a number of 3 accelerators per 1 million inhabitants. International best practice indicates at least 6-8 machines per million. The number was derived from detailed notes presented by Dr L. Gouws. The number is based on the premise that cancer incidence is assumed at 250-300 /100,000 and that 52% of these should receive some radio-therapy and 25% will need a second course. The maximum number of cases that one machine can handle per year is 500 new cases. In Australia the indicative number of machines is 6-8/1 million and they can only provide treatment to 30-40% of cases where 50% is the ideal. Given the lower perceived level of cancer incidence (to date) in South Africa the more conservative number of 3 /1 million was chosen which still leaves a very substantial shortage of facilities in South Africa.*

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Oncologists are in excess of two hundred and fifty. Given the fact that there are currently only 129 Radiation Oncologists actively working in the country, plus 44 registrars, this is clearly not possible in the near future.

3. The Costs of Increasing Coverage

While there are obvious constraints to increasing the footprint of cancer care facilities, it is important to accurately calculate the actual costs of this as it adds to the initial cost burden implicit in a rapid introduction of a comprehensive NHI project. As mentioned before, we assume a successful implementation of the NHI as currently planned, and the public/private partnership that this will require, to assess the implications that increasing coverage may have.

3.1 A Suitable Public/Private Partnership: The ICON Network

During 2007 a group of Radiation Oncologists joined together to form a new managed care initiative for the provision of comprehensive cancer care. The *raison d'être* for the Independent Clinical Oncology Network (ICON) was to provide an alternative for low-income medical insurance scheme patients, while still receiving quality private sector care at reduced fees. The intention behind the formation of ICON was to provide a critical mass where substantial savings could be achieved over the single practice. The network uses private facilities that are

already distributed geographically across South Africa with extensive expansion being planned for. The aim is to provide care equivalent to the best available in public sector¹¹ facilities, but will allow patients immediate access with no waiting lists. Costs are similar to that of the public sector, and most importantly, ICON strives to achieve savings of 11% to 25% on total oncology costs and will be able to accommodate patients across all provinces of South Africa.¹²

Given the stated intention of the NHI plan currently under discussion, ICON serves as a potentially useful example of what might transpire under ideal situations. This assumes that a viable mechanism can be agreed upon, and serves as an example of what a national cancer treatment framework might look like under the NHI. According to current understanding of the intentions of government, the new system would encompass the entire available infrastructure within the country.

3.2 Providing Cancer Care under the NHI

The reason for choosing this study of cancer care and consequently the ICON network, is because there is currently little or no accurate data on what efficiency gains might be expected from a successful implementation of the NHI system. For the purpose of this scenario, it will be assessed what the situation would be if a suitable solution to the incorporation of the ICON concept, and managed care in general, were to

be achieved in South Africa. We also assume that the full facilities currently in operation, both private and public, will be made available to the public and that implementation will be complete and successful. Further it is assumed that costs such as administration and profit are fully reflected in the figures used.

While the savings of 11-25% are below those that have been mentioned by some researchers, they are not insubstantial and are at least based on realistic and reliable data. It is however also important to note that the ICON type care may not be acceptable to many, and that some may therefore choose to buy higher levels, the costs of which will need to be calculated separately.¹³

Even when taking into account all the private and public units, the country would still not be able to cater for all of the population, as the final number would still fall under 2 accelerators per 1 million inhabitants (it has been argued that at least 3 per 1 million would be needed). It is conceivable though that coverage of 50% of the population could be achieved over the medium term, should funding and other constraints be addressed.

Healthcare costs in the public sector are extremely difficult to come by. The ICON concept goes some way to providing a solution to the problem of measuring public sector pricing though, since the prices are intended to be in line with public sector costs. The NHI plan currently also mentions a public-private partnership in the implementation of

11. According to ICON.

12. ICON does not deal with the Leukemia, Stem Cell transplants or Pediatric Oncology cases for reasons of either extreme costs, technical difficulty or very scarce resources. This implies that national specialist units for these diseases such as Red Cross Children's Hospital will need to be continued under any NHI programme.

13. Note that not all private sector units are currently members of ICON, but it is assumed as if their infrastructure is included for the purposes of the NHI scenario.

the scheme, hence private sector costs are important to take note of. ICON was developed in such a way as to provide a low cost option, in line with the demographic realities of South Africa, for the provision of appropriate quality care for cancer.

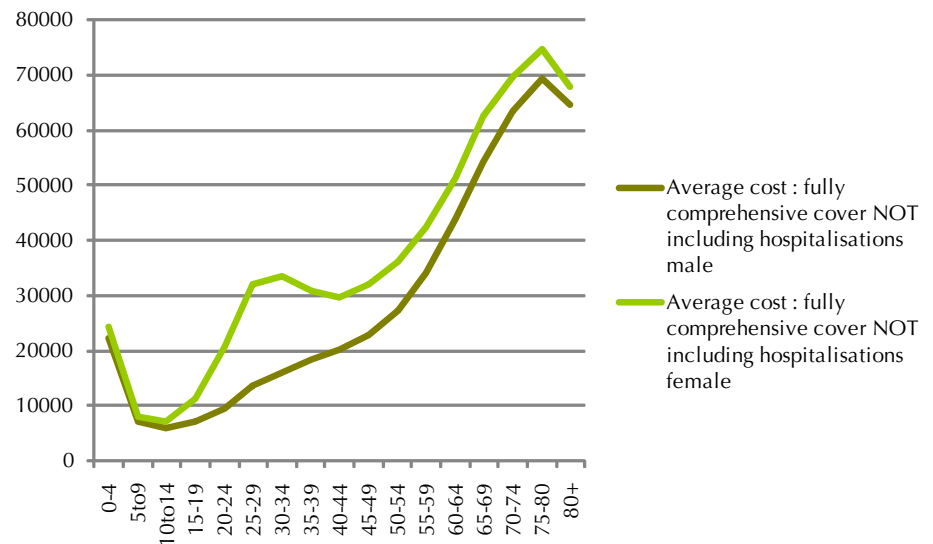
Once the costs of treatment of the average male and female and their ages are known, this can be used along with the incidence data to create a reflection across all age bands.¹⁴ These answers can then be used in conjunction with population data to map the total theoretical costs for cancer care across the entire population.

3.3 Calculating the Potential Costs of Cancer Care under the NHI

While data is hard to come by, several sources have assisted greatly during this study to create an accurate picture of current cancer care costs in South Africa. Data were collected from the entire value chain, namely funders, hospitals and physicians. While cancer care is mostly an out-patient type of treatment in specialised facilities, hospitalisation is regularly required. Using funder data only would lead to under estimating costs, as this would not capture the out-of-pocket expenses which have become a regular feature of cancer care as medical schemes try to reduce costs by limiting benefits.

The full cost of comprehensive care was calculated using the actual costs at the

Figure 4: Comprehensive Cancer Care Costs, Excluding Hospitalizations, 2008



Source: Econex calculations¹⁵

various treatment points – specifically the specialist practice and the hospital. The total costs were then recalculated to get to average costs per age and gender. Figure 4 shows the averages for comprehensive cancer care utilising out-patient facilities only.

Should the costs above be used in conjunction with age appropriate cancer incidence levels and the latest population statistics per age band and racial groups, one can approximate the total costs.¹⁶

The relative split between in-hospital and out-of-hospital costs are then used together with the final figures. Using this approach, the cost of providing quality comprehensive cancer care would be R14.733 billion per annum. The relative

non-hospital costs (i.e. the medical specialist private practice and related costs) would amount to R6.777 billion per annum – assuming 2008 ratios remain constant with the rest consisting of hospital costs.

3.4 Efficiency Gains via the Managed Care/ICON Approach

The fact that cancer has become such an expensive disease to treat has led to many cost control initiatives of which ICON is a good example. It has been shown that ICON has the potential to be implemented nationally as part of a public/private partnership and since this is the only form of data available, it was decided to use this as a scenario of what might transpire, should the NHI be fully (or even partially) implemented.

14. Potentially, a more precise answer for the cost of cancer care might be derived by using the actual cost of cancer treatment per age category. This approach was not used for several reasons – chiefly because the data are not available, but also because doing so would undermine the reasoning behind the cost curves as they are already reflective of the varying costs across age bands. Cancer treatment for children for instance is typically done by specialist units such as Red Cross Childrens Hospital and while the costs reflected by using the curves are most probably not correct, the incidence is also very low.

15. Note that due to different data sets the age categories 0-1 and 1-4 were combined, as were the ages 80-84 and 85+.

16. Assuming that the supply side constraints are somehow solved without their prices changing.

ICON is of the opinion that with their managed care approach, savings of 20-25% over current costs of medications are feasible within a viable business model. In addition to the savings on medications, a further 15% can be saved on the rest of the out-of-hospital expenses. Given the (confidential) actual ratio of medication to total patient cost this might lead to savings over current levels in the order of 20%.¹⁷

Were one then to recalculate the total cancer care costs using these savings as an indicator, the total costs would be (R6.777 billion less 20%) R5.422 billion for non-hospital expenses and (R7.956 billion less 10%) R7.16 billion for the rest. This gives a new total cost for cancer care of R12.58 billion and a total saving of R2.15 billion. To increase the footprint would however be extremely costly on its own and while public sector costs are currently unknown it is possible to accurately predict the shortages and costs implicit in such a roll out.¹⁸

3.5 Costs of Expanding ICON or a Similar Managed Care Model

Due to the extreme sensitivity of the data it is not possible to give a line-item cost breakdown. These costs are heavily dependent on the level of the currency as most of the advanced equipment (CT Scanners, Linear Accelerators etc.) and medications necessary to effectively treat cancer with radiation therapy and related drugs, are imported.

At the time of writing, a full new unit would cost anything between R45-60 million to set up and more than R24

Table 2: Supply Side Requirements and Costs for Expanding Coverage Category Number per unit For 84 new units

CATEGORY	NUMBER PER UNIT	FOR 84 NEW UNITS
Radiation Oncologists and Medical Officers	6	504
Advanced professional staff including radiotherapists, physicists, pharmacists and technicians	14	1176
Nursing staff	6	50
Initial Capital	R45-60 million	R3,780million to R5,040million
Annual running costs	R24 million	R2,016 million

Source: ICON, 2009

million annually to run (at cost). ICON does however intend to establish an additional 10 facilities (or at least additional accelerators). Should the 84 units ideally required in the most optimistic scenario be allowed for, it implies substantial costs in human and financial resources (see Table 2)

Given the very limited number of both practising oncologists and those in training, it is not viable to extend the coverage to the total population in the near future. Making certain assumptions about the extension of coverage it is, however, feasible to calculate the cost of limited extension of coverage to increasing portions of the population.

While the burden of cancer care in the public sector is extensive and currently being managed by several facilities, the aim of this exercise was to determine the total costs AS IF a successful NHI implementation had been achieved. For this reason the data collected from the private sector provider (ICON) will be used

as a proxy for general costs under a joint system. In reality the costs are unlikely to differ much in material terms, but probably substantially in accounting terms, as many public sector costs associated with hard infrastructure such as buildings fall under different government departments.

Should one assume that the private sector is currently serviced efficiently, then it also assumes little spare capacity. The ratio of linear accelerators to the population is 4.73/million, assuming a covered population of 7.82 million. Should the same ratio apply (under an ideal situation) to the uncovered portion of the population, 196 linacs will be needed for that portion of the population. As there are already 31 in the public sector, this implies that an additional 165 accelerators will be required to fully implement comprehensive care levels. 165 units imply set-up costs of between R6.6 billion and R9.9 billion in additional capital requirements.

Currently the private sector alone covers an estimated 7.82 million people

17. *ICON notes and personal correspondence with Dr Leon Gouws.*

18. *Efforts are currently under way to access limited public sector data on a provincial level and updated information will be made available as part of an ongoing process.*

with 36 accelerators. This level is seen as adequate, given existing demand and levels of treatment of the covered population. Should only ICON level care be provided for, it is feasible to use these machines as part of the total (all public and private sector care). Should a portion of the population still desire to access at current private sector levels of care, then one should allow for that

4. Conclusion

The care for cancer is only a small part of total healthcare expenditure, even

though cancer is still a leading cause of death. It has been shown that there will be a substantial shortage of facilities and infrastructure should the NHI be implemented with universal coverage, but that it might be possible from a financial sense to save substantially via efficiency gains delivered by a public-private partnership and managed healthcare. Over the medium term coverage of 50% of the population is probably feasible. The supply side constraints, specifically qualified oncologists, will not be solved at current training levels and 100% coverage will not be possible in the near future.

A managed care initiative was used as an example of what a private public

partnership might look like in the provision of cancer care. The managed care approach together with efficiency gains, will lead to substantial savings over the current situation. Savings of around 15% are perhaps achievable for the sector as a whole, using conservative assumptions throughout.

Using the savings implied by the managed care approach and assuming that the supply side constraints might somehow be resolved, comprehensive cancer care coverage of the entire South African population could cost in excess of R12 billion annually.