Comparing the Cost of Delivering Hospital Services across the Public and Private Sectors in South Africa

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Executive Summary

The South African private healthcare industry faces significant changes in national health policy which most notably include the likely introduction of National Health Insurance (NHI). The possibility exists that the NHI agency will seek to contract with both public and private healthcare providers (referred to as plurality of provision). This raises questions of relative pricing between the two sectors. The concept of "price" from a consumer or funder perspective is complicated because services in the public sector are frequently not sold, and where prices do exist (for those above the means test) they are not determined by the existence of a market. This makes it necessary to consider the underlying cost of delivering services, which in turn raises questions of relative efficiency and quality of care differentials.

The notion of plurality of provision has driven considerable work in the United Kingdom on achieving competitive neutrality between providers. An "unfair playing field" is defined as follows by Monitor, the UK health services sector regulator (2012): "those differences that could create significant advantages or disadvantages for one or more provider type that arise as a result of factors that are outside the control of that provider and that have a negative impact on patient care". A fair playing field is seen as a desirable outcome for the healthcare system and the quality of care provided.

The aim of this research is to compare the (input) cost of delivery, as distinct from the price of hospital care, between the public and private hospital sectors, and to identify systemic cost distortions. This research was conducted using only publicly available data. Therefore the analysis in this report has, by necessity, been done using ratio analysis. Data limitations make it impossible to use more sophisticated methods meaningfully. A number of assumptions have had to be made due to the constraint of working only with publicly available data. Estimates will be refined over time as more data is made available in the public domain.

The research seeks to ascertain the order of magnitude of cost differentials between the two sectors, whilst opening up discussion about:

- Structural differences in the costs between the public and private sectors, including but not limited to: differences in taxation (VAT and corporate taxation), the cost of capital, preferential purchasing arrangements and staffing arrangements; and
- Factors limiting comparability between the two sectors, including differences in nature, structure, objectives, patient case-mix and quality of care.

Clearly, cost minimisation while maintaining quality are key objectives for both sectors; however, this can be subjective due to different sets of stakeholders influencing efficiency targets. The private hospital industry has a wide range of stakeholders to consider including patients, funders and doctors. In South Africa there is a purchaser-provider split in the private sector, but not in the public sector. In

addition, the relationship between doctors and hospitals is fundamentally different in the private sector because private hospitals are not permitted to employ doctors. The primary financial stakeholders for the private hospital industry are the shareholders and debtholders, and this fact creates an additional focus on profit and return on investment. Private entities are, of course, subject to government regulations, which will need to be considered in meeting objectives.

The key measure that is used to compare the two sectors is the average cost per admission. The two sectors are compared on a level-playing-field basis, i.e. with adjustments made for the structural differences in their underlying cost base. The average cost per admission in the public sector that was calculated can be seen in Table 1.

Table 1: Calculation of average cost per admission for public hospitals 2010/11 (base scenario)

Average cost per PDE[1] for district hospitals	1,543
Adjustment factors for mix of hospital types	1.45
Average cost per patient day equivalent for all hospitals	2,237
Proportion of hospital costs related to personnel	65%
Proportion of personnel costs related to medical practitioners and specialists	40%
Average cost per PDE for all hospitals excl doctors	1,656
Average length of stay	5.3
Average cost per admission	**8,775**

The most recent public-sector data relates to the period 2010/11. The average cost per patient-day equivalent (PDE) for district hospitals in South Africa is R1,543 (Day et al., 2011a). If we adjust this figure for the national mix of district, regional and central/tertiary hospital beds we get a figure of R2,237. This is obtained by multiplying the average cost per PDE for district hospitals by a level-of-care index.

From the available data we can see the vast majority of volume in the public sector relates to outpatients (OPD) and emergencies. Public-sector reporting adjusts for this to some extent by down-weighting the OPD headcount and emergencies by multiplying the number by 1/3 – this implicitly

[1] According to the South Africa Health Review (Day et al., 2011a): *"Cost per Patient Day Equivalent (PDE) … measures the average cost per patient per day seen at a particular level of hospital. PDEs combine the number of inpatients, plus ½ the number of day patients plus 1/3 of emergency room or outpatient visits."*

assumes that each of these cases consumes 1/3 of the resources of an average inpatient day. It is likely that these cases could consume, on average, less than 1/3 of the resources of an inpatient case. Consider, for example, the costs associated with a patient collected chronic medication. If this is the case the number of patient day equivalents would be overstated, and the average cost per PDE would be understated.

In our base scenario we assumed that 65% of total public-hospital costs are on personnel, and that 40% of those costs relates to medical practitioners. These assumptions are based on costs in the Western Cape which appear to be more comparable to the private sector in terms of vacancy levels and utilisation of medical specialists. However, the net effect is still a far lower proportion of spend in the public sector on medical practitioners. This is to be expected given that pathology and radiology costs are not fully reflected in public-sector personnel costs and because practitioners in the public sector are salaried whereas private hospitals have no control on the billing practices of private doctors. In addition there are high vacancy rates in the public sector that distort comparisons. Personnel costs in the public sector are understated to the extent that facilities are understaffed. However, productivity levels in the public sector may increase if facilities are more fully staffed.

The average length of stay (ALOS) in public hospitals is 5.3 days resulting in an average cost per admission of R8,775. The ALOS in the public sector is likely to be understated relative to the private sector due to methodological differences in the counting of patient days. From the detailed figures available for the Western Cape we can see that there is considerable variation in ALOS between different types of facilities. Facilities such as psychiatric hospitals, TB hospitals and rehabilitation hospitals have exceptionally long lengths of stay and provide a service different to that offered by the private sector. The public sector figures would likely be slightly lower if these facilities were excluded. However, the average cost per day would also be higher if these hospitals were excluded. The longer stays are typically medical admissions with lower average costs per day than surgical admissions as there are no theatre costs included and the acuity of care is relatively lower. This detailed split of ALOS between facility types is not available for provinces other than the Western Cape so no adjustment could be made.

The average cost per admission in the private sector that was calculated can be seen in Table 2.

Table 2: Calculation of average cost per admission for private hospitals 2010 (base scenario)

Average cost per day	4,329
Average cost per day (excluding VAT)	3,797
EBITDA margin (as a percentage of revenue net of VAT)	21.30%
Cost per day (excluding VAT and adjusting for EBITDA)	2,989
Pharmaceutical costs as a % of hospital costs	20%
Average state discount on pharmaceutical tenders	25%
Cost per day (excluding VAT, adjusting for EBITDA, including pharma discount)	2,839
Average length of stay	3.27
Average cost per admission	**9,284**

The total expenditure on private hospitals, as reported by the Council for Medical Schemes will include Value Added Taxation (VAT). By comparison the public sector figures do not include VAT. However, private hospitals also pay VAT on some of their input costs. If private hospitals were to be VAT-exempt the net effect on the amount charged would likely be less than 14%. However, because all figures in Annual Financial Statements are reported net of VAT it is not possible to determine the actual percentage from publicly available information.

Private hospitals are capital-intensive entities, with only two sources of capital to meet their significant requirements, namely equity and debt. Shareholder returns and interest payments on debt are therefore necessary in order to attract and service capital. In addition, private hospitals are required to pay corporate tax. Both of these elements limit comparability between the public and private sectors on a level-playing field basis. The EBITDA margin is used in this report as a proxy for corporate tax and cost of capital. The EBITDA margin is calculated as the ratio of Earnings before Interest, Taxation, Depreciation and Amortisation (EBITDA) to revenue, and therefore represents the portion of private hospital revenue that is allocated towards capital costs, corporate taxation and allowances for depreciation and amortisation. The EBITDA ratio is used because it is objective and publicly available.

The State has sufficient purchasing power to be able to secure discounts for some pharmaceutical and surgical products through the issuing of tenders. For products where tenders have been successful the discounts secured are frequently substantial. However, there are a large proportion of products for which there is no discount (either where no tender is issued or there is no response to a tender).

In order to accurately calculate the financial impact of the State discount, data on the mix and volume of products purchased is required. Allowance would also need to be made for differences in the basket of goods purchased between the two sectors. This information is not available in the public domain.

It can be expected that the State would only issue tenders for goods that it makes use of. There will therefore be a strong relationship between the mix of goods used and the extent of discounts (i.e. differential pricing will only apply on goods that are used in both sectors).

The base scenario assumes a saving of 25% on average (i.e. that roughly a third of products are discounted, with an average discount of 75%), and that pharmaceutical and surgical products make up 20% of private-hospital costs.

Using the methodology outlined in this report, we found the ratio between the average cost per admission in the private sector to that in the public sector to be **1.058** (i.e. costs are 5.8% higher in the private sector).

Table 3: Comparison of average cost per admission for private hospitals 2010 and public hospitals 2010/11 (base scenario)

Public-sector average cost per admission	**8,775**
Private-sector average cost per admission	**9,284**
Ratio of private-sector to public-sector	**1.058**

The personnel cost and preferential purchasing discount assumptions in the base scenario are sensitivity tested to obtain a sense of the potential range of values for the ratio. This is necessary given the data constraints that were faced. The results of the sensitivity tests range between **0.947 to 1.205** (i.e. costs are between 5.3% lower and 20.5% higher). The extent of the difference between the two sectors depends on assumptions made and is highly sensitive to differences in the casemix between sectors.

As with any analysis across the public and private sectors, it should be borne in mind that the comparison is confounded by the following structural differences:

- We know that the **inputs** used in the two sectors differ. Most notably, the public sector employs medical practitioners which the private sector is not permitted to do. This will have a number of implications including the alignment of incentives between hospitals and practitioners.
- We also know that the **outputs** produced in the two sectors differ due to differences in both supply and demand factors. For example, we know that public sector hospitals treat a large number of outpatient and emergency cases. These cases are reflected in the average cost per patient day equivalent, but are not reflected in the average length of stay. In addition, the public sector produces outputs such as training and research which are not accounted for in the comparison.

- Importantly, we have not been able to quantify differences in **casemix** between the two environments due to an absence of publicly available data. Again, this will be affected by both supply and demand factors. Anecdotal evidence indicates that a much higher proportion of public-sector inpatient cases are medical cases compared to the private sector which has a higher surgical mix.
- We know that the **objectives** of the two sectors differ by virtue of their natures and the stakeholders that they serve. Related to this, we expect **rationing** mechanisms to differ between the two environments. For example, we may expect average **casemix** in the public sector to be heavier than in the private sector as scarce resources are channelled to more serious cases. This may be offset by differences in the medical/surgical mix between the two sectors, with anecdotal evidence indicating greater surgical intensity in the private sector.
- We have not addressed the issue of differences in **quality** between the two sectors in this report, other than reporting higher patient satisfaction levels in the private sector. Ideally a meaningful comparison should be on a quality-adjusted basis, particularly since higher quality care is typically associated with higher costs of delivery.

There are currently no rigorous comparisons of the private and public hospital sectors in South Africa. This raises the risk of policy decisions being made on the basis of polarised perceptions and broad characterisations of the two sectors. However, the current paucity of publicly-available data is a serious constraint on analysis for the purpose of evidence-based policy making.

It is clear that at present the lack of accurate and comprehensive hospital-level data limits us to high-level comparisons between the two sectors. These high-level comparisons mask the vast differences between individual institutions and merely provide a rough sense of relative costs. Proper benchmarking is likely to yield insight for both sectors and is a useful means of identifying best practice but requires far more information than is currently in the public domain.

The fair-playing-field comparison of the cost per admission between the private and public sectors indicates a far smaller differential in the costs of delivery than implied by current rhetoric. These results highlight the necessity of ensuring that comparisons adjust appropriately for structural differences between the sectors i.e. taxation, preferential purchasing arrangements, doctor employment and the costs of capital. The work done here indicates that plurality of provision is a policy option that requires serious consideration.

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1. Introduction

The South African private healthcare industry faces significant changes in national health policy which most notably include the likely introduction of National Health Insurance (NHI). The possibility exists that the NHI agency will seek to contract with both public and private healthcare providers (referred to as plurality of provision). This raises questions of relative pricing between the two sectors. The concept of "price" from a consumer or funder perspective is complicated because services in the public sector are frequently not sold, and where prices do exist (for those above the means test) they are not determined by the existence of a market. This makes it necessary to consider the underlying cost of delivering services, which in turn raises questions of relative efficiency and quality of care differentials.

The South African healthcare delivery system is made up of a public and private sector, with the majority of the population accessing the public sector. Healthcare spending, however, does not reflect this with approximately half of healthcare expenditure attributed to spending by private intermediaries (medical schemes) and private out-of-pocket expenditure (Day, Gray, & Budgell, 2011a). The private out-of-pocket expenditure arises mainly because while only 16.6% of the population has medical scheme cover (Council for Medical Schemes, 2011; Statistics South Africa, 2010) 36.9% make use of at least some private care (Econex, 2010c). In 2010 medical schemes spent R31.1 billion on hospitals: 36.7% of their total healthcare expenditure (Council for Medical Schemes, 2011)[2] with less than 1% of this attributed to public hospital care (Council for Medical Schemes, 2011). This clearly illustrates the significance of private hospital expenditure relative to the total expenditure on healthcare in South Africa.

The private hospital industry has been severely criticised by regulators and policymakers for their alleged role in constantly rising private medical expenditure (Bhengu, 2011; Council for Medical Schemes, 2008; Matsebula & Willie, 2007; Mbanjwa, 2011; McIntyre, 2010). It is often implicitly assumed that the underlying cost base in the private sector is unreasonably high, with little empirical evidence to back this. The aim of this research is to compare the cost of delivery, as distinct from the price of hospital care, between the public and private hospital sectors. The research seeks to ascertain the order of magnitude of cost differentials between the two sectors, based only on publicly available data, with the following taken into consideration:

- Structural differences in the costs between the public and private sectors, including but not limited to: differences in taxation, the cost of capital, preferential purchasing arrangements and staffing arrangements; and

[2] This figure relates only to the amount billed directly by hospitals and does not include the amount billed by doctors for in-hospital care.

- Factors limiting comparability between the two sectors, including differences in nature, structure, objectives, patient case-mix and quality of care.

2. Overview of the Public Hospital Sector

Expenditure in the public hospital sector has risen from R38.9bn in 2007/08 to a projected R73.1bn in 2013/14; an average annual increase of 11%. This increase in spending can be attributed to increased staff costs and/or increased utilisation, both in terms of number of staff and due to the implementation of the Occupational Specific Dispensation.

There are various types of hospitals operated by the public sector. These are detailed in Table 4 below.

Table 4: Description of public hospital services

Programme	Sub-Programme	Description
District Health Services	District hospitals	Rendering of a district hospital service at sub-district level.
Provincial hospitals	General (regional) hospitals	Rendering of hospital services at a general specialist level and providing a platform for training of health workers and research.
	Tuberculosis hospitals	To provide for the hospitalisation of acutely ill and complex TB patients (including patients with MDR and XDR TB).
	Psychiatric hospitals	Rendering a specialist psychiatric hospital service for people with mental illness and intellectual disability and providing a platform for the training of health workers and research.
	Rehabilitation services	Rendering specialised rehabilitation services for persons with physical disabilities including the provision of orthotic and prosthetic services.

	Dental training hospitals	Rendering an affordable and comprehensive oral health service and providing a platform for training and research.
Central hospitals	Central hospitals	Rendering of general and highly specialised health services on a national basis and maintaining a platform for the training of health workers, and research.

(Western Cape Government: Health, 2012b)

3. Background on Benchmarking

In the hospital industry, the considerable variations in the mix and number of hospital services as well as the quality of care delivered mean that defining, and thereafter establishing, an absolute value of efficiency is difficult (Zuckerman, Hadley, & Iezzoni, 2004). Hospitals provide a complex set of services to a diverse set of customers. In benchmarking performance it is therefore important to consider the full range of services provided in addition to the complex mix of services and resources. Ideally, it is necessary to account for variations in the severity of patients' illnesses, the quality of care and patient outcomes in order to meaningfully measure hospital efficiency.

Comparisons between the public and private sector are problematic because, in comparing different organisations we need to consider the complexity of objectives, the composition of stakeholders and the complexity of inputs and outputs (Sherman & Zhu, 2006). Clearly, cost minimisation while maintaining quality are key objectives for both sectors; however, this can be subjective due to different sets of stakeholders influencing efficiency targets. In meeting the needs of stakeholders, government needs to consider voters, legislators, the Receiver of Revenue, tax payers and special interest groups (Sherman & Zhu, 2006). The private hospital industry also has a wide range of stakeholders to consider including patients, funders and doctors. In South Africa there is a purchaser-provider split in the private sector but not in the public sector. The relationship between doctors and hospitals is fundamentally different in the private sector because private hospitals are not permitted to employ doctors. The primary financial stakeholders for the private hospital industry are the shareholders and debtholders, and this fact creates an additional focus on profit and return on investment. Private entities are, of course, subject to government regulations, which will need to be considered in meeting objectives.

The concept of "price" from a consumer or funder perspective is complicated because services in the public sector are frequently not sold, and where prices do exist (for those above the means test) they

are not determined by the existence of a market[3]. This results in an inability to measure public-sector output using relatively objective quantitative measures (Sherman & Zhu, 2006), although inputs used tend to have market prices. This raises the question of appropriate performance measures in the absence of Return on Investment/profit. State facilities may measure performance in terms of meeting budgeted expenses, achieving budgeted costs per unit of service or operating goals. The focus of this research is on the cost of delivering hospital services (as distinct from price) due to the complexity of the notion of price in the public sector.

Appendix A defines the various components of efficiency (price, allocative, technical and scale) and draws comparisons between the efficiency of the private and public sectors.

Considerable work has been done in the United Kingdom (UK) on achieving competitive neutrality between providers. An "unfair playing field" is defined as follows by Monitor, the UK health services sector regulator (2012): "those differences that could create significant advantages or disadvantages for one or more provider type that arise as a result of factors that are outside the control of that provider and that have a negative impact on patient care". A fair playing field is seen as a desirable outcome for the healthcare system and the quality of care provided.

In the context of plurality of provision (i.e. across public and private hospitals), differential payments to providers may be justified if the playing field is not level. The rationale for differential payments may arise from one of three broad categories (Mason, Miraldo, Siciliani, Sivey, & Street, 2008):

1. To encourage entry and participation by certain providers;
2. If public and private providers face different unavoidable costs;
3. If public and private providers are delivering different services.

Table 5 lists the factors that were identified in the United Kingdom (UK) as driving cost differences between public and private providers, and that are considered to be relevant in South Africa.

[3] Competitive dynamics in healthcare differ to other sectors of the market. Price establishment is affected by information asymmetry, third-party payer influence, agency problems and demand distortions. The hospital market is also more concentrated than, for example, the medical practitioner market.

Table 5: Factors driving cost differences

Factor	Relevance in South Africa
Corporation Tax	Private providers are required to pay corporate tax on their profits (basic rate of 28%). This results in a taxation asymmetry between the public and private sectors.
VAT	Differential application of VAT rules in the public and private sectors.
Cost of capital	There are substantial differences between the public and private sectors in South Africa in terms of sources of capital, ease of access to capital, costs of accessing capital and accounting requirements (e.g. allowances for depreciation).
Costs of labour	Three elements of labour cost differentials are considered in the UK: recruitment costs, pay costs and pension provision. In South Africa there are the following complications: private hospitals are prohibited from employing doctors; there are high vacancy rates in the public sector and the country as a whole faces severe human resource constraints.
Access to cheaper inputs	The key example of this in the South African environment is the Department of Health's medical and pharmaceutical contracts where lower prices for drugs and surgicals are secured.
Provision of other outputs	Not considered in this report but it should be noted that there are activities that occur in the public sector such as teaching and training, and these will incur additional costs.
Differences in casemix	Differences in the profile of patients treated in each sector. Anecdotal evidence suggests that public-sector activity is more focussed on medical cases than the private sector.

(Mason et al., 2008)

4. Methodology

The aim of this research is to compare the public and private hospital sectors in South Africa using only publicly available data. Therefore the analysis in this report has, by necessity, been done using ratio analysis. Data limitations make it impossible to use more sophisticated methods, such as Data Envelopment Analysis (DEA), meaningfully.

Ratio analysis involves comparing different key ratios between comparable hospitals (Zere, McIntyre, & Addison, 2001) and is mostly used to assess the performance of various aspects between these hospitals within a single time period (Sherman & Zhu, 2006). Examples of ratios include cost per transaction, cost per unit of outcome, amounts of resources per unit of output and units of resource A used per unit of resource B (Sherman & Zhu, 2006). Zere *et al*. (2001) highlight the use of average cost per inpatient day and bed occupancy rate. Thomas (2006) advocates the use of Risk-adjusted Average Length-of-Stay, Risk-adjusted Early Readmission Rate, Risk-adjusted Admission Costs and Risk-adjusted Episode Costs; all of which are not possible in the South African environment while using publicly available data.

When measuring performance of an entity that converts inputs into outputs, a typical and accepted measure of performance is a productivity ratio. The productivity ratio is defined as the ratio of outputs to inputs, and thus a larger value would imply better performance (Coelli, Rao, O'Donnell, & Battese, 2005).

Ratio analysis has the advantage of being simple to apply and can provide very useful managerial information. However, it only provides a meaningful result in a single-input-single-output scenario, which is unlikely to be the case in the hospital environment. It also requires homogeneous measurement units for the inputs and outputs, which can be difficult in a multiple-input, multiple-output scenario (Zere et al., 2001).

Another problem with using Ratio Analysis lies in the fact that not all information is contained in a single ratio. This is illustrated by an example in Sherman and Zhu (Sherman & Zhu, 2006) in which Hospital A achieves a cost of $300 per patient per day whilst Hospital B has a cost of $350 per day. The reasons for this difference can be explained as one or a combination of the following:

a. Hospital A is in fact more efficient.
b. Hospital A treats less severe and/or less resource-consuming cases.
c. Hospital A can buy inputs at a lower cost, but is no more technically efficient than Hospital B.
d. Hospital A is exploiting economies of scale.
e. Hospital A is not providing programme services that Hospital B offers, such as health improvement classes aimed at improving quality of life.

Note that options (b) and (c) do not indicate whether Hospital A is more technically efficient than Hospital B. Furthermore, after it has been determined which of Hospital A and B is more efficient, it is still possible that neither hospital is operating at maximum efficiency.

A set of ratios is able to capture the mix of inputs and outputs as well as being able to identify where inefficiencies may lie. However, the disadvantages of using this method are that, first, interpreting a set of ratios can be complex and require judgement. Second, a set of ratios may not capture all of the

elements that can explain the inefficiency. Third, a set of ratios does not provide an objective point above or below which efficiency is attained. Despite these limitations, ratios can be useful in identifying and thereafter explaining the reasons for higher cost per unit of resource or higher resource utilisation.

The suggested ratios to be used in this research are:

- Average cost per patient day equivalent; and
- Average cost per admission.

In order to make these ratios more comparable across sectors where possible adjustments will be made for the issues identified in Table 2.

5. Inputs

Hospitals consume labour, medical and non-medical goods as well as capital in the form of beds, infrastructure and medical equipment.

Labour inputs account for a large part of hospital production and can be broken down into clinical staff as well as administrative and operational staff. It should be noted that in South Africa private hospitals are not permitted to employ doctors. They do, however, maintain a close working relationship with doctors given the operational reliance on their services.

There are an estimated 25 000 nurses employed by private hospitals constituting roughly 13% of the total number of nurses in South Africa. There are a number of different categories of nurses with different levels of training. The main categories are registered nurses, enrolled nurses (ENs) and enrolled nursing auxiliaries (ENAs). The number of highly trained RNs has declined as a proportion of the total number of nurses in training from 42.1% in 2000 to 16.6% in 2009 (Econex, 2010a). There are extremely high levels of attrition in the nursing profession for a variety of reasons including emigration, retirement and leaving the profession. Breier, Wildschut, and Mgqolozana (2009) estimate an annual attrition rate of 67% (as a percentage of the total number of new nurses trained) whilst Econex (2010a) estimated a lower attrition rate of 40%. The projected shortage of doctors over the next decade (Econex, 2010b) combined with nursing attrition is likely to be a major operational constraint in both sectors.

In the public sector, there is a high level of variation in the number of medical practitioners and specialists between provinces (Figure 1). Medical specialists are concentrated in those provinces where academic central hospitals are located. The variation in the number of practitioners per 100 000 people is even more dramatic (Figure 2).

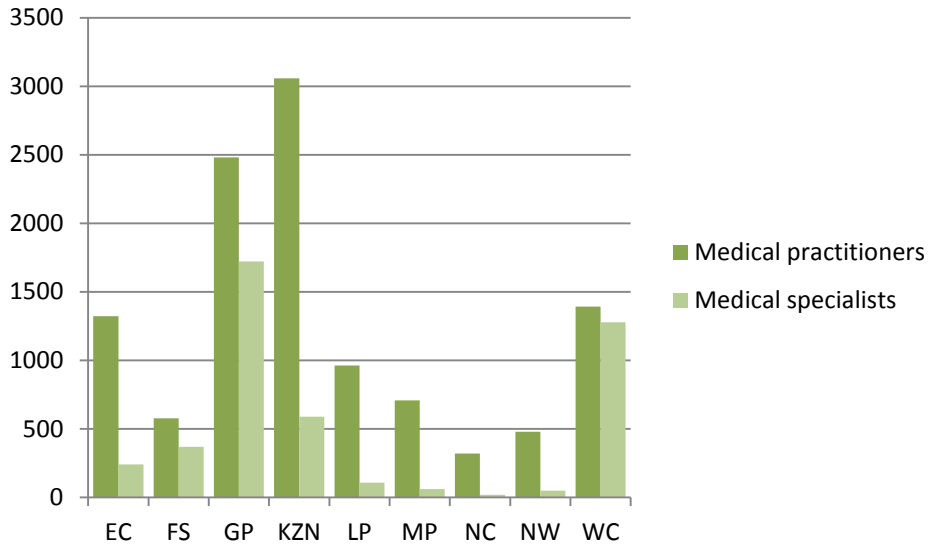

Figure 1: Number of medical practitioners and specialists for each province 2010/11 (Day, Gray, & Budgell, 2011b)

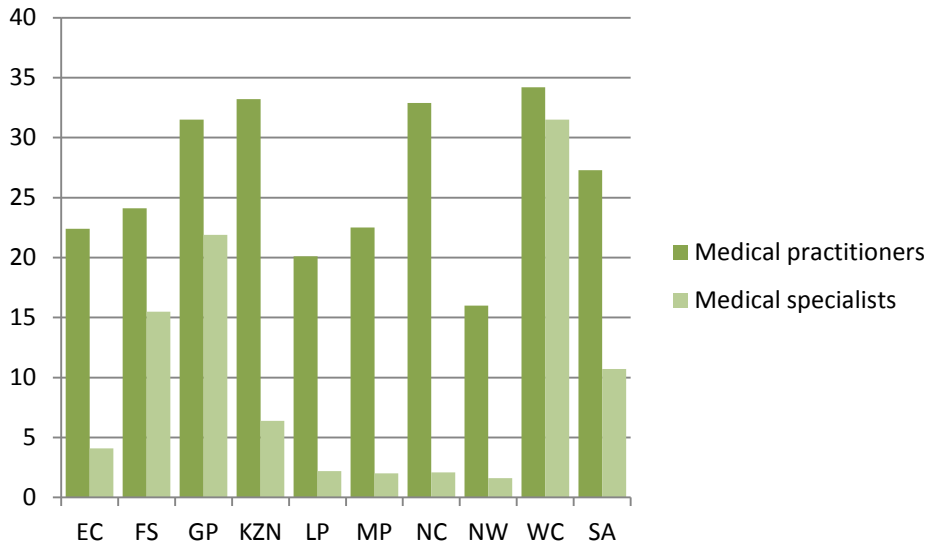

Figure 2: Number of medical practitioners and specialists for each province 2010/11 per 100 000 people (Day et al., 2011b)

The public sector is characterised by high levels of vacant posts. To some extent this means that the costs that we see per admission or per day may be understated. However, as doctor staffing levels increase the number of cases treated may increase accordingly.

Accurate figures on vacancy rates are not available. According to the most recent South African Health Review: “Data on vacant posts are no longer supplied as this only really reflects vacancies relative to

the staff establishment on the system, which has not been created with reference to any agreed norm or standard of required health professionals, and may therefore be quite misleading."

Figures published by Econex in 2010 (Econex, 2010b) indicate a national average vacancy rate for all healthcare professionals of 42.5%, with significant variation between provinces. Limpopo, for example, has GP and specialist vacancy rates over 80%.

Measuring capital is challenging because of the need to measure the stock of existing infrastructure and equipment, as well as due to the problems in attributing capital use to any particular period (Nguyen & Coelli, 2009). Most studies utilise number of beds as a proxy for capital and scale.

It is important to note that hospitals that do not employ some of the defined inputs should only (ideally) be compared with other hospitals using the same inputs. This is done for consistency. For example, private hospitals in South Africa are not permitted to employ doctors and specialists rendering the use of this input variable meaningless. In this study we attempt to adjust for differences in inputs explicitly.

There are many studies of hospital efficiency that focus exclusively on hospital costs and revenues. Although patient copayments are included as revenues in such models, there is no recognition of indirect patient costs. Bernet, Moises, & Valdmanis (2010) included patient travel time in their study. Similarly patient queuing time could also be included. These additional factors may be useful in analysing efficiency in the South African public sector.

6. Outputs

In the hospital industry there are considerable variations in the mix and number of hospital services, as well as the quality of care delivered (Zuckerman et al., 2004). Hospitals provide a complex set of services to a diverse set of customers: emergency, theatre and ward facilities for the treatment of inpatients, outpatients and emergency cases. The cases treated can be broadly categorised as medical, surgical or maternity, all of which vary in terms of clinical complexity and resource use.

The different categories of cases have different characteristics and differential impact on operational activity. For example, for elective patients demand is a function of time; arrivals can be controlled and are thus highly correlated with month, day of the week and time of day (Harper, 2002).

The outputs measured are typically intermediate outputs (such as the number of patients treated) and not final health outcomes (such as lower mortality rates and longer life expectancy) as data for these are problematic. Hospital activities such as surgical procedures are used as proxies for outputs. This is not necessarily problematic if there is good evidence that hospital activities lead to health improvement, i.e. where treatments are effective (Nguyen & Coelli, 2009).

Zuckerman, Hadley and Iezzoni (2004) used patient admissions, inpatient days, and outpatient visits as outputs. Given the heterogeneity inherent in these categories of output volume, it is useful to analyse a more detailed set of variables. Clement *et al.* (2008) had as outputs: number of births,

outpatient surgeries, emergency room visits, outpatient visits, and casemix adjusted admissions (calculated as the number of admissions multiplied by the hospital's average casemix). Kibambe and Koch (2007) used four output variables that were available from all of the hospitals they surveyed: total admissions, inpatient days, outpatient days, and total surgeries. Parkin and Hollingsworth (1997) used the acute discharges (medical), acute discharges (surgical), accident and emergency attendances, outpatient attendances, obstetrics and gynaecology discharges, and other speciality discharges.

The following list of variables that can be used to elaborate on the clinical composition of each output is drawn from Zuckerman, Hadley and Iezzoni (2004):

- Percentage of beds in intensive care units;
- Percentage of outpatient visits that do not involve surgery;
- Percentage of admissions that are long-term;
- Ratio of births to admissions;
- Average case-mix based on DRGs;
- Inpatient surgical operations per admission;
- An index of high technology services (e.g. cath labs).

It is important to note that the training of health professionals and research are additional outputs produced by the public sector that are not produced to the same extent by the private sector.

7. Adjusting for quality

According to Zuckerman et al. (2004): "reducing resource use in inefficient hospitals would seem to be an unambiguously desirable policy objective. However, it is possible that resource use that appears to be inefficient could in fact enhance the quality of hospital care. It is essential, therefore, that the relationship between quality and cost be accounted for in the measurement of inefficiency."

Adjusting for quality requires including variables that capture severity of diagnosis and patient outcomes. Examples in the literature include 30-day mortality rates and expected in-hospital complication rates reflected by discharge diagnosis and procedure codes (Zuckerman et al., 2004). Clement et al. (2008) used inpatient quality indicators (IQIs) that were adjusted for patient age, gender, the interaction of age and gender, and all patient diagnosis related group (APR-DRG) classifications.

Many studies cited in Clement et al. (2008) find that "higher nurse to patient staffing levels and higher proportions of registered nurses in the nurse staffing mix are associated with fewer patient adverse events and lower mortality rates". In addition, Burstin et al. (1993) found that higher hospital operating cost per discharge was associated with a lower likelihood of negligent medical injury, while Picone et al. (2003) similarly found that higher intensity service resulted in lower mortality rates for certain diagnoses.

Conversely, other studies have found the relationship between inputs and outputs to be complex, indicating that more costly or intense care may actually be inefficient (Clement et al., 2008). A number of studies found that as the RN proportion of nursing staff increased beyond some point, the incidence of adverse outcomes began to increase even after controlling for patient acuity, i.e. RN staffing proportions that are too high may be inefficient. Fleming (1990) found that cost and quality increased together in low-cost hospitals but there was a negative cost/quality relationship for mid- to high-cost hospitals.

In their study Clement et al. (2008) found that technical inefficiency is associated with poorer quality of patient outcomes and that the majority of study hospitals could improve both their technical efficiency and patient care outcomes. Therefore, contrary to the frequent assumption that quality costs more, they found that efficiency and quality go together.

The only measure of quality that is published for both the public and private sectors is a measure of patient satisfaction. This provides a very narrow perspective on quality, but is informative nonetheless. Patients consistently report higher levels of satisfaction in the private sector (Table 6).

Table 6: Patient satisfaction

	EC	FS	GP	KZN	LP	MP	NC	NW	WC	SA
Percentage of users of private health services highly satisfied with the service received										
2009 GHS	95.1	92.4	91.2	94.7	92.2	87.8	95.6	94.2	92.5	92.5
2010 GHS	95.1	91.0	91.2	88.5	96.1	91.3	90.8	92.7	94.9	92.1
2011 GHS	98.6	95.3	92.4	85.9	97.2	94.8	89.9	89.9	92.0	92.9
Percentage of users of public health services highly satisfied with the service received										
2009 GHS	56.0	41.8	52.9	53.7	67.4	46.8	65.8	44.8	58.1	54.5
2010 GHS	52.7	55.8	52.4	48.9	75.4	57.4	64.1	50.5	60.4	55.9
2011 GHS	67.0	68.4	57.6	51.5	78.1	62.2	54.5	52.0	65.6	61.9

(Day & Gray, 2013)

8. Public Sector Analysis

8.1. Data

Data on public sector hospitals were obtained from three sources:

- Annual performance plans published by each provincial Department of Health;
- The South African Health Review published by the Health Systems Trust; and
- The District Barometer Report.

The following features of the data should be noted:

- The data is lagged – the 2012/13 annual performance plan reports on the period 2010/11;
- Data quality varies considerably between provinces; and
- Figures vary between sources, raising questions about the quality of the data.

It is important to note that data definitions vary over time. Therefore, a single year as the basis for comparison was selected. If in the future a multi-year comparison is carried out, care should be taken to ensure consistency. For example, according to the Western Cape annual plan (2012b) between 1 April 2008 and 31 March 2011 regional hospital beds in central hospitals were reflected against Programme 4 (regional hospitals) whereas from April 2011 they were included in programme 5. The result is that regional hospitals (Programme 4) reflect a decline in patient volumes in 2011/12 whereas central hospitals reflect an increase.

According to the South Africa Health Review (Day et al., 2011a):

"Cost per Patient Day Equivalent (PDE) is an indicator of hospital efficiency. It measures the average cost per patient per day seen at a particular level of hospital. PDEs combine the number of inpatients, plus ½ the number of day patients plus 1/3 of emergency room or outpatient visits. Ideally case mix information should be available for each hospital to interpret whether the cost per PDE indicates efficient management, since different types of diseases and procedures consume very different levels of resources."

Each province publishes a detailed annual performance plan. Ideally it should be possible to get the PDE for each hospital type in each province. However, not all provincial reports are readily available and the completeness of the reports varies. The South African Health Review (Day et al., 2011a) provides a consolidated view of all the provinces, but only for district hospitals.

8.2. Variation in the average cost per patient day equivalent between provinces

There is considerable variation between provinces in the average cost per patient day equivalent for district hospitals (Figure 3). This is to be expected as the provinces differ dramatically in terms of the

number of beds available per 1000 uninsured people, hospital staffing, the extent of urbanisation and the burden of disease.

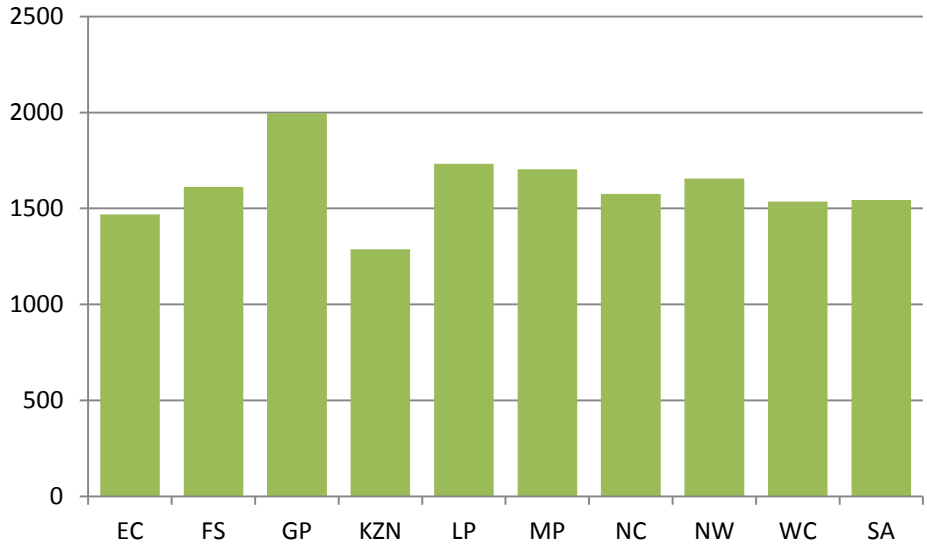

Figure 3: Average cost per patient day equivalent for district hospitals for each province 2010/11 (Day et al., 2011b)

Access to hospital care will be influenced by both the availability of beds and patients' geographical proximity to beds. The number of beds per 1000 uninsured lives varies considerably between provinces from a low of 1.47 beds in the Northern Cape to a high of 2.67 beds in Kwazulu-Natal. The extent of urbanisation also varies dramatically between provinces: Gauteng is the most densely populated and highly urbanised province in South Africa, with only 4% of the population classified as rural. At the other end of the spectrum we have Limpopo where 90% of the population is classified as rural. The proximity of regional and central hospitals will impact on the mix of cases seen by district hospitals.

8.3. Variation in the average cost per patient day equivalent between types of hospitals

As can be expected the average cost per patient day equivalent varies considerably between the different types of hospitals. This can be seen in Table 7 and Figure 5, and is explained as follows by the Gauteng Department of Health and Social Development (2012):

"The average length of hospital stay, Caesarean section rate and case fatality rate get progressively higher as we move from district to regional hospitals and upward to central hospitals. This is to be expected as patients seen at higher levels of care are more seriously ill."

Table 7: Differences in utilisation between types of hospitals in Gauteng (2009/10)

Indicator	District hospitals	Regional hospitals	Central hospitals
Bed utilisation rate	67%	81%	77%
Average length of stay	3 days	4.3 days	5.7 days
Caesarean section rate	18.40%	27.00%	37.50%
Surgical mortality rate	2%	4%	5%

(Gauteng Department of Health and Social Development, 2012)

The mix of types of hospital beds, and the associated level of care offered, varies considerably between provinces with the Eastern Cape and Gauteng having the highest proportion of central and tertiary hospitals.

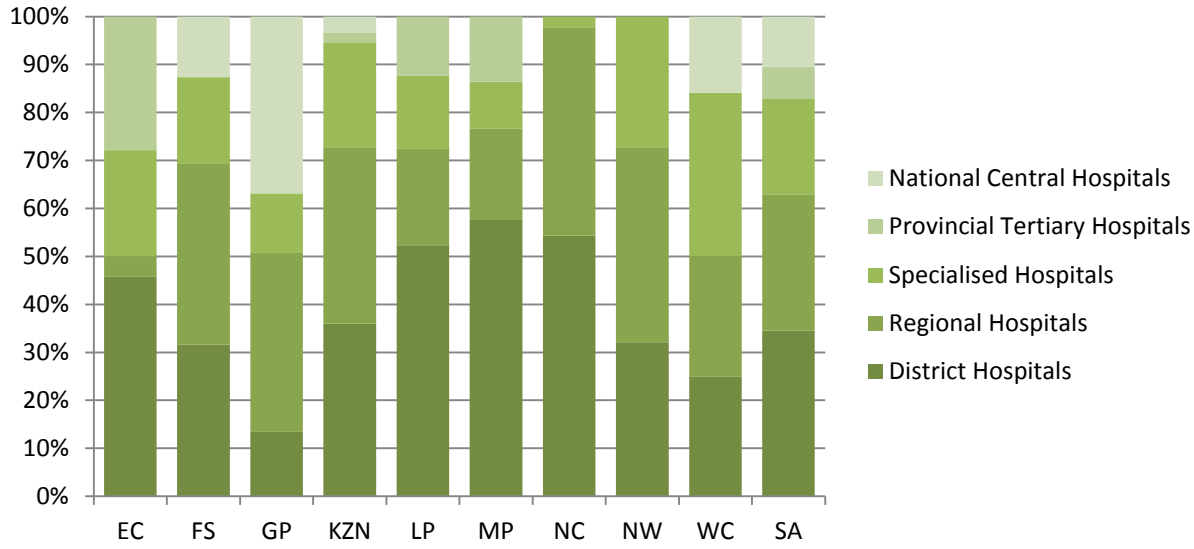

Figure 4: Split of hospital beds in each province by hospital type
(Day et al., 2011b)

Due to the data available from the South African Health Review relating only to district hospitals it was necessary to adjust the cost per PDE in each province to reflect the mix of hospital beds. The Western Cape Department of Health Annual Performance Plan (Western Cape Government: Health, 2012b) has detailed data for each major hospital type (Figure 5).

Figure 5: Variations in average cost per patient day equivalent between hospital types Western Cape 2010/11 (Western Cape Government: Health, 2012b)

The ratio of costs per PDE for regional and central hospitals to the costs per PDE for district hospitals was calculated based on the Western Cape data (Figure 5) – district hospital beds were given a weight of 1, regional and specialised hospitals a weight of 1.3 and central and tertiary hospitals a weight of 2.8. These weights were then multiplied by the proportion of hospital beds in each category to create a level-of-care index for each province (Table 8).

Table 8: Calculation of level-of-care index

	EC	FS	GP	KZN	LP	MP	NC	NW	WC	SA
District Beds	46%	32%	13%	36%	52%	58%	54%	32%	25%	34%
Regional Beds	26%	56%	50%	59%	35%	29%	46%	68%	59%	48%
Central/Tertiary Beds	28%	13%	37%	5%	12%	14%	0%	0%	16%	17%
District hospital cost per PDE	1469	1612	1996	1287	1732	1704	1575	1655	1508	1543
Regional hospital cost per PDE									1961	
Central/Tertiary hospital cost per PDE									4207	
(Regional hospital cost per PDE)/(District hospital cost per PDE)									1.30	
(Central/tertiary hospital cost per PDE)/(District hospital cost per PDE)									2.79	
Level-of-care index	1.58	1.39	1.81	1.27	1.33	1.33	1.14	1.20	1.46	1.45

(Western Cape Government: Health, 2012b), (Day et al., 2011b)

The lowest level-of-care index for a province is 1.14 and the highest is 1.81. The overall national level-of-care index is 1.45. The adjusted figures for each province (i.e. the average cost per patient day equivalent for district hospitals multiplied by a province-specific level-of-care index) are significantly higher than the unadjusted figures published in the South African Health Review (Figure 6).

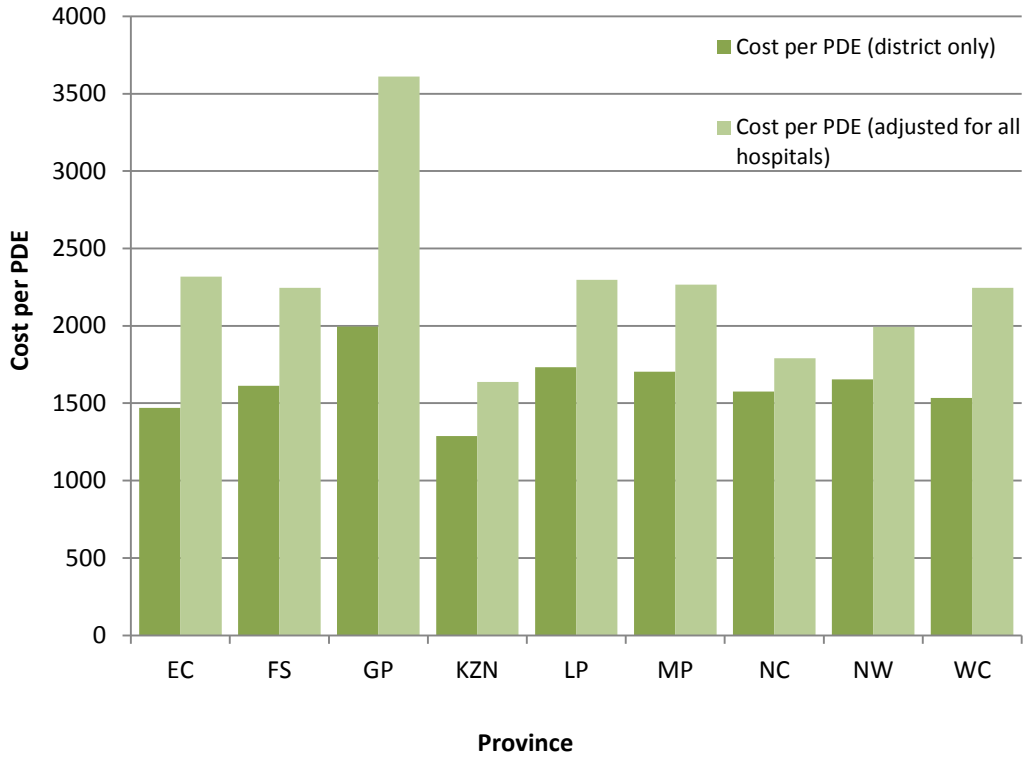

Figure 6: The cost per PDE for district hospitals compared to the adjusted cost per PDE for all hospitals by province 2010/11
(Day et al., 2011b), own calculations

8.4.Estimation of the cost per day in the public sector

The most recent data relates to the period 2010/11. The overall cost per PDE for district hospitals in South Africa is R1,543 (Day et al., 2011a). The national figure masks variation between the provinces (Figure 3: the lowest value is for Kwazulu-Natal (R1,287) and the highest value is for Gauteng (R1,996). The values for all other provinces are within 11% of the overall value for South Africa.

If we adjust this figure for the national mix of district, regional and central/tertiary hospital beds we get a figure of R2,237. This is obtained by multiplying the average cost per PDE for district hospitals by the level-of-care index.

This figure is effectively public hospital costs/PDEs where PDEs include a portion of outpatient visits (OPD headcount) and emergency visits. The comparable figure for the private sector includes a far lower proportion of outpatient visits largely because the outpatient visits in the public sector include items such as consultations and collections of chronic medication and not just emergency centre visits – in other words the mix of outputs varies between the two sectors. Not all provinces publish the split between separations (sum of: day patients + inpatient deaths + inpatient discharges + inpatient transfers out) and there is no public data available splitting costs between inpatients and outpatients.

From the available data we can see the vast majority of volume relates to outpatients and emergencies.

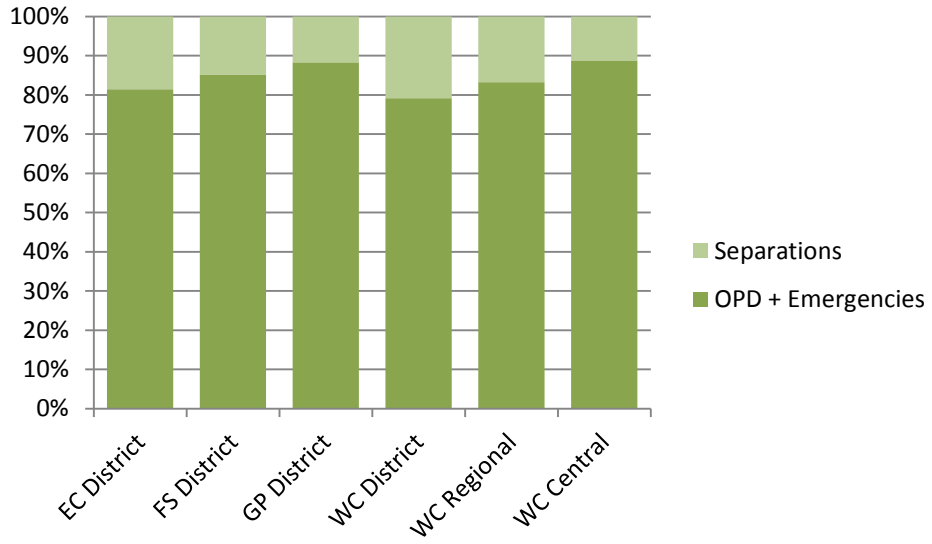

Figure 7: Volume of OPD headcounts and emergencies as compared to separations in public hospitals (Free State Government: Health, 2012; Gauteng Department of Health and Social Development, 2012; Western Cape Government: Health, 2012b)

To some extent this has been adjusted for by down-weighting the OPD headcount and emergencies by multiplying the number by 1/3 – this implicitly assumes that each of these cases consumes 1/3 of the resources of an average inpatient day. It is likely that these cases could consume, on average, less than 1/3 of the resources of an inpatient case (consider, for the example, the costs associated with patients collecting chronic medication). If this is the case the number of patient day equivalents would be overstated, and the average cost per PDE would be understated.

Table 9: Public Sector estimates of the cost per day

Estimate Description	**2010/2011 value**
National cost per district hospital PDE (Day et al., 2011a)	R1,543
National cost per PDE adjusted for national mix of district, regional and central/tertiary hospitals	R2,237

8.5.Estimation of the cost per admission in the public sector

The South African Health Review (Day et al., 2011a) defines average length of stay (ALOS) as follows:

(Inpatient days + 1/2 Day patients)/(Discharges + Deaths + Transfers out + Day patients)

The public sector uses what is referred to as the midnight-census method to measure the number of inpatient days (Day, Barron & Massyn, 2011). With this method patients are counted at midnight. By comparison the private sector uses "billed" days which include half days (van Eck & Besesar, 2009). The following example, for a patient admitted at varying times on a Monday and discharged at varying times on a Wednesday, illustrates the differences that arise from these two patient-day definitions.

Table 10: Comparison of midnight census and billed method of counting patient days

Admitted	**Discharged**	**Public-sector (midnight census method) number of patient days**	**Private-sector (billed method) number of patient days**
Monday AM	Wednesday AM	2	2.5
Monday AM	Wednesday PM	2	3
Monday PM	Wednesday AM	2	2
Monday PM	Wednesday PM	2	2.5
Average Length of Stay (assuming uniform distribution across admission and discharge times)		**2**	**2.5**

Based on this methodological difference, we would expect the average length of stay in the public sector to be understated relative to the private sector. Consequently, the cost per PDE would be overstated. However, the overall cost per admission is not affected.

The ALOS figures published in the South African Health Review reflect all hospital types and not just district hospitals. As expected there is considerable variation between provinces (Figure 8). This may be due to differences in the mix of facilities, patient casemix and differences in efficiency levels.

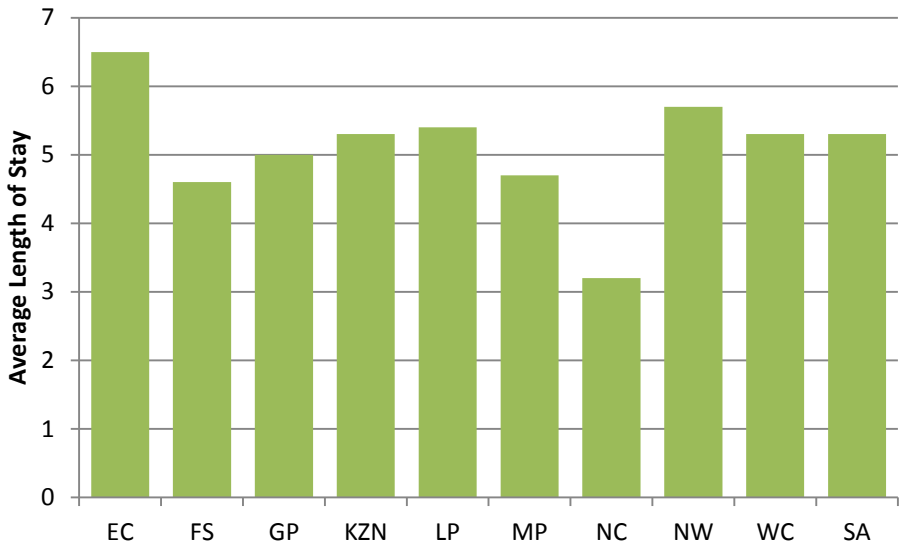

Figure 8: Average length of stay in each province 2010/11 (Day et al., 2011b)

From the detailed figures available for the Western Cape we can see that there is considerable variation in the average length of stay between different types of facilities. Facilities such as psychiatric hospitals, TB hospitals and rehabilitation hospitals have exceptionally long lengths of stay and provide a service different to that offered by the private sector. The public sector figures would likely be slightly lower if these facilities were excluded. However, the average cost per day would also be higher if these hospitals were excluded. The longer stays are typically medical admissions with lower average costs per day as there are no theatre costs included and the acuity of care is relatively low. This detailed split of ALOS between facility types is not available for provinces other than the Western Cape so no adjustment could be made.

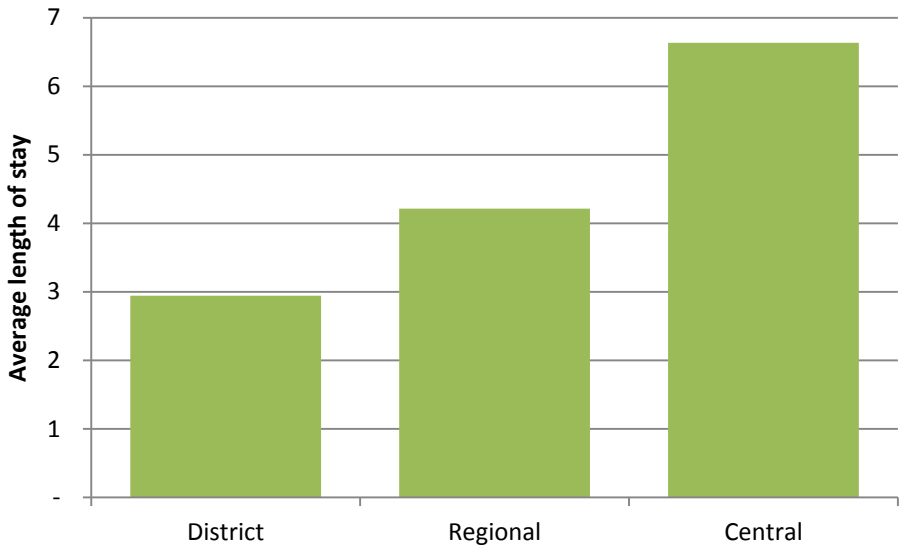

Figure 9: Average length of stay for each hospital type in the Western Cape 2010/11 (Western Cape Government: Health, 2012b)

Table 11: Public Sector estimates of the cost per day 2010/11

Estimate Description	2010/2011 value
National cost per PDE adjusted for national mix of district, regional and central/tertiary hospitals	R2,237
Average length of stay	5.3
National cost per admission	R11,858

9. Private sector analysis

Data for the private sector was obtained from reports published by the Council for Medical Schemes (CMS). This data is on a calendar-year basis and the time period therefore varies by two months from the financial-year basis used in the public sector. Where possible, figures were checked against published research and annual financial statements. The starting value for the private sector was calculated as the total expenditure on private hospitals divided by the number of days sold. The precise definition of "days sold" is not clear from the CMS reports. Econex (2012) provide a figure (based on data obtained directly from the three large hospital groups) of 847 hospital days per 1000 beneficiaries in 2010. Given that the results from these two independent sources are highly consistent, it is reasonable to assume that the CMS figure provides a suitable estimate for the number of bed days sold in the private sector.

Table 12: Average expenditure per day in the private sector 2010

	2010
Total expenditure	30,833,169,879
Total beneficiaries	8,315,718
Days per 1000	856.6
Total days	7,123,244
Expenditure per day	4,329
ALOS	3.27
Expenditure per admission	14,156

(Council for Medical Schemes, 2011)

The total expenditure figure of R30.8 billion is for all private hospitals (i.e. not just the major hospital groups or the members of HASA) but excludes the expenditure for private patients who are not medical scheme beneficiaries.

10. Adjusting figures for comparability

10.1. Adjusting for VAT

The total expenditure on private hospitals, as reported by the Council for Medical Schemes will include Value Added Taxation (VAT). By comparison the public sector figures do not include VAT. However, private hospitals also pay VAT on some of their input costs. If private hospitals were to be VAT-exempt the net effect on the amount charged would likely be less than 14%. However, because all figures in Annual Financial Statements are reported net of VAT it is not possible to determine the actual percentage from publicly available information.

Table 13: Average expenditure per day in the private sector adjusted for VAT 2010

	2010
Expenditure per day (inclusive of VAT)	4,329
Expenditure per day (excluding 14% VAT)	3,797

10.2. Adjusting for corporate tax and cost of capital

Hospitals are capital-intensive entities and are required to pay corporate tax. Both of these elements limit comparability between the public and private sectors on a level-playing field basis.

Private hospitals have only two sources of capital to meet their significant requirements, namely equity (i.e. shareholder capital) and debt. Shareholder returns and interest payments on debt are therefore necessary in order to attract and service capital.

Public sector capital spending is funded from the fiscus with no return on capital requirement. Such expenditure is shown in the Department of Health (DoH) budget, but it is ring-fenced for use by the

Department of Public Works on behalf of the DoH. In order to compare public and private hospital costs (and not the price charged), one therefore needs to adjust for the cost of capital and corporate tax.

The EBITDA margin is used in this report as a proxy for corporate tax and cost of capital. The EBITDA margin is calculated as the ratio of Earnings before Interest, Taxation, Depreciation and Amortisation (EBITDA) to revenue, and therefore represents the portion of private hospital revenue that is allocated towards capital costs, corporate taxation and allowances for depreciation and amortisation.

The average EBITDA ratio across Mediclinic, Netcare and Life (for the financial year ending in 2011) was 21.3% (weighted by revenue) based on information published in audited annual financial statements. Adjusting the sales revenue figure down by this percentage provides us with a more comparable figure to the public sector.

The EBITDA ratio is used because it is objective and publicly available.

Table 14: Average expenditure per day in the private sector adjusted for VAT and EBITDA 2010

	2010
Expenditure per day (inclusive of VAT)	4,329
Expenditure per day (excluding 14% VAT)	3,797
EBITDA margin (as a percentage of revenue net of VAT)	21.3%
Cost per day (excluding VAT and adjusting for EBITDA)	2,989

10.3. Employment of doctors

Medical scheme expenditure on private hospitals, as reported by the Council for Medical Schemes, includes theatre fees, ward fees, consumables and medicine used in hospital. The expenditure does not include the fees charged by doctors and specialists, radiology, pathology, allied professionals and dentists.

There are two possible approaches to adjusting for the difference in inputs between public and private hospitals: to exclude doctor salaries for the public figure or to add medical scheme expenditure on doctors in hospital to the private figure. The available data on private-sector doctor expenditure from the CMS is problematic for a number of reasons. The key issue is that because private hospitals are not permitted to employ doctors, they have no control over their billing practices. Consequently, the combination of private-hospital expenditure and private-doctor expenditure is not comparable to the total cost of delivery in the public sector (whereas the removal of salaries in the public sector does

create a comparable cost base). In addition, medical scheme expenditure on doctors is increasingly not reflective of true costs – in particular the reported figures exclude the impact of cash practices and balance-billing.

Medical practitioners and specialists account for a combined 23% of national public-sector personnel costs (Department of Health, 2011). This proportion will vary between types of facilities, and is likely to be higher in hospital facilities where activities are more doctor-driven. Personnel expenditure as a percentage of total expenditure also varies by facility. For the Western Cape this varies between 55% and 71% for those programmes that include hospitals (Table 15).

Table 15: Personnel expenditure as a percentage of total expenditure 2010/11

Programme	Description	Personnel Expenditure as a % of total expenditure
Programme 2	District Health Services	55%
Programme 4	Provincial Hospitals	71%
Programme 5	Central Hospitals	67%

(Western Cape Government: Health, 2012a)

From Figure 2 we can see that staffing levels vary considerably between provinces, making national adjustments for medical practitioner salaries difficult to do accurately. In our base scenario we assumed that 65% of total expenditure is on personnel, and that 40% of that expenditure relates to medical practitioners. These assumptions are based on costs in the Western Cape which appear to be more comparable to the private sector in terms of vacancy levels and utilisation of medical specialists.

The net effect is a lower proportion of spend in the public sector on medical practitioners than in the private sector (see Appendix B). This is to be expected given that practitioners in the public sector are salaried whereas private hospitals have no control on the billing practices of private doctors. As discussed previously, the high vacancy rates in the public sector distort comparisons. Personnel costs in the public sector are understated to the extent that facilities are understaffed. However, productivity levels in the public sector may increase if facilities are more fully staffed.

No additional adjustment was made for radiology and pathology costs in the public sector – some of the staff costs may be included in the public sector personnel costs but these figures will not include the costs of equipment, materials and costs arising from services outsourced to the National Health Laboratory Service (NHLS).

10.4. Pharmaceutical and surgical tender prices

The State has sufficient purchasing power to be able to secure discounts for some pharmaceutical and surgical products through the issuing of tenders. We were not able to find the total value of these discounts in the public domain. However, the extent of the discount on individual items can be

identified using information in the public domain[4]. For products where tenders have been successful the discounts secured are frequently substantial. Table 16 provides three examples for products that are frequently used in the private sector. However, there are a large proportion of products for which there is no discount (either where no tender is issued or there is no response to a tender).

Table 16: Examples of public sector discounts on products

Product	Supplier	Private sector SEP per unit ex VAT	DOH tender price	DOH Tender Price ex vat	Duration of DOH tender	Public sector discount on private sector prices (ex VAT)
TARGOCID INJ 400mg/20ml 3ml WATER-1	Sanofi Aventis	1345.33	289.56	254.00	Up to 31 Jul 2013	81%
CLEXANE INJ 0.4ml 40mg PREFILLED SYR-10	Sanofi Aventis	67.37	19.38	17.00	1 Jun 12 to 31 May 14	75%
MERONEM VIAL 1G -1	Astra Zeneca	326.5	125.95	110.48	Up to 31 Jul 2013	66%

In order to accurately calculate the financial impact of the State discount, data on the mix and volume of products purchased is required. Allowance would also need to be made for differences in the basket of goods purchased between the two sectors. This information is not available in the public domain. It can be expected that the State would only issue tenders for goods that it uses. There will therefore be a strong relationship between the mix of goods used and the extent of discounts (i.e. differential pricing will only apply on goods that are used in both sectors).

The proportion of expenditure in the private hospital sector that is attributable to pharmaceuticals can be obtained from the Council for Medical Schemes annual report. Anecdotal evidence from the industry indicates that the reported proportion of expenditure relating to medicine and consumables is incorrect and underestimated. This would have the effect of overestimating the private sector figures. However, the CMS report is the only publicly available data source. The most recent figures indicate total expenditure of 20% in 2011 (Table 17).

[4] The tender price information can be found on http://www.doh.gov.za/tenders.php?type=Medical%20and%20Pharmaceutical%20Contracts and the private sector single exit price can be found using the South African Medicine Price Registry www.mpr.gov.za

Table 17: Composition of medical scheme expenditure of private hospitals (fee-for-service) 2010

Category	Proportion of private hospital expenditure
Ward fees	51%
Theatre fees	24%
Medicine	**14%**
Consumables	**6%**
Other	2%
Procedure	2%
Equipment	1%

(Council for Medical Schemes, 2011)

Due to the high level of uncertainty associated with the extent of the discount in the public sector, a sensitivity-tested approach has been used. The base scenario assumes a saving of 25% on average (i.e. that roughly a third of products are discounted, with an average discount of 75%), on 20% of expenditure. The alternative scenario tested assumed savings of 50% (i.e. two-thirds of products are discounted, with an average discount of 75%) on 30% of expenditure.

11. Results

The key measure that is used to compare the two sectors is the average cost per admission. The two sectors are compared on a level-playing-field basis, i.e. with adjustments made for the structural differences in their underlying cost base.

11.1. The base scenario

The average cost per admission in the private sector is calculated as follows:

Table 18: Calculation of average cost per admission for private hospitals (base scenario)

Average cost per day	4,329	Source: Council for Medical Schemes
Average cost per day (excluding VAT)	3,797	See Section 10.1
EBITDA margin (as a percentage of revenue net of VAT)	21.30%	See Section 10.2
Cost per day (excluding VAT and adjusting for EBITDA)	2,989	
Pharmaceutical expenditure as a % of hospital expenditure	20%	Council for Medical Schemes
Average state discount on pharmaceutical tenders	25%	
Cost per day (excluding VAT, adjusting for EBITDA, including pharma discount)	2,839	
Average length of stay	3.27	Council for Medical Schemes
Average cost per admission	**9,284**	

Note that the average cost per admission does not include the fees charged by doctors and specialists, radiology, pathology, allied professionals and dentists.

The average cost per admission in the public sector is calculated as follows:

Table 19: Calculation of average cost per admission for public hospitals 2010/11 (base scenario)

Average cost per PDE for district hospitals	1,543	South African Health Review
Adjustment factors for mix of hospital types	1.45	See Section 8.3
Average cost per patient day equivalent for all hospitals	2,237	
Proportion of hospital costs related to personnel	65%	See Section 10.3
Proportion of personnel costs related to medical practitioners and specialists	40%	See Section 10.3
Average cost per PDE for all hospitals excl doctors	1,656	
Average length of stay	5.3	South African Health Review
Average cost per admission	**8,775**	

Based on these assumptions and adjustments the ratio between the average cost per admission in the private to that in the public sector is **1.058** (i.e. costs are 5.8% higher in the private sector).

This indicates that costs of delivery in the private sector remain marginally higher than in the public sector even once differences in taxation, preferential purchasing arrangements and the costs of capital are adjusted for. However, the extent of the difference depends heavily on assumptions made.

The comparison on a cost-per-admission basis is illustrated below.

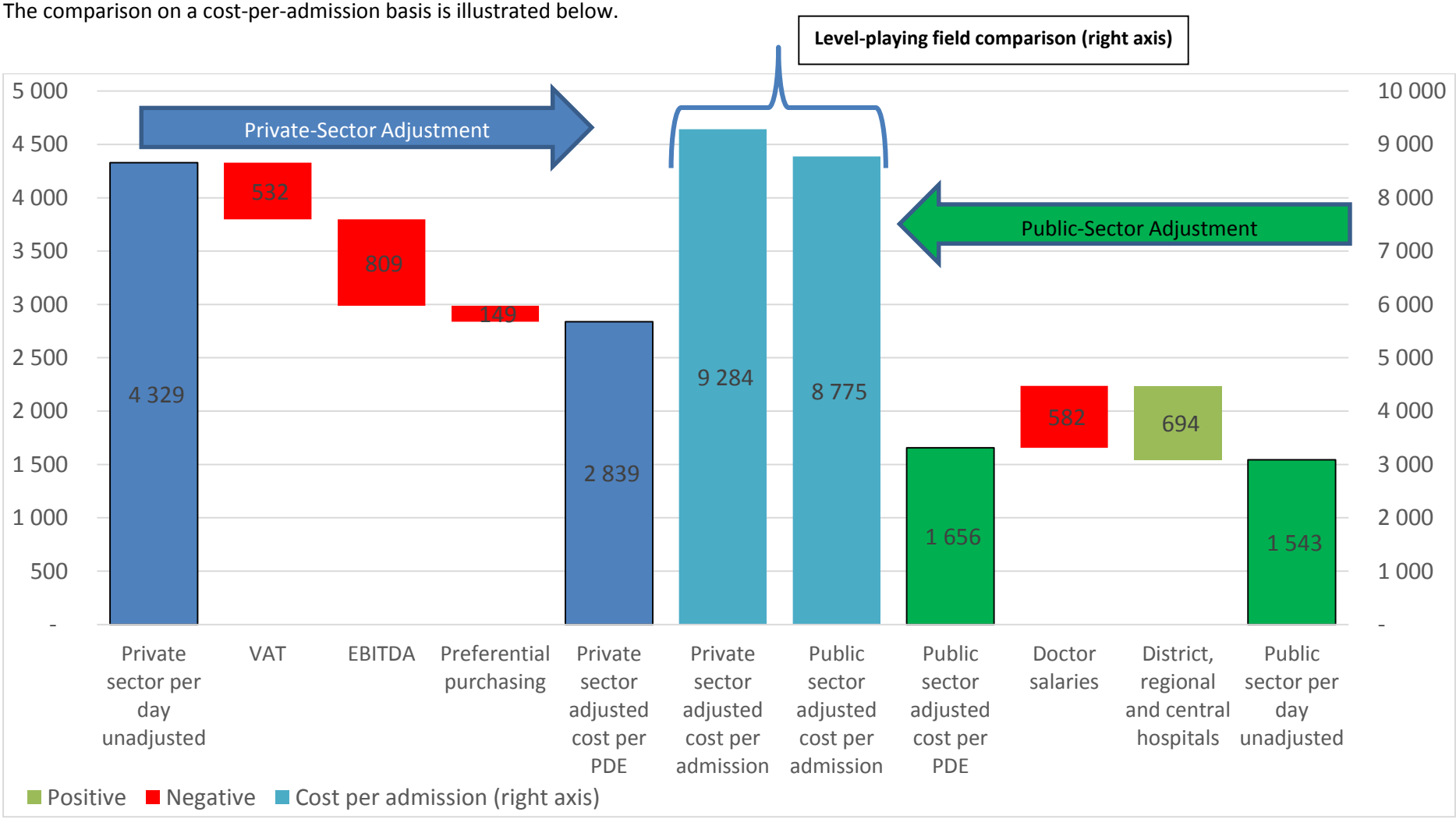

Figure 10: Level-playing field comparison per day

11.2. Sensitivity Analysis

A sensitivity testing model is attached to this report. The two assumptions with the highest degree of uncertainty (medical practitioner costs and preferential purchasing discounts) in the base scenario are sensitivity tested to obtain a sense of the potential range of values for the ratio.

Table 20: Sensitivity analysis

		Cost per admission private sector	**Cost per admission public sector**	**Ratio**
Base Scenario (Level Playing Field)		9,284	8,775	1.058
Discount on ethical and surgicals	Allowance for a higher discount on ethicals and surgicals in the public sector. Base scenario discount is 25% on 20% of expenditure. Alternative assumption is a 50% discount on 30% of expenditure.	8,307	8,775	0.947
Personnel costs	Base scenario assumes that 65% of hospital costs relate to personnel and 40% of those costs relate to medical practitioners and specialists. Combined effect: 26% of expenditure Alternative assumption allows for higher costs i.e. fewer vacancies than in the Western Cape, higher pathology and radiology costs. Combined effect: 35% of expenditure	8,307	7,708	1.205

It is important to note that there are other elements of uncertainty present in the assumptions and adjustments made:

- The VAT adjustment to private-sector costs is likely to be overstated;
- The average cost per PDE in the public sector is likely to be understated due to the crudeness of the adjustment that is made for the high proportion of OPD and emergency cases;

12. Conclusions

Using the methodology outlined in this report, we found the ratio between the average cost per admission in the private sector to that in the public sector to be **1.058** (i.e. costs are 5.8% higher in the private sector).

Table 21: Comparison of average cost per admission for private hospitals 2010 and public hospitals 2010/11 (base scenario)

Public-sector average cost per admission	**8,775**
Private-sector average cost per admission	**9,284**
Ratio of private-sector to public-sector	**1.058**

The personnel cost and preferential purchasing discount assumptions in the base scenario are sensitivity tested to obtain a sense of the potential range of values for the ratio. This is necessary given the data constraints that were faced. The results of the sensitivity tests range between **0.947 to 1.205** (i.e. costs are between 5.3% lower and 20.5% higher). The extent of the difference between the two sectors depends on assumptions made and is highly sensitive to differences in the casemix between sectors.

As with any analysis across the public and private sectors, it should be borne in mind that the comparison is confounded by the following structural differences:

- We know that the **inputs** used in the two sectors differ. Most notably, the public sector employs medical practitioners which the private sector is not permitted to do. This will have a number of implications including the alignment of incentives between hospitals and practitioners.
- We also know that the **outputs** produced in the two sectors differ due to differences in both supply and demand factors. For example, we know that public sector hospitals treat a large number of outpatient and emergency cases. These cases are reflected in the average cost per patient day equivalent, but are not reflected in the average length of stay. In addition, the public sector produces outputs such as training and research which are not accounted for in the comparison.
- Importantly, we have not been able to quantify differences in **casemix** between the two environments due to an absence of publicly available data. Again, this will be affected by both supply and demand factors. Anecdotal evidence indicates that a much higher proportion of public-sector inpatient cases are medical cases compared to the private sector which has a higher surgical mix.
- We know that the **objectives** of the two sectors differ by virtue of their natures and the stakeholders that they serve. Related to this, we expect **rationing** mechanisms to differ

between the two environments. For example, we may expect average **casemix** in the public sector to be heavier than in the private sector as scarce resources are channelled to more serious cases. This may be offset by differences in the medical/surgical mix between the two sectors, with anecdotal evidence indicating greater surgical intensity in the private sector.

- We have not addressed the issue of differences in **quality** between the two sectors in this report, other than reporting higher patient satisfaction levels in the private sector. Ideally a meaningful comparison should be on a quality-adjusted basis, particularly since higher quality care is typically associated with higher costs of delivery.

There are currently no rigorous comparisons of the private and public hospital sectors in South Africa. This raises the risk of policy decisions being made on the basis of polarised perceptions and broad characterisations of the two sectors. However, the current paucity of publicly-available data is a serious constraint on analysis for the purpose of evidence-based policy making.

It is clear that at present the lack of accurate and comprehensive hospital-level data limits us to high-level comparisons between the two sectors. These high-level comparisons mask the vast differences between individual institutions and merely provide a rough sense of relative costs. Proper benchmarking is likely to yield insight for both sectors and is a useful means of identifying best practice but requires far more information than is currently in the public domain.

The fair-playing-field comparison of the cost per admission between the private and public sectors indicates a far smaller differential in the costs of delivery than implied by current rhetoric. These results highlight the necessity of ensuring that comparisons adjust appropriately for structural differences between the sectors i.e. taxation, preferential purchasing arrangements, doctor employment and the costs of capital. Furthermore, the work done here indicates that plurality of provision is a policy option that requires serious consideration.

Appendix A

Table 22: Price efficiency, allocative efficiency, technical efficiency and scale efficiency

	Private-sector	Public-sector
Price efficiency involves purchasing those inputs that are required to fulfil operations at the lowest possible price. Price efficiency is improved when inputs (capital and labour) are purchased at a lower price without sacrificing quality.	Price efficiency is not always in the control of private hospitals. For example, the SEP legislation controls drug prices and nurse salaries may be driven up by public sector salaries. If we measure inputs and outputs in both physical units and rand amounts we can begin to segregate price efficiency from technical and scale efficiency.	Price efficiency is a source of relative efficiency in the public sector both in terms of the absence of VAT and the existence of tender prices.
Allocative efficiency relates to the optimal mix of inputs (and/or the optimal mix of outputs). When multiple inputs/outputs are involved, inefficiencies can be due to the mix of inputs used to produce the mix of outputs.	Allocative efficiency can be considered if price and cost data are available, and a cost minimisation or profit maximisation constraint can be applied. A profit maximisation criterion is likely to apply in the private sector, although cost minimisation criterion may play a role where there are alternative reimbursement mechanisms. Examples include the mix of different types of nurses used, as well as the use of technology/equipment in such a way as to reduce HR requirements.	The public sector has different goals to the private sector. Importantly, because of societal objectives the optimal mix of outputs may differ in the public sector. In some ways the public sector has greater control of the outputs produced (due to rationing efforts) than the private sector (where, by and large, patients who arrive for treatment are treated). Profit maximisation is irrelevant in the public sector where cost minimisation is driven by global budget allocations.
Technical efficiency refers to the production of a given level of outputs using minimum inputs, or alternatively, the maximum generation of outputs using a given level of inputs.	This relates to the usage of beds, nurses, medication and equipment.	It may be difficult to compare the outputs produced in the public sector with the outputs produced by the private sector due to qualitative differences in outputs (recovery time, mortality, hospital acquired

		infections etc.). Accurate and comparable data are not available in South Africa.
Scale efficiency: optimal activity volume level - that size of the entity at which optimal technical efficiency is achieved. A firm can be technically efficient but still be able to improve its productivity by making use of economies of scale.	Relates to each service or type of service provided, not just the number of beds. Examples of scale effects include the optimal booking of theatre time and usage of expensive equipment.	Issues relating to scale are likely to be similar in the public sector as compared to the private sector. Diseconomies of scale may be more acceptable in the public sector if geographical access is important.

Appendix B

According to Econex (Econex & Quantec Research, 2011) 54% of the fees charged by GPs and specialists in South Africa relate to services provided in hospital. We can therefore add 54% of expenditure on medical practitioners (including radiology and pathology) as reported by the CMS to the total private sector hospital figure. No adjustment was made for the allied professions, dental specialists or dentists due to the lack of splits in the CMS data between in-hospital and out-of-hospital costs, and the lack of data relating to these activities in the public sector. This exclusion will underestimate the extent of the difference in the cost base between the two sectors.

Table 23: Average expenditure per day for GPs and Specialists in private hospitals 2010

	2010
Total expenditure	13,473,125,820
Total expenditure (excluding VAT)	11,818,531,421
Total beneficiaries	8,315,718
Days per 1000	856.6
Total days	7,123,244
Expenditure per day (GP and Specialist)	1,659
Expenditure per day (hospital plus GP and Specialist)	4,648

(Council for Medical Schemes, 2011), own calculations

Table 24: Comparison of two approaches to adjusted for medical practitioner salaries

	Private Sector	**Public Sector**
Costs per day (including medical practitioners)	4,648	2,237
Cost per day (excluding medical practitioners)	2,989	1,656
Practitioner costs as a percentage of the total	35.7%	26.0%

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