

**SHIELD Work Package 5 Report:**

**Modelling the estimated resource requirements  
of alternative health care financing reforms in  
South Africa**

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## **Note to readers**

This report is the final product of a multi-country research project initiated in 2006 and ending in September 2010. Given the debate about health care financing reforms currently underway in South Africa, we are placing this report in the public domain to contribute to debate about an appropriate way forward for the South African health system. We are also releasing the report in an effort to generate discussion that can contribute to refining the assumptions used in the models. I would welcome all comments on the model design, and particularly on the assumptions that have been used, so that the analysis presented here can be strengthened even further.

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## Executive summary

Models are not a crystal ball; no model can predict the future with complete accuracy. It has been said that no models are correct, but some models are helpful. The purpose of this report is to try to present models that could be helpful in assessing alternative health care financing reforms in South Africa. It is part of an ongoing research project that has critically evaluated equity in the existing health system and alternative options for the possible future development of health care financing mechanisms. The alternatives considered include:

- Maintaining the current system (the ‘status quo’ scenario) where 16% of the population are covered by medical schemes and the rest are largely dependent on publicly funded services;
- Pursuing a universal health system (akin to the proposed national health insurance policy, which aims to fund a comprehensive package of services for all South Africans from an integrated pool of public funds, sourced from general tax revenue and possibly a mandatory contribution or earmarked tax by formal sector workers) – the ‘universal coverage’ scenario; and
- Pursuing what is often called a social health insurance system (SHI), which refers to the mandatory extension of medical scheme cover to all formal sector workers above the income tax threshold, with the remainder being covered by tax funded health services (an option put forward since the early 1990s) - the ‘mandatory extension of schemes’ scenario.

The models draw on international best practice for making ‘high-level’ estimates of the likely resource implications of substantial health financing system changes. In particular, the models are based on the International Labour Organisation’s approach of projecting future changes in the size and age/sex composition of the population, utilisation rates for different categories of health services for each demographic group and the unit cost of different health services. The estimated resource requirements for each scenario are the product of population, utilisation rates and unit costs. Projections are made for 15 years from the date of implementation initiation. This report provides a detailed overview of the methods used in the models and provides evidence to support the key assumptions adopted. In order to provide a reliable basis for comparison across the three scenarios, the core assumptions have been used consistently unless there was a sound basis for using a different assumption in a particular scenario.

Under the ‘status quo’ scenario, recent trends in spending on public sector services and by medical schemes are projected forward. It assumes some growth in medical scheme coverage, somewhat improved cost containment within schemes and some efforts to improve the public health system.

In essence, the ‘universal coverage’ scenario is based on a public sector framework of service delivery. The current policy proposals indicate that a comprehensive package of services will be provided which is more in line with how services are currently provided in the public sector than in medical schemes, which have a very explicit and limited list of services that will be covered with all other services being excluded from cover. However, it uses unit costs that are substantially higher than currently prevail in the public sector to take account of the need for improved resourcing of public services to achieve high quality services. These higher unit cost levels would also enable purchasing of services from private providers. In addition, this scenario assumes very large increases in utilisation of health services, particularly at the primary care level and in district hospitals, with somewhat smaller increases at higher level hospitals.

The ‘mandatory extension of medical schemes’ scenario assumes extension of coverage to all formal sector workers above the income tax threshold, and their dependents, within five years and continued extension of coverage as formal sector employment grows. It also assumes that there would be a relative shift in utilisation within the schemes environment in favour of primary care services and reduced utilisation of specialist services. This is related to earlier proposals put forward in relation to moving towards a SHI to expand the prescribed minimum benefits to include primary care services.

Given the magnitude of the AIDS epidemic, the resource requirements for treatment of those on antiretroviral treatment (ART) is modelled separately. The same estimates of funding requirements for ART are applied to all scenarios.

The most important findings of the analyses presented in this report include:

- The mandatory extension of medical scheme coverage scenario has the highest level of resource requirements and would result in total health care spending in South Africa exceeding 13% of gross domestic product (GDP). Under this scenario, approximately 39% of the population would be covered by medical schemes within 15 years, with these schemes accounting for health care expenditure equivalent to 10% of GDP, while the remainder of the population would remain reliant on publicly funded health services (which would have expenditure of just over 3% of GDP). Only one country in the world has expenditure levels of this magnitude – the USA; in my view, this option is unaffordable.
- The status quo and universal coverage scenarios would result in similar levels of health care expenditure – expenditure levels under the status quo scenario would grow to approximately 9.5% of GDP within 15 years for the status quo scenario and 8.6% for the universal coverage scenario. The key difference between the two scenarios is that:
  - under the status quo scenario the majority of funding would be accounted for by medical schemes, totalling 6% of GDP (schemes would cover just over 20% of the population within 15 years) and public funding would only account for 3.5% of GDP; while
  - under the universal coverage scenario the majority of spending would be funded from public sources (totalling 6.4% of GDP) while schemes would only account for spending equivalent to 2.2% of GDP.

A key concern about pursuing a universal health system is the potential tax burden of generating public health sector funds equivalent to over 6% of GDP. The analyses undertaken in this report estimate that if the allocation to the health sector from general tax revenue is gradually increased to 15%, which would be in line with the Abuja commitment, a maximum additional tax on income of 4% (shared between employers and employees) would be required to fund a universal health system.

The modelling presented in this report also highlights key factors that can influence the sustainability of alternative health system reform pathways. In relation to the universal coverage option, it is particularly important to carefully manage increases in service utilisation, such as through ensuring good community level services, high quality and accessible primary level services and to implement a strong gatekeeping system at primary level facilities with referral to specialists and hospitals only as necessary. Equally important is to ensure that health service unit costs and increases in these costs are carefully controlled. If the fee levels currently charged by private health care providers were charged for all services in a universal system, health care expenditure would exceed 28% of GDP.

Using the same model structure and consistent assumptions for key variables across scenarios, the findings clearly indicate that the level of health care expenditure will be lowest under the universal coverage scenario and that it will result in only a marginal increase in total health care expenditure relative to GDP (from just over 8% currently to 8.6% within 15 years). This means that the resource requirements for universal coverage will grow in line with GDP growth. However, the universal coverage option requires a very substantial increase in **public** funding. The revenue estimates indicate that it is possible to do this, but the magnitude of the challenge of generating additional tax

funding, and awarding the health sector greater priority than at present in the allocation of the overall government budget, should not be underestimated.

The choice between moving towards universal coverage or retaining the status quo is a policy decision that needs to draw on a wider range of information than presented in this report. For example, the health status improvements and the other social benefits of dramatically improved financial protection and access to needed health services for all in South Africa need to be taken into account when considering moving from the status quo to a universal health system. These have to be weighed against the need to increase the health sector's share of the government budget funded from general revenue to 15% as well as introduce a dedicated tax on income for the health sector (or some other combination of percentage share of general revenue for the health sector and dedicated health taxes or contributions).

The models presented in this report are admittedly simple and are designed to produce 'high-level' estimates of the resource requirements for a universal health system under different conditions and to compare this with not introducing health system changes (maintaining the status quo) and an alternative reform of mandatory extension of medical scheme coverage. There are undoubtedly areas where further refinement is possible. However, as indicated previously, the purpose of this modelling process is not to come up with a definitive, immutable estimate of the resources required to achieve universal coverage or the other scenarios. Instead, it provides information that may assist in evaluating the desirability of universal coverage as opposed to maintaining the current system or pursuing an alternative reform path. It also provides helpful insights into the key elements of the universal coverage system design that need to be addressed to ensure that universal coverage is affordable and sustainable within the South African context.

## Introduction

This report is part of the SHIELD (Strategies for Health Insurance for Equity in Less Developed countries) project, which was initiated in 2006 and is funded by a grant from the European Commission under its Sixth Framework Program and a supplementary grant from IDRC. The aim of SHIELD is to critically evaluate existing inequities in health care in Ghana, South Africa and Tanzania and the extent to which changes in health care financing mechanisms could address equity challenges. The first phase of SHIELD involved undertaking detailed financing incidence analyses (i.e. an evaluation of the distribution of the current health care financing burden between socio-economic groups relative to each group's ability-to-pay) and benefit incidence analyses (i.e. an evaluation of the distribution of the benefits of using health services across socio-economic groups relative to each group's need for health care) as a means of identifying existing health system inequities and the factors contributing to these inequities in each of the three countries. The second phase of SHIELD relates to identifying and critically evaluating options for the future development of health care financing mechanisms in relation to their potential equity impact and their feasibility and sustainability given attitudes of key stakeholders. This report focuses on aspects of this phase of work in South Africa, namely the feasibility and sustainability of alternative health financing reforms in relation to their respective resource requirements.

The government has indicated its intention to introduce a national health insurance – NHI. In broad terms, this will involve funding a comprehensive package of services for all South Africans from an integrated pool of public funds, sourced from general tax revenue and possibly a mandatory contribution or payroll tax by formal sector workers. This report considers the resource requirements related to the proposed introduction of a NHI, which is called the 'universal coverage' scenario<sup>1</sup>. There has been considerable debate, particularly in the media, about the proposed NHI. Some of those who are opposed to the introduction of a universal health system have suggested that we should simply continue with the existing health system. Others have suggested that we should instead pursue what, in South Africa, has historically been called social health insurance (SHI). Proposals for SHI in the late 1990s and early 2000s focused on mandatory extension of medical scheme cover to all formal sector workers above the income tax threshold. The report therefore also considers two alternative scenarios, namely the 'status quo' scenario and the 'mandatory extension of private medical schemes' scenario.

The approach adopted in the modelling component of the SHIELD project draws on international best practice for making 'high-level' or macro estimates of the likely resource implications of substantial health financing system changes (Cichon et al., 1999). As explained in the overview of health financing modelling prepared by the International Labour Office, models are simply:

*“mathematical formulations of health care financing systems” and “attempt to translate complex observations into simpler images in order to better understand reality”. “Financial models in the health sector ... describe the expenditure and financing of the national health care delivery system and permit the projection of the future financial status of the system.”* This text goes on to explain that *“Modelling is never an end in itself ... financial models have two major uses: (a) they can serve as an early warning system for potential future financial problems; and (b) they can be used to explore the financial effects of alternative policy options. The latter aspect is of particular importance, since real-world experiments in the realm of social policy (unlike many other fields of inquiry) are often unacceptable from an ethical or financial point of view. Models are therefore an instrument of governance, a*

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<sup>1</sup> Although the term NHI is being used in the current debates, it has led to some confusion. In particular, many are under the impression that health insurance mechanisms for purchasing services such as exist in medical schemes will be applied, whereas this is not necessarily the case. For this reason, we prefer to use the term 'universal coverage', as the core elements of the NHI proposals are that of ensuring financial protection and access to needed services for the entire population.

*supporting tool for policy makers – no more, no less. ... Models only provide a mapping of observed reality. Due to the complexity of the subject, a complete image of the characteristics and the behaviour of the modelling object will not be achieved ... all models are prone to error ... A model is not a crystal ball; it does not predict the future. Rather, models project a possible future state on the basis of observations and assumptions on future conditions. ... models are never final – they can and should always be improved ... Modelling is not an event, it is a process” (Cichon et al., 1999).*

In line with this advice, the modelling presented here is regarded as an input to understanding the potential implications for the health system of moving towards universal coverage relative to the options of retaining the status quo or extending medical scheme coverage to all formal sector workers above the income tax threshold. In addition, models of this nature illustrate how changes in the cost of service provision and/or health service utilisation can dramatically affect overall health system resource requirements. In this way, this report will also highlight the importance of appropriately designing the proposed NHI or universal coverage (UC) system in order to ensure that it is affordable and sustainable in the South African context. Given the stated intention of government to pursue a UC system, the methodology and assumptions for the UC scenario are described in considerable detail. The same basic methodological approach is used for the other scenarios, and the key assumptions for each scenario are described after the overview of the UC scenario model.

## **Methods**

### ***Basic approach***

The model is structured to answer the question: “what will be the total expenditure on health care in a UC system” or “what financial resources will be required for health services under a UC system”. There are three key variables in the model, which can be described by the following equation (with each of the three main variables disaggregated in various ways):

Total expenditure = population x service utilisation rates x unit costs

A key issue in modelling of this nature is that there are considerable differences in utilisation rates between different age/sex groups. In particular, utilisation is higher among young children, the elderly and women of childbearing age. For this reason, population and utilisation data are disaggregated into the following age groups: 0-4, 5-14, 15-49, 50-59 and 60+ years, expressed separately for females and males.

This is in line with the standard international approach to modelling future resource requirements with health system change, which is described as follows:

*“The general approach would be to assume that persons of different age groups would use a certain amount of services over a given period, and also to make certain assumptions regarding the development of prices over time. The multiplication of these utilization rates and unit costs yields expenditure for each type of service analysed. These expenditure sub-totals are then added to arrive at total benefit expenditure with the system” (Cichon et al., 1999).*

The population is also disaggregated into those covered by medical schemes and those who are not. The emphasis in the modelling is on what will happen in terms of *publicly funded health services*. This is the major concern of government which wants to understand what resources are likely to be required in future years to provide adequate health services for the population who are dependent on or entitled to use publicly funded services (whether solely tax funded under the current

arrangements or under a universal health system funded from tax revenue and possibly a mandatory contribution or dedicated health tax).

Nevertheless, even under a universal publicly funded health system, some of the wealthiest South Africans will choose to have private health insurance cover over and above being entitled to benefit from services that are publicly funded. In order to provide an indication of likely total health care expenditure (i.e. public funding plus private health insurance), the model includes both publicly funded services and medical schemes models. The publicly funded model reflects spending (from general tax revenue and possibly a mandatory contribution or dedicated health tax) on health services for *all* South Africans (but with an assumption that those with medical scheme cover will not use publicly funded services to the same extent as those without private insurance coverage); the schemes model reflects spending on those with such cover.

Utilisation rates and unit cost data are also disaggregated according to type of health service. These health service categories are based on what currently exists within the health system, which has both public and private health care providers. The categories of health services included in the model are the following:

- Public sector services:
  - Visits to primary care facilities (clinics or community health centres)
  - District hospital outpatient visits
  - Regional hospital outpatient visits
  - Provincial and central hospital outpatient visits
  - District hospital inpatient days
  - Regional hospital inpatient days
  - Provincial and central hospital inpatient days
- Private sector services:
  - Visits to general practitioners
  - Visits to specialists
  - Visits to dentists
  - Visits to retail pharmacies
  - Private hospital outpatient visits
  - Private hospital admissions

These categories were used because they account for the largest share of expenditure (Council for Medical Schemes, 2009, National Treasury, 2009b), and so it is important to attempt to model likely spending on these services as accurately as possible. In addition, as these are the categories of services that are most widely used, it was possible to obtain sufficient data to enable disaggregation by age and sex groups.

Table 1 illustrates the format of the Microsoft Excel model. These rows are repeated for each of the above service categories.

**Table 1: Extract from basic Excel model**

Year	Gender	Age group	Coverage	Service type	Population	Utilisation	Unit cost	Expenditure
Base year	Female	0-4	Only public funding	Clinic				=Population * utilisation * unit cost
Base	Female	05-14	Only public funding	Clinic				
Base	Female	15-49	Only public funding	Clinic				
Base	Female	50-59	Only public funding	Clinic				
Base	Female	60+	Only public funding	Clinic				
Base	Male	0-4	Only public funding	Clinic				
Base	Male	05-14	Only public funding	Clinic				
Base	Male	15-49	Only public funding	Clinic				
Base	Male	50-59	Only public funding	Clinic				
Base	Male	60+	Only public funding	Clinic				
Base	Female	0-4	Scheme member	Clinic				
Base	Female	05-14	Scheme member	Clinic				
Base	Female	15-49	Scheme member	Clinic				
Base	Female	50-59	Scheme member	Clinic				
Base	Female	60+	Scheme member	Clinic				
Base	Male	0-4	Scheme member	Clinic				
Base	Male	05-14	Scheme member	Clinic				
Base	Male	15-49	Scheme member	Clinic				
Base	Male	50-59	Scheme member	Clinic				
Base	Male	60+	Scheme member	Clinic				

As various services as well as administration costs are not included in the basic model, a lump sum amount is added to the output of the model to ensure that total resource requirements are captured. The services included in this lump sum are:

- Public sector:
  - Specialised hospitals for tuberculosis and psychiatric care
  - Emergency medical services
  - Community-based services
  - Health worker training
  - Health care support services
  - Health facilities management
  - National Department of Health services
  - Administration at all levels of the public health system
- Private sector:
  - Range of other providers (e.g. psychologists, physiotherapists, chiropractors, homeopaths, etc.)
  - Administration costs

In addition, given the magnitude of the HIV epidemic and the commitment to universal access to antiretroviral treatment (ART), a separate model of resource requirements for scaling up the ART program was used.

Before any projections were undertaken, the model was 'benchmarked' for the years 2007 and 2008. The total expenditure predicted by the model was compared to actual expenditure on these services as reported by National Treasury (2009b) and the annual reports of the Council for Medical Schemes (2008, 2009).

After benchmarking, projections were undertaken for a fifteen year period. As it is unclear when health system change may be initiated in earnest, the findings are presented relative to a base year (i.e. relative to what the current situation is) and projected forward over an implementation period of 15 years from the date of initiating change. All projections are expressed in real 2010 values. Total projected resource requirements are not only expressed in Rand terms, but also as a percentage of Gross Domestic Product (GDP). As noted by international guidelines on health care financing modelling: "Relative cost estimates [predicted health care expenditure as a percentage of GDP] generally have more explanatory power than absolute values" (Cichon et al., 1999).

In addition, the projected expenditure from public funding is compared with potential availability of funding from general tax revenue (based on estimates of potential tax revenue and percentage allocation to the health sector) and the magnitude of mandatory contributions that may be required.

The primary data sources and range of assumptions included in the model are described in detail in the following sections. As assumptions were required in relation to a number of key variables, extensive sensitivity analyses were undertaken to assess how sensitive the model outputs are to changes in these assumptions.

### ***Data sources for baseline and projections***

#### **Population**

Population data are drawn from the Actuarial Society of South Africa (ASSA) model, more specifically the most recent version of the ASSA suite of models, the ASSA2003 AIDS and Demographic Model (downloaded from [www.assa.org.za](http://www.assa.org.za)). ASSA is regarded as the pre-eminent body undertaking demographic modelling of the South African HIV-epidemic, which is the factor with the greatest impact on demographic trends in South Africa at present. Projections for the specific age/sex groups were drawn for the years 2010-2025.

In the models, the population is divided into those covered by medical schemes and those not covered by schemes. The total number of medical scheme members is drawn from the Council for Medical Schemes' Annual Reports (Council for Medical Schemes, 2008, Council for Medical Schemes, 2009). The distribution of scheme members between age/sex groups is drawn from the only data source available to the research team, namely the SACBIA household survey (see next section for details of this survey). Unfortunately, the Council for Medical Schemes does not report on the demographic profile of scheme members despite these data being routinely collecting for purposes of the proposed 'risk equalisation fund' (REF) planning.

#### **Utilisation**

Data on the current utilisation of different types of health services are drawn from a national household survey, called SACBIA (the South African Consortium for Benefit Incidence Analysis), which was initiated by the Health Economics Unit at the University of Cape Town, the Centre for Health Policy, University of the Witwatersrand, and the national Department of Health. Data collection was contracted to an experienced survey company, the Community Agency for Social Enquiry (CASE).

The survey was nationally representative. Enumerator areas (EAs) were stratified by province, type of settlement (farm, informal settlement, tribal settlement, small holding, and urban settlement) and population group. In total, 960 EAs were selected across the nine provinces and five randomly selected households were interviewed within each EA, giving a total sample size of 4,800 households. The EAs within each stratum were selected with a probability proportional to the size of the EA, where size was defined according to the number of households within each EA. Fieldworkers were given extensive training to ensure the questions were well understood. Data were collected in May and June 2008. Twenty percent of questionnaires were subjected to telephonic 'check-backs' for verification and double-entry data capture reduced errors. The data were weighted to national population levels. The questionnaire and study protocol were subject to ethical review by the University of Cape Town, and all respondents provided signed informed consent.

The SACBIA survey is the only survey that allows for the calculation of utilisation *rates* and to do this for a disaggregated set of public and private health service providers. The only other national household survey that collects health service utilisation information is the annual General Household Survey (GHS), which unfortunately has a number of deficiencies in terms of its measurement of health service utilisation. Utilisation information in the GHS is dependent on self-reported recent illness, i.e. utilisation information is only collected if a respondent indicates that they or another household member has been ill or injured within a specified recall period and then service utilisation information is only collected in relation to that self-reported illness. This means that health service use for other reasons (e.g. for ante-natal care, other preventive services, deliveries, etc.) is not reported. In addition, the GHS only asks about the use of one service while many people use more than one service or have multiple visits to the same service provider during an illness episode. Thus, the GHS data not only under-report utilisation levels, it also does not allow for the calculation of *utilisation rates*, i.e. the average number of outpatient visits per person or hospital admissions or inpatient days per 1,000 people per year. Instead, these data simply indicate the percentage of the population which reported being ill and visiting a health service within the specified recall period (previous month). To overcome these deficiencies, the SACBIA survey asked about any outpatient health service utilisation in the preceding month (i.e. not restricted to use in relation to self-reported illness) and obtained information on all visits (i.e. multiple visits to the same provider and visits to more than one service provider) and likewise in relation to hospital admissions in the preceding year.

Another deficiency in the GHS is that the service provider categories are not sufficiently disaggregated to identify exactly what type of service was used. For example, the GHS only records whether or not a public hospital was used, rather than what type of public hospital was used. As unit costs at different types of public hospitals vary considerably (Lombard et al., 1991), it is important in modelling future resource requirements to know the distribution of utilisation across different categories of public hospitals. Admittedly, household survey respondents are unlikely to know whether the facility they visited is classified as a district, regional or provincial/central hospital. For this reason, the SACBIA survey asked for the name of the hospital visited or to which an individual was admitted and this was later coded into the three main categories of public hospital level. The main categories of formal<sup>2</sup> health care providers for outpatient services included in the SACBIA survey were:

- Public hospitals (disaggregated into district, regional and provincial or central hospitals)
- Public clinics or community health centres
- Private general practitioners
- Private specialists

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<sup>2</sup> Information on utilisation of traditional and spiritual healers was also collected but is not included in the modelling of future health system resource requirements.

- Private dentists
- Private retail pharmacies
- Private hospitals

The recall period for outpatient visits in the SACBIA survey is one month and for inpatient admissions is one year, which is consistent with international practice (O'Donnell et al., 2008). Seasonality indices were applied to outpatient visit data to generate annual *utilisation rates*, taking account of seasonal variations in visits based on the month and the province where the survey was conducted rather than the traditional fixed multiplication by 12 for a recall period of one month (O'Donnell et al., 2008). This is because of seasonal patterns in disease incidence as well as variations in the health seeking patterns of households (Sauerborn et al., 1996).

For visits to public facilities, the seasonality indices were generated from the District Health Information System (DHIS) which documents total visits to individual public sector facilities in each month, while for private services the indices were generated from data on utilisation patterns in each month provided by the largest medical scheme administrators<sup>3</sup> given that the use of private facilities is skewed towards medical scheme members. The index essentially compares utilisation of each type of service in the month(s) in which household survey data were collected, with the average monthly utilisation over a full year. We apply the seasonality indices to the utilisation data from the household survey to obtain seasonally adjusted annual utilisation rates of the specified health facility or service.

Utilisation data from the SACBIA survey were triangulated against two other data sources:

- The national DHIS for public sector facilities; and
- Data from the largest medical scheme administrators for those covered by schemes.

More details of the triangulation process are provided in the section on benchmarking the model.

### **Unit costs**

To calculate the unit costs of public sector services, data on recurrent expenditure for each type of facility (and for individual facilities in the case of hospitals) was obtained from National Treasury (unpublished data obtained directly from Treasury). In addition, total utilisation of public sector facilities was obtained from the national Department of Health's DHIS dataset (unpublished data obtained from the Department). In the case of clinics and community health centres, the unit cost was simply calculated as expenditure divided by number of visits. In the case of hospitals, unit costs are calculated as the total recurrent expenditure in a facility divided by the weighted total number of users (inpatients and outpatients). Frequently, the assumption made (even internationally) is that the cost of an outpatient visit is a fixed proportion of the cost of an inpatient day. An outpatient visit for instance is considered to be one-third or one-quarter of the cost of an inpatient day across all hospitals (Adam and Evans, 2006, Barnum and Kutzin, 1993, Lombard et al., 1991). However, this assumption is not based on a solid empirical basis and previous research has shown that the ratio of expenditure per inpatient day to expenditure per outpatient visit varies considerably across hospitals at different levels of care (Lombard et al., 1991).

For this reason, we calculated the ratio of the unit costs for inpatient care and outpatient visits for different categories of public sector hospitals using statistical methods. Data on total outpatient and inpatient utilisation by type of hospital and by province were extracted from the DHIS, as well as the total number of nurses and medical doctors – as a proxy for the relative size of the facility. This data were combined with data on recurrent expenditure at each public sector hospital in South Africa,

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<sup>3</sup> The SHIELD research team gave an assurance of confidentiality to the administrators providing data. The data provided represents nearly half of all medical scheme beneficiaries.

provided by the National Treasury. A simple regression model was fitted to generate the ratio of variation between the cost of an outpatient visit and an inpatient day across various public facilities. This ratio was then used to estimate the unit costs for inpatient and outpatient services for each hospital category. The ratios and unit costs calculated through this method are summarised in Table 2.

**Table 2: Cost ratios and unit costs for inpatient days and outpatient visits to public sector hospitals (2006)**

	District hospital	Regional hospital	Provincial/Central hospital
Ratio of the cost of an inpatient day to an outpatient visit	0.371	0.418	0.562
Unit cost of outpatient visit (Rand)	315	435	810
Unit cost of inpatient day (Rand)	849	1,040	1,441

For private sector services, unit cost estimates were based on data provided by the largest medical scheme administrators. The total value of claims (as opposed to the amount paid by the scheme) was divided by the total number of visits or hospital admissions for each type of service (e.g. visit to a private dentist, GP or specialist).

### **Services for those on ART**

The methods for the model used to estimate resource requirements for ART scale-up are described in detail elsewhere (Cleary et al., 2008, Cleary et al., 2006, Cleary and McIntyre, 2010). This model was used as the basis for costing the ART component of the National Strategic Plan for HIV and AIDS and STIs (2007). It includes the full range of costs involved with caring for those who are on ARV treatment (costs of clinic visits for diagnosis, monitoring, adherence support and to collect ARVs, costs of ARVs and routine monitoring tests, costs of outpatient and inpatient treatment of all opportunistic infections including TB, etc.). However, it only focuses on adults, given the limited information available on the costs of treatment of children on ARVs. These data were adjusted to reflect more recent price and cost estimates as follows:

- Doctor and nurse salaries were increased in line with the 2009/2010 Occupation Specific Dispensation (OSD) salary levels.
- ARV and laboratory investigation costs were based on public sector prices for 2009/2010 from the national Department of Health.

In addition, the costing was adapted to reflect recent changes in the “South African Antiretroviral Treatment Guidelines” (2010) regarding ARVs prescribed for the first-line regimen. Specifically, it was assumed that:

- Half of all individuals commencing treatment would receive stavudine and the remainder would receive tenofovir.
- The proportion of patients receiving efavirenz versus nevirapine was based on recent primary data from the Western Cape province (Dr Andrew Boule, personal communication).

The period of costing for ART was assumed to commence in line with the initiation of public sector ART provision in 2003. This is because many of those starting ART between 2003 and 2010 would still be in care. The following assumptions and data were used to estimate the number of adults (aged 15 years and older) commencing treatment in each year:

- For 2003, an estimate of the total numbers starting treatment (in the public, NGO and private sectors) was made using data from Adam and Johnson (2009).
- From 2004 – 2014, actual and projected numbers of adults starting treatment in the public sector were obtained from the national Department of Health.

- From 2015 – 2025, the numbers commencing treatment were assumed to be a proportion of the numbers of people reaching the World Health Organisation (WHO)-defined stage 4 of illness (AIDS sick state) which in turn was based on output from the ASSA2003/ite model.
- The percentage of new AIDS sick adults commencing treatment was set at 92%. This assumption was determined by taking into account recent government targets and the fact that targets have been exceeded in the past. The numbers expected to commence treatment in the estimates from the national Department of Health as a proportion of the numbers reaching stage 4 (as per the ASSA model) were also considered. These proportions peak at 97% in 2010 and decline to 91% in 2014.
- People commencing treatment in a given year were assumed to do so evenly across the year (i.e. no assumptions regarding seasonality were made).

### **Other expenditure**

As indicated previously, the basic model does not include certain services that are used less frequently by the population nor does it include administration costs. Instead a lump sum amount is added to the basic model outputs. Information on spending on these services and administration activities were drawn from National Treasury reports (National Treasury, 2009b, National Treasury, 2009a) in the case of the public sector and from Council for Medical Schemes reports in the case of schemes (Council for Medical Schemes, 2008, Council for Medical Schemes, 2009).

### **Macroeconomic data**

Data on recent GDP levels and estimated rates of future GDP increases are drawn from the most recently available Treasury report (National Treasury, 2010).

### ***Benchmarking process***

The first step in the benchmarking process was to critically assess the utilisation data drawn from the SACBIA dataset. Total utilisation for each category of public sector facility (when the SACBIA sample was weighted for the entire population) was compared with reported utilisation from the DHIS. Similarly, utilisation by medical scheme members was compared with the dataset from the largest medical scheme administrators. In addition, information was obtained on the relative ratio of use of outpatient and inpatient services by different age/sex groups in other countries for which data were available (unfortunately all of which were high income countries) as a basis for assessing the consistency of the distribution of utilisation across age/sex groups. Nevertheless, the SACBIA data were found to be relatively consistent in that the data did not have major ‘outliers’ around these ratios.

Thereafter, the model was benchmarked using data for two years, 2007 and 2008. This entailed inputting the data firstly for 2007 for each variable into the model as illustrated in Table 1. The total expenditure predicted by the model was then compared with actual expenditure on these services in 2007 as reported by Treasury (National Treasury, 2009b) and the Council for Medical Schemes (Council for Medical Schemes, 2008) for the public sector and schemes respectively.

Small adjustments to the data drawn from the SACBIA survey were required for some services (e.g. the SACBIA data suggested slightly higher levels of utilisation of provincial and central hospitals than the DHIS levels and these were adjusted downwards, while SACBIA appeared to under-estimate use of pharmacies by medical scheme members). After these adjustments, expenditure predicted by the model was comparable to actual expenditure reported by Treasury and CMS (less than 1% difference).

Data for 2008 were then inputted into the model, using the adjusted utilisation rates, estimates of 2008 unit cost levels and the 2008 population. Expenditure predicted by the model was again comparable to actual expenditure reported by Treasury and CMS for 2008 (Council for Medical Schemes, 2009, National Treasury, 2009b). No further adjustments were made as the model was viewed to be accurately predicting expenditure levels.

### ***Summary of key projection estimates and assumptions: UC scenario***

This section outlines the key assumptions used in the model and the methods for estimating variables used in the model projections. This is presented for each of the key model components, and summarised in tables that describe the assumptions, the basis for the assumptions and likely criticisms of the assumptions as well as the efforts that were made to accommodate these potential criticisms.

### **Population**

The model only used ASSA2003 AIDS and Demographic Model data. No alternative demographic projections are available that are regarded as reliable. For this reason, no sensitivity analyses using other demographic projection estimates were undertaken.

A key 'variable' in terms of population estimates relates to the split between those that are covered by medical schemes and those that are not. While current scheme membership levels are known, the potential impact of substantial health system change (in this case moving to a universal health system) is a matter of speculation. For this reason a range of assumptions were made, ranging from no change in membership to a maximum of a 60% decline on current levels, and sensitivity analyses were performed. A range of alternative assumptions was also made about the timeframe within which these changes in medical scheme membership are likely to occur; these included a 10 and 15 year timeframe.

The estimates of the total number of medical scheme members then had to be allocated to the different age/sex groups. The basis for this was the percentage distribution across age/sex groups derived from the SACBIA household survey. A key assumption was that the age/sex distribution of scheme members would remain roughly constant in future.

The steps involved in projecting the age/sex disaggregated population for scheme members and non-members were as follows:

- Estimate total scheme membership in future years (using a range of different assumptions);
- Apply the current age/sex distribution of scheme members drawn from the SACBIA survey;
- Subtract number of scheme members in each age/sex group in each year from the ASSA estimates of total population in that age/sex group in that year.

### Critical analysis of key assumptions relating to population estimates

Key assumption	Basis for assumption	Key issues relating to assumption
The ASSA2003 AIDS and Demographic Model is the most reliable source of population projections and the only demographic dataset used in this model	ASSA is widely regarded as the most reliable source of demographic projections which take account of the impact of the HIV epidemic	Estimates of population size in each age/sex group is a key variable in the model and inaccurate estimates will impact on outputs. However, no alternative is available that is widely regarded as being reliable.
A range of assumptions are made in terms of the size of the population covered by medical schemes with the introduction of a 'UC' system, ranging from no change to a maximum decrease of 60% of current membership levels	Medical scheme contributions have been increasing at rates far exceeding general inflation for several decades. Without substantial changes in the medical schemes industry, it is very unlikely that scheme membership will grow in the context of a relatively comprehensive package of services with substantially improved resourcing over current public sector services. At present, 43% of scheme members pay contributions which are 10% or more of their income (based on an analysis of Statistics South Africa's 2005 Income and Expenditure Survey); internationally, spending on health care of 10% of income is regarded as 'catastrophic' and those contributing at this level may opt out of medical schemes in future. A reduction of medical scheme membership of 40% is therefore selected as the 'best guess' option with a 60% reduction in membership as the most extreme assumption.	The potential impact of introducing a 'UC' on medical scheme membership is highly speculative and the subject of considerable debate. For this reason, sensitivity analyses are undertaken to consider a range of options. Most importantly, as the inclusion of medical scheme membership in the model is largely to estimate total health expenditure in SA, there are limited implications for estimates of public resourcing requirements.
The distribution of medical scheme members across age/sex groups is based on the SACBIA household survey estimates.	SACBIA is a nationally representative household survey and there are no other publicly available sources of information on the age/sex distribution of medical scheme members.	Information drawn directly from medical schemes would provide a more reliable estimate of the current age/sex distribution of scheme members.
The distribution of medical scheme members across age/sex groups will remain relatively constant in future.	Although this assumption is unlikely to hold, there is no evidence base for an alternative assumption.	It is more likely that the highest income groups will retain scheme membership. This assumption could be refined if it were possible to obtain estimates of the age/sex distribution of current membership according to different socio-economic groups.

## **Utilisation**

Potentially the most critical assumption in the model is that the 'public sector framework' of service delivery was assumed to be the most appropriate basis for modelling a future 'UC' system. The rationale for this assumption is that the information available about the proposed UC system indicates that:

*"There will be a comprehensive package of services that includes primary health care services as well as hospital inpatient and outpatient care. People will be expected to follow the appropriate referral route to ensure effective gate-keeping as at the primary health care level before referrals to specialists and hospital-based care when necessary. This will ensure that resources are used efficiently and appropriately. People will have choices of where to obtain care. ... Health care will be purchased from either public or private health care providers which have been accredited by the NHI." (ANC Today, 23-29 January 2009, Volume 9, Number 3)*

This strongly implies that the benefit package covered under the UC will be more similar to the current 'public sector framework' than the current 'medical scheme framework'. While medical scheme packages use a very explicitly stated 'positive list' of specific services that will be covered (e.g. whether or not chronic medicines for depression are covered), the public sector currently provides a comprehensive package of services with an implicit 'negative list' (i.e. services that the public sector simply does not provide) and implicit rationing (e.g. a limited number of dialysis machines are available and clinicians have to select which patients should receive priority in being treated with these machines). This comprehensive package is defined in terms of individuals having access to primary care facilities, for which there are 'norms' in relation to the type of staff that should be employed, equipment that should be available and range of services that should be provided, and to specialist and hospital care on referral. There are also broadly specified 'norms' in terms of the range of services that should be available at the different levels of hospitals. This appears to be more in line with the benefit package model envisaged for the UC system. The fact that it is proposed that services will be purchased from both public and private providers does not negate this approach; it simply requires using a range of unit cost levels which would accommodate the higher prices charged by private providers relative to current public sector unit costs.

The other reason for choosing to adopt the current 'public sector framework' as the basis for the UC benefit package is that it allows the model to draw on data which reflects the entire South African population (particularly the service utilisation rates drawn from the national SACBIA household survey). In contrast, a model based purely on a 'medical scheme framework' would have to rely on data drawn from medical schemes. As only 16% of the population is covered by medical schemes, this cannot be considered to be representative of all South Africans. Even if a 'low cost scheme model' were used to project to the 84% of the population who are currently not covered by schemes, this would seem to be an unjustifiable assumption. There is clearly benefit in undertaking analyses of potential future expenditure that is directly related to disease profiles of the population and utilisation of health services for these diseases, which one is undoubtedly better able to do with medical schemes data, particularly in the context of data collected to estimate the risk-equalisation fund implications of the prescribed minimum benefit (PMB) package. However, this is likely to be more important as a UC system is rolled out, when it will be critical to collect high quality data on illness profile and treatment practices, to be used as an instrument for predicting likely expenditure levels in the next few years and for controlling expenditure patterns.

The current levels of utilisation of public sector services are relatively low compared to utilisation levels of medical scheme members as well as utilisation levels in OECD countries (which comprise mainly high-income countries but also some countries at similar levels of economic development to South Africa). It was assumed that utilisation levels under the proposed 'UC' would be greater than those for public sector services at present.

A key challenge was to project what future utilisation rates may be. Two primary sources of likely future utilisation rates were used, namely the 'Need Norms' study for primary care services and the 'Hospital Strategy Project' (HSP) for out- and in-patient services in hospitals.

The aim of the 'Need Norms' study was to develop guidelines for primary care services in the South African context (Rispel et al., 1996). Empirical studies were undertaken to determine utilisation rates for different categories of primary care services under what were considered 'optimal conditions' (i.e. minimal access barriers to health services). These empirical studies were conducted in well-functioning public sector, NGO and private primary care providers. Where there were gaps in current service provision (e.g. for mental health care and comprehensive women's health services), a combination of in-depth interviews with experts and a review of the literature were undertaken to determine what services should be provided. These were supplemented by estimates of the minimum number of visits for key preventive and promotive interventions (e.g. full immunisation of children and antenatal care for pregnant women) and for monitoring and treating the most common chronic conditions. Once again, these were developed through consulting relevant experts and reviewing the literature. This information was then used to calculate a set of utilisation rate 'norms' for different demographic groups. The 'Need Norms' study was published in 1996, and therefore had to be updated with respect to certain services. In particular, the number of reported TB cases has increased by a factor of 3.5 since the time of the 'Need Norms' report (based on a comparison of estimated TB cases in the 'Need Norms' report (Rispel et al., 1996) relative to the most recent estimates provided in the 'Roadmap' report (Development Bank of South Africa, 2008)). The other element that required updating was services used by pregnant women. The Need Norms project linked these service utilisation estimates to the crude birth rate. The most recent estimate of the South African CBR is 23 per 1,000 (based on the UNICEF database found at: [www.unicef.org/infobycountry/southafrica\\_statistics.html](http://www.unicef.org/infobycountry/southafrica_statistics.html), confirmed by applying a CBR of 23 per 1,000 to the 2008 ASSA population which translated into an estimate of just over 1.1 million births, which related well to the Roadmap report estimate of 1,121,000 births in mid-2006). In addition, the 'Need Norms' project also proposed utilisation rates that it regarded as more 'realistic'. These estimates were updated for the development of a target PHC package by the national Department of Health, with input from a number of health system researchers (Chitha et al., 2004). The 'realistic' and 'ideal' utilisation rates are summarised below.

**Table 3: Basis of 'Need Norms' utilisation estimates**

TYPE OF SERVICE	'Realistic'	'Ideal'
Combined (preventive & curative) services children <5	2.70	4.1
Combined services for children 5-14	1.43	3.9
Chronic care for children under 15 (5-14)	0.41	0.78
Family planning (women 15-49)	1.63	2.18
Antenatal care (no of pregnant women 15-49)	3.48	4.64
Deliveries (no of pregnant women 15-49)	0.75	1
Postnatal care (no of pregnant women 15-49)	0.75	1
Termination of pregnancy (women 15-49)	0.02	0.06
Other well-women services (ca cervix) (women 30-50)	0.02	0.24
Adult acute curative care (pop 15 years +)	1.06	2.5
Casualty care (both medical and surgical) (total pop)	0.20	0.51
STDs (pop 15 years +)	0.19	0.24
Tuberculosis care (total pop)	0.09	0.105
Care for persons with HIV and AIDS (non-ART)	0.32	0.32
Chronic curative (pop > 30 years)	0.90	2
Mental health with low screening	0.28	0.28
Chronic Psychiatric Care (pop 20 years +)	0.31	0.31

The 'Hospital Strategy Project' (HSP) undertook a comprehensive analysis of the major problems facing public hospitals in South Africa in the mid-1990s and strategies to address the most critical problems (Monitor Company et al., 1996). A key component of the HSP was to develop detailed guidelines or norms for affordable public hospital services (e.g. in relation to bed to population and staff to workload ratios). A key element of this was to ensure appropriate distribution of services between geographic areas and levels of care, with the HSP noting that there was currently a "heavy bias towards urban areas, and central/academic hospitals". The HSP estimated that the ideal number of acute hospital beds per 1,000 population would be 3.3, distributed across different levels of care as follows:

- Level I hospitals: 2 beds per 1,000 population
- Level II hospitals: 1 bed per 1,000 population
- Level III hospitals: 0.3 beds per 1,000 population

In order to translate the bed to population ratios into estimated number of inpatient days per capita, the following formula was used:

$$\text{Number of beds (as listed above)} * (\text{population size} / 1,000) * 365 \text{ days} * 0.85 \text{ (as an assumption of 85\% bed occupancy levels)} / \text{population size}$$

This translated into an estimated number of inpatient days per person per year (across all acute hospitals) of 1.024. This level of utilisation is greater than that in some high income countries with universal health systems. For example, the acute hospitalisation rate in the UK, Canada, Finland, Ireland, Italy and Norway is approximately 0.9 inpatient days per person per year (OECD Health Database, 2008). It was assumed that 'ideal' hospital utilisation rates in South Africa would not exceed those in these countries. For this reason, the HSP 'ideal' rates were scaled down to a total of 0.9 inpatient days per person per year, with the distribution across hospital levels remaining as in the HSP estimates.

The HSP also indicated that a potentially more affordable or realistic bed to population ratio would be 2.18 beds per 1,000 population. The above ratio between beds in Level I, II and III hospitals was applied to this figure and then translated into inpatient days per capita using the same formula as for the 'ideal' option.

The estimated number of inpatient days per capita for the 'ideal' and 'realistic' HSP estimates are summarised in the table below.

**Table 4: Summary of HSP utilisation norms**

Hospital level	'Realistic'	'Ideal'
Level I	0.414	0.545
Level II	0.207	0.273
Level III	0.062	0.082
<b>Total</b>	<b>0.683</b>	<b>0.900</b>

The HSP did not consider optimal utilisation rates in relation to outpatient services at hospitals. However, the Western Cape Department of Health has developed a comprehensive plan for the restructuring of services in the province. Based on their research and service planning expertise, they have assumed that the ideal number of outpatient visits relative to inpatient days would be a ratio of 1 : 1 for Level I (or district) hospitals and 1.1 : 1 for Level II (or regional) hospitals and for Level III (or provincial / central hospitals). These ratios were applied to estimate the 'ideal' and 'realistic' number of hospital outpatient visits per person per year for each hospital level.

The key health service utilisation options that are used in the model (both for primary care and hospital-based services) are:

- Utilisation increases from current levels to the 'realistic' level (**realistic**)
  - Utilisation increases from current levels to halfway between the 'realistic' and 'ideal' levels (**mid**)
- It was ultimately decided not to use the 'ideal' utilisation rates as they are unrealistic in the foreseeable future based on a critical assessment of the 'ideal' utilisation levels relative to those in high-income countries and in middle-income countries that have introduced universal coverage.

In addition to these options, the period over which utilisation moves from current levels to one of the above levels (ideal, realistic or mid) can be varied. Three key options are considered:

- Utilisation changes happen over a 5 year period
- Utilisation changes happen over a 10 year period
- Utilisation changes happen over a 15 year period

In terms of medical scheme members, utilisation rates are already relatively high. It was assumed that utilisation rates would not change much for this group in terms of the services they utilise that are funded by schemes. The basis for this assumption is that medical schemes and the providers from whom schemes purchase services would be under considerable pressure to control expenditure levels (both in terms of utilisation rates and price levels) in the context of a universal health system.

Those who retain medical schemes' cover over and above their UC entitlements are also assumed to make use of at least some of the services to which they are entitled to via the UC system. As it is very unlikely that those covered by medical schemes in addition to the UC system will not draw on at least some of their UC entitlements, a range of weights are used from 10% to 33% of the usage of UC services.

### Critical analysis of key assumptions relating to utilisation estimates

Key assumption	Basis for assumption	Key issues relating to assumption
A 'public sector framework' is more reflective of the proposed UC benefit package than a 'medical scheme framework'	The description of the proposed UC benefit package as a comprehensive package of services including primary care services and hospital outpatient and inpatient care is more in line with the current public sector 'service framework' than explicitly defined 'positive lists' of services covered used by medical schemes. Data drawn from a national household survey of the current experience of South Africans in relation to health services is undoubtedly more representative than the use of schemes data which is only representative of 16% of the population.	The major concern that may be raised is that a 'public sector framework' may not adequately reflect the potentially higher expenditure that would result from purchasing services from both public and private sector providers. However, this can be addressed by incorporating unit cost estimates that take account of the higher prices charged by private for-profit providers.
Utilisation rates will increase for those who are not currently covered by medical schemes under a UC system.	There is considerable international evidence that as financial barriers to health service access are reduced, which will occur in a UC system which has no out-of-pocket payments at the point of service delivery, utilisation rates increase (Gilson and McIntyre, 2005, World Health Organisation, 2005). Utilisation increases will be promoted by increased service delivery points and improved resourcing of public sector services as proposed under the UC system, but this is unlikely to be achieved rapidly.	
The 'Need Norms' study provides a reasonable basis for predicting likely future utilisation rates for primary care services.	The 'Need Norms' study undertook a very detailed process of identifying a comprehensive package of services for the primary care level. It is reflective of the burden of ill-health and service needs of South Africans. There is no other source of estimates of what is required for comprehensive primary care services, and the 'Need Norms' package has been adopted by the national Department of Health as the basis of its 'norms' for services to be provided at the primary care level. Some elements of the package needed to be updated (e.g. where tuberculosis incidence has increased and the crude birth rate has changed), and this has been done.	The reduction of financial barriers to health service access may result in moral hazard <sup>4</sup> , which could translate into higher utilisation levels than predicted by the 'Need Norms' model. Moral hazard effects could possibly be assessed by comparing utilisation rates for households who are currently covered by medical schemes with those who are not, but where they are of similar socio-economic status and geographic location. However, the confounding factor is that at least part of the higher utilisation rates among scheme members is likely to be due to supplier-induced demand that arises due to the current fee-for-service, third-party payer system that prevails in the medical schemes environment. The UC system will be seeking to minimise the likelihood of this through using reimbursement mechanisms other than fee-for-service.

<sup>4</sup> A tendency for entitlement to the benefits of a universal system or under an insurance scheme to act as a strong incentive for people to consume more and "better" health care and a weak incentive for them to maintain a healthy lifestyle

**Critical analysis of key assumptions relating to utilisation estimates continued**

<p>The 'Hospital Strategy Project' provides a reasonable basis for predicting likely future utilisation rates for hospital care</p>	<p>Similar to the rationale outlined above. The HSP included a very detailed analysis of requirements within the public sector hospital context.</p>	<p>Similar concerns about the potential moral hazard implications. A similar cross-check could be undertaken as outlined above for primary care services, but the confounding influence of supplier-induced demand is likely to be even greater at the hospital level. In addition, many scheme members go directly to specialists, whereas they would need to follow the referral route under a UC system. However, it is important to note that the 'ideal' utilisation rates are comparable to many OECD countries</p>
<p>Utilisation increases are phased in over a period of 5, 10 or 15 years</p>	<p>A key constraint to utilisation increases is existing service supply (facilities, personnel, etc.). It is unlikely that utilisation will increase more rapidly than supply will permit. There will undoubtedly be fluctuations in utilisation. For example, when free care at primary care level was introduced in South Africa, utilisation increased substantially and rapidly. This is likely to have been largely due to previously unmet need. However, within a few months, utilisation settled at a level that was higher than before the removal of fees, but lower than the initial spike. As supply increases and waiting times at facilities decline, utilisation will begin to increase further</p>	<p>There may be concerns about the implications of more rapid than expected utilisation increases. This can be addressed by considering a scenario that phases in utilisation increases over a 1 to 2 year period. However, such a scenario is regarded as unrealistic.</p>
<p>There will be little change in utilisation rates among medical scheme members for services covered and used via medical schemes (over and above UC)</p>	<p>Utilisation rates among medical scheme members are already relatively high, particularly in relation to utilisation rates found in many OECD countries. Schemes and the providers from whom they purchase services will be under considerable pressure to control expenditure to make scheme membership over and above UC entitlements attractive.</p>	<p>It is possible that utilisation rates may decrease if schemes and the providers they purchase services from exercise considerable expenditure (i.e. both utilisation and price) control. However, a basis for making an explicit assumption on the magnitude of potential reductions is not immediately evident. Most importantly, this assumption does <i>not</i> affect the estimates of the resource requirements for publicly funded services; instead, it would only result in a possible overestimate of total health care expenditure.</p>
<p>Those who have additional medical scheme cover will use at least some of the services to which they are entitled under the UC system</p>	<p>In most countries that have universal health systems, those with additional private health insurance coverage tend to use this as a form of complementary or supplementary insurance coverage and do use some of the services funded under the universal system. At present, medical scheme members do make use of public sector services (based on data from the SACBIA household survey).</p>	

### Unit costs

Unit cost data were obtained for 2006 for the public sector and 2007 for medical schemes members. At the time of accessing data on utilisation of public sector facilities from the DHIS and on expenditure per facility from Treasury, 2006 was the most recent year for which a complete and audited set of data could be obtained. Similarly, at the time of making the data request to the largest medical scheme administrators, a complete set of data were only available for the 2007 year across all of these administrators (i.e. the most recent common denominator had to be selected).

In order to inflate these unit costs to 2007 and 2008 (for the benchmarking), the following approach was adopted:

- Utilisation estimates were available for 2008 (which is the year in which the SACBIA household survey was undertaken). It was assumed that utilisation rates were unlikely to have changed much between 2007 and 2008, and so the same utilisation data were used for both years.
- The only data available was on changes in total expenditure on the different categories of services. Data for the public sector were translated from the public sector financial year (April to March) into calendar year equivalents (e.g. 25% of expenditure in 2006/07 + 75% of expenditure in 2007/08 = expenditure in 2007).
- As expenditure is the product of population  $\times$  utilisation  $\times$  unit cost, and as utilisation was held constant, changes in expenditure between 2006 and 2007, and between 2007 and 2008, are attributable to changes in population and unit cost. The percentage change in expenditure was calculated and the component attributable to population (or scheme membership) increase was netted out. This was done for each category of facility or service provider (e.g. district hospitals, clinics and community health centres in the public sector and GPs, specialists etc. for medical schemes).

In order to inflate costs to 2010, which is the baseline in the model, a similar approach was used, but the average increase between 2006 and 2008 was applied to estimate unit costs in 2009 and then 2010. The model presents data in real 2010 values (as will be explained, the OSD was also taken into account).

The estimated unit cost for each category of service is applied equally to each age/sex group. Although there are likely to be some differences in unit costs for different age/sex groups, there is no information that can be used as an accurate basis for making assumptions about the extent of these differentials.

The main assumptions in terms of unit costs in the model relate to what may happen to unit costs when a universal health system is implemented. There is general consensus that the public health system is currently under-resourced, particularly in terms of staffing levels (Development Bank of South Africa, 2008). For this reason, as a minimum, it is necessary to assume that the current unit cost levels in the public sector are an underestimate of the resources required to provide an adequate range and quality of services. In addition, as services will be purchased from both public and private sector providers, overall unit costs will be greater than what currently prevails in the public sector. Ultimately, in a universal health system where public and private providers are both reimbursed by an integrated purchaser, and with adequate quality assurance programs in both sectors, the unit costs between public and private providers should only differ by the level of the profit margin within the private sector.

A number of different options are included in the model. The first is termed the **DBSA** option: The Development Bank of South Africa produced a report at the end of 2008 (the 'Roadmap' report) where they estimated the minimum resources necessary to get the public health system back to a

position of being reasonably resourced. The table below indicates the specific areas that they felt required new funding.

**Table 5: DBSA estimates of additional resource requirements in the public sector**

Priority area	New expenditure (R'000)
• HIV and AIDS Treatment Programme	10,000,000
• TB Treatment (general services)	1,000,000
• Maternal care	2,000,000
• Prevention of Mother to Child Transmission	1,000,000
• District Health System (double existing capacity)	1,500,000
• Nutrition for children under age of 3	500,000
• Staff improvements (focus on hospitals)	10,000,000
• Emergency medical services	1,000,000
• Information systems	1,000,000
• Re-capitalisation	3,000,000
• Other priorities (contingency)	3,000,000
<b>Total</b>	<b>34,000,000</b>

This was then adjusted as follows:

- The amount estimated for the HIV/AIDS treatment programme was excluded as we are incorporating an amount for the scale-up of ART through a separate model (including all associated treatment for those on ARVs such as treatment of TB and other opportunistic infections) (reducing the amount required to R24 billion)
- The amount estimated for general TB services is excluded as this is addressed through the adjusted estimates for TB treatment drawn from the 'Need Norms' study (reducing the amount required to R23 billion)
- Another R2 billion was added as the estimates in the table above only included R10 billion for staff improvements, whereas elsewhere in the DBSA report it is estimated that if staffing levels in the public sector had kept up with population growth and the burden of disease, particularly in relation to HIV/AIDS, we required 79,791 additional personnel and an additional R12 billion to fund these staff (increasing the amount required to R25 billion)
- The OSD for doctors and other health professionals other than nurses was introduced in 2009. Based on information from the Bargaining Council agreement and the Medium-Term Budget Policy Statement, it was estimated that an additional R2 billion per year would be required for existing staff and that a further R1 billion would be required for the additional staff required as outlined above (increasing the amount required to R28 billion)
- Of this amount, R21.5 billion relates to services included in the model (maternal care, PMTCT, nutrition, staff improvements, other priorities, OSD). The DBSA recommended phasing this in over 5 years. This translates into an average real increase of 6.8% per year over the 5 year period (after population changes over this period are netted out – given that this is an adjustment to *unit costs* rather than total expenditure)
- The other R6.5 billion relates to services not included in the model (emergency services, district systems, information systems and re-capitalisation) and are added to the lump sum amount added to the model output (see 'Basic approach' section)

The second option is termed the **other public increase** option. This allows for a range of greater increases than are allowed for by the DBSA options (such as a real per annum increase of 8%, 10%, 12% or even higher) over the first five years in an effort to substantially improve resourcing in the public health sector. The DBSA estimates were relatively constrained in that they focussed on the

most essential improvements and it is important to consider more generous resource improvements.

Another option, termed **full private**, considers what would happen if unit costs for all health services were pushed up to the levels currently charged by private providers. The challenge here was how to convert private sector charges (e.g. the cost of a GP visit or a specialist visit) into the equivalent service within the public sector service framework (e.g. primary care visit). This is also challenging in relation to converting private hospital charges into the different levels of care within the public sector – private hospitals provide services that would equate to level I, II and III care, but there is no means for distinguishing this in the private sector data. Estimates of the private sector equivalent unit cost of the service categories used in the ‘public sector framework’ were calculated on the following basis:

- The closest equivalent to the comprehensive primary care services provided in public sector clinics and community health centres would be visiting a GP and receiving some medicines, i.e. a combination of the cost of a GP visit and a retail pharmacy visit. Not all visits to a GP result in a visit to a pharmacy, as some GPs directly dispense medicines to their patients. The estimated ‘full private’ unit cost was thus the average cost of a GP visit plus a portion of the cost of a pharmacy visit (based on ratio of GP to pharmacy visits).
- In terms of the cost of inpatient admissions and outpatient visits:
  - The unit cost per admission for medical scheme members combined costs for clinician visits and radiology and pathology tests that were listed as ‘in-hospital’ within the medical scheme administrator dataset, with ward and theatre fees and the cost of consumables. This reflects the range of costs that would be incurred in a public sector admission.
  - As there is only an average unit cost per admission (from medical scheme administrator data), estimates of the cost per inpatient day at different levels of care had to be derived. The approach adopted was to apply the ratio of costs for inpatient care at the different levels (from the public sector unit cost data), and to weight it by the HSP recommendations on distribution of inpatient care between the different levels of care. These were then translated into cost per inpatient day based on an assumed average length of stay of 3.5 days per admission for scheme members (weighted for differences in average length of stay at different levels of care)
  - A similar approach was used for outpatient visits based on the average cost of an outpatient visit to a private hospital. In the case of outpatient visits at level II and III hospitals, the cost of specialist visits was also incorporated (as this would be the equivalent in the public sector service framework).

The final option is what is termed **mid public-private**. This option is necessary as it is proposed that the UC system will purchase from both public and private providers. While ‘full private’ unit costs are likely to be unrealistic in the context of UC, particularly due to the impact of a single purchaser system and the use of reimbursement mechanisms other than fee-for-service, unit cost levels for private providers are higher than what prevails in the public sector at present due to the far better resourcing levels in this sector. It would probably have been ideal to base this estimate on the National Health Reference Price List (NHRPL), which provides an indication of what it costs to provide health services by private providers (including operating costs such as rent, utilities, consumables, income for health professionals and a return on investment). However, this was not possible given that the NHRPL presents fees in such a disaggregated form. Instead, a crude estimate of the midpoint between current public and private sector unit costs is used.

In projecting forward, it is assumed that unit costs will increase in real terms. This is based on experience of the rate of medical price inflation being consistently greater than general inflation.

The model allows for a range of estimates in unit cost increases. Since 1996, spending on medical schemes per beneficiary has increased on average by over 7% per year in real terms. This is assumed to be the highest possible increase in real unit costs in the medical scheme environment (as utilisation is assumed to be unchanged for medical scheme members, real increases in total spending per person are assumed to equal real increases in unit costs). It was also assumed that, with intensive efforts by the medical schemes to control cost increases and with co-operation from private providers, annual real unit cost increases in the medical schemes environment could potentially be reduced to 3%. The average annual real increase in public sector spending per person dependent on the public sector since 1996 has been just over 2% per year. As utilisation rates of public sector services in the UC model will be increasing (i.e. real expenditure increases will be attributable to both utilisation and real unit cost increases), the assumed annual real increase in public sector *unit costs*, after the initial five-year period of intensive improvement in public sector resourcing, ranges from 1% to a maximum of 3%.

### Critical analysis of key assumptions and challenges relating to unit cost estimates

Key assumption/ challenge	Basis for assumption	Key issues relating to assumption
The unit cost for each category of service is applied uniformly to each age/sex group.	Although the unit cost of services provided at the same level of care but to different age/sex groups may differ (e.g. the paediatric formulation of a specific medicine can be more expensive than the adult version and because there are different illness profiles for different age groups), there is no rigorous basis for making assumptions on the extent of such differentials. In addition, differences in utilisation rates across age/sex groups are likely to be of far greater importance in predicting expenditure differentials than unit cost differences.	There may be concerns that potential differences in unit costs across age/sex groups are not taken into account in the model. The only likely source of such data is medical schemes. These estimates suffer from the problems outlined in the utilisation section, namely that they only reflect the experience of 16% of the population and are unlikely to represent appropriate medical practice (e.g. many children who are covered by medical schemes are taken directly to a paediatrician for all ailments even though a GP would be able to effectively treat the majority of their conditions).
There are a large number of very detailed assumptions included in deriving estimates for the different unit cost 'options', particularly the 'full private' option.	Each assumption is based on the best publicly available information and is framed to be consistent with other elements of the model (e.g. using the HSP ratio of the appropriate ratio between Levels I, II and III in estimating the 'full private' unit cost levels).	It may be possible to obtain more refined estimates of the 'full private' unit cost for different levels of care by drawing on some of the PMB estimates. It may also be possible to attempt to obtain a more realistic estimate of the basic cost of private sector services (i.e. similar to the intention of the NHRPL) from schemes that use different reimbursement mechanisms to fee-for-service. The key issue is that the existing range of options is likely to provide adequate insights into the lowest acceptable and the highest likely resource requirement levels.
Annual real increases in expenditure over the past decade can form the basis for estimating future annual increases in real unit costs.	It is regarded as appropriate to use past trends over an extended period as the basis for predicting future trends. Given that there can be short-term fluctuations in expenditure trends, it is advisable to consider past trends over a decade or more. Increases in real expenditure per person (either per scheme member or per person dependent on the public sector) are due to a combination of increases in utilisation and unit costs. Utilisation increases were taken into account to estimate the unit cost component.	As it is difficult to predict future unit cost changes accurately, a range of assumptions were used to reflect 'more favourable' unit cost trends (lower than in the past in the case of medical schemes and higher than in the past in the case of public sector services).

### **Expenditure on services not included in the model**

The most frequently used health services for which disaggregated utilisation and unit cost data were available are included in the main model; these are listed earlier in the report. However, such data are not available for some services. In the public sector, this is the case for specialised hospitals (psychiatric and TB hospitals), ambulance and related emergency services, community-level services, training of health professionals, facility maintenance, and administration in the national and provincial health departments. Current spending on these services was added to the expenditure predicted by the model. These costs were increased over the period of the modelling using the annual increase in real costs assumed in the overall model and by the rate of population growth.

A similar approach was used in the case of medical schemes, where services such as ambulances and those provided by chiropractors, psychologists and a range of other health care providers whose services are not covered under the PMBs, as well as administration costs (including brokers' fees and managed care costs) are not included in the core model. Current spending on these items was added to the expenditure predicted by the model and increased annually by the real cost increases in schemes assumed in the overall model.

### **Administrative costs**

As the proposals for a universal health system suggest that a separate organisation (a 'NHI Fund') would be established, an additional amount is included for the potential administration costs of such an organisation. This is over and above the costs associated with the administration of health services (e.g. by the national and provincial health departments). Based on international experience of the administrative costs associated with a single purchaser, these costs were assumed to be between 2% to 5% of all other costs of universal coverage (World Health Organisation, 2005).

### ***Summary of key projection estimates and assumptions: Status quo scenario***

The same basic model and data sources as were used for the universal coverage scenario were used for the status quo scenario. This section summarises the key assumptions used in the model for this scenario. The objective of this scenario was to consider what the health system would look like in future if we continued on the path we are currently on and therefore draws heavily on past trends. The broad assumption is that the public health sector will continue much as it is at the moment; while there would be no major efforts to improve resourcing, it is assumed that there would be a real increase in unit costs and that, over time, utilisation rates (of non-ART services) will increase gradually. However, there would be considerable efforts to ensure scale-up of the ART program. The medical schemes would face similar increases in spending levels as in the past and potentially, some increase in membership.

### **Population**

Once again, the major assumption relates to medical scheme coverage of the population. Medical scheme membership increased from just over 6 million in 1992 to 6.9 million in 1997. It then stagnated until 2005, fluctuating around the 6.9 million mark. In 2006, membership crossed the 7 million mark and increased rapidly to 7.7 million by 2008. This is largely due to the introduction of GEMS (the Government Employees Medical Scheme) in 2006. This represents an average annual increase of 3.6% in 2006, 2007 and 2008. However, over the past decade the average annual increase was about 1.2% with most of this being attributable to the growth in GEMS since 2006. While some other schemes have grown, this is largely due to members shifting from another scheme, i.e. this has largely not been due to attracting new medical scheme members.

In the status quo scenario, it is assumed that it is likely that medical scheme membership may grow from 1% to 3% per year. Such a growth would largely be attributable to growing membership by civil servants (as has occurred since the introduction of GEMS) and an increase in formal sector employment over time, with at least some of this growth being amongst higher income employees.

### **Utilisation**

This status quo scenario assumes that utilisation of public sector services will increase to the minimum levels recommended in terms of the 'Need Norms' and 'Hospital Strategy Project' (HSP). The national Department of Health has set the goal of achieving these norms in relation to primary care services and so it is expected that there should be some progress towards this goal in future. It should be noted that these utilisation increases are not insignificant (ranging from 20% to 100% for different levels of care, with the greatest increases at primary care and level I hospitals and lower increases at the highest levels of care). However, as this scenario assumes that there will not be a concerted effort to improve resourcing within the public sector (as has been the case over the past few decades), these utilisation rates will only be achieved over an extended period of time (15-20 years).

As in the universal coverage scenario, it is assumed that utilisation rates by medical scheme members will not increase. This is largely attributable to these utilisation rates already being reasonably high and the difficulty of predicting how utilisation rates may change within the schemes environment. However, to accommodate for this assumption, unit costs of these services will be increased at a rate that matches recent increases in total medical scheme expenditure.

Another assumption in relation to utilisation relates to the use of public sector services by scheme members. From household survey data (see the information on the SACBIA survey earlier), utilisation of public sector primary care services by medical scheme members is about 10% of that by those who are not medical scheme members, use of district and regional hospital services by scheme members is about 20% that of non-scheme members and about one-third in the case of provincial and central hospitals. These percentages were estimated by comparing the utilisation rates of public sector services across all medical scheme members with the rates for those who are not covered by schemes. In terms of sensitivity analyses of this utilisation, the highest cost option assumed that utilisation of public sector services by medical scheme members would remain at the current levels. An alternative assumption is that use of these services by medical scheme members would decline over time, particularly given that there will not be a concerted effort to improve the resourcing of the public sector.

There is also utilisation of private sector services by some individuals who are not members of medical schemes, largely in the form of GP services and retail pharmacies. At present, utilisation by non-scheme members is about 10% and 3% of the utilisation rate of medical scheme members for GP services and retail pharmacies respectively. It was assumed in sensitivity analyses that utilisation of private sector primary care providers by non-medical scheme members may increase over time, which could be driven by growing employment and limited resource improvements in the public sector.

### **Unit costs**

In terms of medical schemes' spending and contributions, there have been annual real increases per beneficiary of more than 7% over the past decade. Real increases over the past 2 decades were almost 7%. However, in recent years, the annual real increase in medical schemes spending has been in the region of 3%. In the status quo scenario, it is assumed that unit cost increases in the medical schemes environment would range from 3% to 7%. These levels are used as it is assumed

that utilisation of private sector services by medical scheme members would remain unchanged (i.e. the full increase in expenditure per beneficiary is due to increases in unit cost).

In relation to public sector spending, the average annual real increase in public sector spending per person dependent on the public sector since 1996 has been just over 2% per year. As utilisation rates of public sector services in the status quo model will be increasing (i.e. real expenditure increases will be attributable to both utilisation and real unit cost increases), it was assumed that there may be no annual real increase in public sector *unit costs* or that these may increase by a maximum of 1% per year. As quite substantial increases in utilisation of public sector services are projected, these very small real unit cost changes nevertheless translate into relatively significant real increases in government expenditure.

### ***Summary of key projection estimates and assumptions: Mandatory extension of private medical schemes scenario***

The broad assumption in this scenario is along the lines of the proposals to introduce a Social Health Insurance (SHI) that were put forward from the mid-1990s to early 2000s. It was envisaged that it would be mandatory for all formal sector employees above the income tax threshold to become members of medical schemes. It was also proposed that the current prescribed minimum benefits (PMBs) would be expanded to include primary care services (see for example: McLeod, 2004). As in the status quo scenario, it is assumed that limited efforts are made to improve resourcing of the public sector. However, because a greater proportion of the population would be covered by medical schemes, the available public sector resources would be used to serve a smaller section of the population (i.e. per capita resourcing would improve considerably in the public sector).

#### **Population**

The population variable is the most critical assumption in this scenario. The SHI proposals were targeted at formal sector workers who currently pay PAYE (i.e. earn above R60,000 per year). The number of formal sector workers above the PAYE threshold (drawn from the latest SARS statistics) (National Treasury and SARS, 2010) was combined with an average of 1.61 dependents per person paying personal income tax (which was estimated from the 2005/06 Income and Expenditure Survey). If medical scheme membership is made compulsory for this group, it is unlikely to be possible to implement with immediate effect, but it is likely that rapid roll-out would be considered desirable. It was thus assumed that mandatory membership would be rolled-out over 4 to 5 years. Membership would continue to increase over time in line with increases in formal sector employment growth. The Labour Market Dynamics report (Statistics South Africa, 2009) indicated that formal sector employment grew by an average of 3% per annum between 2003 and 2008. It is possible that employment growth could be more rapid amongst lower income groups and that the growth in employees who would be required to become members of medical schemes would be lower. For this reason, it was assumed that growth in formal employment above the PAYE income tax threshold would range from 1% to 3%. Using these assumptions, coverage of the population by medical schemes would increase from the current levels of 16% of the population to between 33% and 45% of the population within 15 years.

#### **Utilisation**

As in the status quo scenario, it is assumed that utilisation of public sector services (largely by those outside medical schemes) would increase to at least the minimum norms recommended in the 'Need Norms' and HSP. The difference relative to the status quo scenario is that it is assumed that these higher utilisation rates could be achieved in a shorter period of time, given that there would be a substantial shift of the population to medical schemes and hence the available capacity

(facilities and staff) in the public sector would more easily be able to accommodate these utilisation increases. It is unlikely that those who join medical schemes would not use any public sector health services, or if they did, that schemes would fully reimburse public facilities at cost-recovery levels (which is not currently the case, largely due to poor billing practices in public hospitals). So there is an assumption that there will be some utilisation of public sector services by medical scheme members.

It is assumed that utilisation of private sector primary care services by those who are not medical scheme members is likely to decline. This is because many non-scheme members who currently use GP care will be in the group who become scheme members under the mandatory system (i.e. are formal sector workers who are above the income tax threshold). At the same time, far fewer people would be using public sector primary care services than at present, and those who are not members of schemes are therefore likely to be more satisfied with public sector services. For these reasons, it is assumed that there would be no use of private sector primary care services by those not covered by schemes under this scenario.

A final assumption related to utilisation is that if primary care services are included in the PMBs, utilisation of GPs will increase while that of specialists and private hospital outpatient care will decrease for medical scheme members. This is based on the assumption that scheme members are likely to use GPs more than they currently do if schemes are required to pay for GP care (currently most scheme members either have to pay for such care out-of-pocket or from their savings accounts). It is also assumed that schemes may place constraints on direct access to specialists as a cost containment measure and that the use of private hospital outpatient care (i.e. going to the casualty service) may decrease if members have better access to GP care. It is assumed that GP utilisation rates may increase by about 5% to 7% per year while use of specialist and private hospital OPD care may decrease by 2% to 3% per year. There is no evidence base for these assumptions.

### **Unit costs**

Comparable assumptions on unit cost increases were used in this scenario as in the status quo scenario. To restate these, public sector unit costs would increase in real terms by 1% per year, to gradually improve public sector resourcing. Scheme costs would increase by between 3% and 7% in real terms per year, based on recent trends.

The main difference in this scenario relates to administration costs (including brokers' fees and managed care costs) of medical schemes. In the other scenarios, these were merely included as a lump sum added to expenditure on specific services included in the model. The lump sum was based on current spending on administration (and other services not included in the model) and increased using the annual real increase in scheme expenditure. For this scenario, these administrative costs were included as a percentage of other medical scheme spending. The highest cost assumption is that this would be at the current level of 16.5% with the lowest cost assumption being that it would decrease to 10% with a concerted effort to achieve this by the medical schemes industry.

### ***Elements of modelling which were consistent across scenarios***

#### **Services for those on ART**

As indicated previously, a separate model was used to estimate the resource requirements of providing ART services to all eligible South Africans. The same estimates were used in all three scenarios and were added as a lump sum amount to the resource requirement estimates for the provision of other health services. A key implicit assumption is that there is no double-counting

between the ART model and the general health service model. The basis for this assumption is that the future utilisation rates drawn from the 'Need Norms' and HSP did not include ART-related services. Another assumption is that the public sector would continue to provide the majority of ART services. Although ART is now included in the PMBs, data from 2008 suggest that only 15% of those on ART received care via private providers, and this proportion has been falling over time (Adam and Johnson, 2009). It is therefore likely that the public sector would remain the major provider of ART services (whether under the 'status quo' or the 'mandatory extension of medical schemes' option). At worst, this assumption would result in a slight misallocation of the resource requirements between the public and medical scheme estimates. These services would have to be provided and are unlikely to be reflected adequately in current medical schemes spending levels.

### **Macroeconomic data**

The key piece of macroeconomic data used was GDP, as estimated health care expenditure is presented as a percentage of GDP. Given that all estimates of future health care expenditure are presented in real (2010) terms, it was necessary to estimate likely real GDP growth. The most recent estimates of real GDP growth from National Treasury were used for 2010 (2.3%), 2011 (3.2%) and 2012 (3.6%) (National Treasury, 2010). It was assumed that the real GDP growth rate would be 4% in 2013 and 4.5% thereafter. This appears to be in line with the expectations of international organisations, such as the recent OECD review team that visited South Africa, which predicted real GDP growth of closer to 5% (OECD, 2010).

### ***Estimating revenue***

The major focus in estimating revenue relates to identifying what resources need to be generated through public funding mechanisms (existing tax and potentially other mandatory contributions). In the case of the status quo and mandatory extension of medical schemes scenarios, the emphasis is on determining what percentage of the total government budget is required to fund public sector health services. In the universal coverage (UC) scenario, additional public funding would be required over and above the existing allocations from general tax revenue to the health budget. The focus here is to determine the magnitude of these additional funds and how these could be funded.

The first step was to estimate how the total government budget may increase over time. The actual budget in 2010 (National Treasury, 2010) was taken as the baseline. The key assumption was that the government spending to GDP would remain constant, i.e. that the real government budget and spending would increase in line with real GDP growth projections (see GDP growth assumptions above).

For the status quo and mandatory extension of medical schemes scenarios, the estimated resource requirements for public sector health services calculated through the models described previously were divided by the estimated government budget to assess what percentage of this total budget would need to be allocated to the health sector.

For the UC scenario, the following approach was used:

- An assumption was made that as a first step to improved public funding of health care, the allocation to the health sector from the overall government budget would increase over time to 15% (which is in line with the Abuja declaration whereby African heads of state agreed to devote at least 15% of government resources to health services (OAU, 2001), which was reaffirmed at the African Union meeting of heads of state on 25-27 July 2010 in Kampala (AU, 2010)).
- The difference between the resource requirements for UC calculated through the model outlined above and the increased allocation (phased in to 15%) from the government budget was calculated.

- Alternative ways of funding these additional resource requirements were explored.

To explore how the additional revenue could be generated, an assumption was made that the main mechanism would be a mandatory contribution by formal sector employees and their employers. This approach, which is effectively a dedicated tax on income, is focused on as it has been suggested in not only the current NHI debates but also earlier discussions on health financing reform in South Africa (Department of Health, 1997, Department of Social Development, 2002, Ministerial Task Team, 2004, Department of Health, 1995). Two alternatives were considered: A proportional tax or contribution, whereby everybody pays the same rate, and a progressively structured tax or contribution, whereby the lowest income earners pay a lower rate than higher income earners. In both cases, it was assumed that employers and employees would share the component of the tax that relates to wages or salaries.

Data on the distribution of taxable income across different tax groups and personal income tax payments as a percentage of income for each tax group were drawn from the latest SARS statistics (National Treasury and SARS, 2010). Total personal income tax revenue in 2010 was obtained from the most recent Budget Review (National Treasury, 2010) and used as the basis for estimating total taxable personal income in 2010 and taxable income for each tax group. The assumption is, therefore, that the tax would be levied on total income and not simply wages and salaries and that it would also include those who currently only pay SITE. In effect, this means that employers and employees would only equally share the tax on the wages and salaries component of income. The tax on income from sources other than wages and salaries would be entirely borne by the individual earning that income.

Revenue generation from an additional income tax was then calculated based on these estimates of taxable income applying a range of tax rates. A very crude approach was used for modelling the progressive tax rate, with taxable income groups being split into five groups: those in the tax group to R70,000; R70,001-R150,000; R150,001-R300,000; R300,001-R750,000; and >R750,000. A range of maximum tax rates were considered, with the lowest income group being levied one-fifth of the maximum rate, the second lowest group being levied two-fifths of the maximum rate, and so on, and the maximum rate being levied for those in the >R750,000 tax group. This provided an estimate of revenue generating potential in 2010. Real GDP growth rates were once again used as the basis for estimating future revenue generating potential (which assumes that taxable income will grow in line with GDP).

This enabled us to identify what tax rates, either proportional or progressive, would need to be levied in order to meet the additional resource requirements. The impact on overall personal income tax rates was also estimated. It must be noted that these estimates could be considered as very crude, given that it is based on the quite aggregated data available from the tax statistics. These revenue calculations are merely used to present a broad indication of the likely magnitude of the additional tax burden.

## **Key findings**

For each of the three scenarios (universal coverage, status quo and mandatory extension of private medical schemes), three sub-scenarios are presented. In order to demonstrate the impact of sensitivity analyses across the range of possible assumptions, 'highest cost' and 'lowest cost' sub-scenarios are presented. In addition, a 'best guess' sub-scenario is presented. This represents, in the author's view, the most likely way in which the health system will evolve within that scenario's context, based on the available information. For each scenario, the assumptions for the sub-scenarios are presented in a summary table, followed by the results of the sub-scenarios. The 'best

guess' sub-scenario is also presented as a graph with health care spending expressed as a percentage of GDP.

As it is unclear when health system change may be initiated in earnest, the findings are presented relative to a base year (i.e. relative to what the current situation is) and projected forward over an implementation period of 15 years from the date of initiating change. The broad trend patterns should be the same whatever the date of implementation.

### ***Universal coverage scenario***

The key assumptions used in the three sub-scenarios are summarised below. These assumptions are not justified here as they have been discussed in considerable detail earlier. However, the justification for the 'best guess' variable selection can be summarised as follows:

- Currently, medical scheme contributions exceed 10% of income for over 40% of members. It is assumed that this group will 'opt out' of medical schemes under a UC system as contributions represent a substantial burden on household resources.
- While it is assumed that a sizeable number of existing medical scheme members will opt out of schemes under UC, this will not happen overnight. Current members will need to be assured that they will receive services of good quality under the UC and it will take time to develop health system capacity to deliver high quality services to the entire population. In particular, it will take considerable time to fill the current health professional gap (e.g. takes 7 years for trainee doctors to graduate). For this reason, it is considered most likely that the phasing-in of UC, the utilisation increases that will occur as financial barriers are reduced, and the process of opting out of scheme coverage by lower income earners, will occur over a 15-year period.
- As indicated previously, the 'ideal' utilisation rates were regarded as unrealistic and are not used in any of the scenarios. The highest utilisation rate used in any scenario or sub-scenario ('mid') is used in the 'best guess' sub-scenario.
- The DBSA 'Roadmap' report undertook a detailed analysis of the additional resources required to implement the most essential improvements in the public health system. This increase, which was equivalent to a real increase of approximately 7% per year, was regarded as somewhat conservative. The 'best guess' sub-scenario therefore adopted a higher annual increase for the first five years of 10% to promote a substantial improvement in public sector services.
- Real unit costs within the public sector are unlikely to increase very rapidly after the initial resourcing improvements, and are therefore assumed to increase at 1% per annum. Staff costs account for the largest share of public sector health care expenditure. While salaries may grow in real terms in future, the OSD has achieved a substantial improvement in salaries for health workers and there is therefore a strong basis for containing real salary increases. Having a single-purchaser under UC will provide a strong basis for containing real unit cost increases. It should be recognised that substantial increases in utilisation rates are assumed which will translate into far higher real expenditure increases than suggested by the 1% increase by unit costs.
- A quite conservative assumption on real cost increases in the medical schemes environment (of 3% per year) is assumed in the 'best guess' sub-scenario. It should be noted that, given that there is an assumption of no utilisation increases in schemes, the real increase in unit costs actually represents the real increase in total expenditure in the case of schemes. As medical schemes expenditure per beneficiary has been increasing in real terms by over 7% annually over

the past decade, this is indeed a conservative assumption. This conservative assumption is based on the expectation that schemes will be under considerable pressure to improve cost containment when faced with the possibility of current members opting out under a UC system.

- As indicated previously, international experience highlights that the administrative costs of a single purchaser UC system tend to range from 2% to 5% of all other costs. Given that a wide range of other administration costs associated with service delivery is included elsewhere in the model, the 'best guess' sub-scenario assumes 3% administration costs (i.e. not at the lowest possible level, but at the lower end of the scale).

#### Summary of key assumptions for universal coverage scenario

<b>POPULATION VARIABLES</b>			
	<b>Best guess</b>	<b>Lowest cost</b>	<b>Highest cost</b>
Size of change in scheme membership	- 40%	-60%	0%
Phase-in period for scheme membership changes	15	10	0
<b>UTILISATION VARIABLES</b>			
Projected utilisation level (UC)	'Mid'	'Realistic'	'Mid'
Phase-in period for utilisation changes (UC)	15 years	15 years	5 years
Usage of UC services by scheme members	25%	10%	33%
<b>UNIT COST VARIABLES</b>			
Unit cost level	Annual real increase of 10% from baseline public costs for first five years	'DBSA' resource improvement for first five years	Full private sector cost
Annual real increase in UC system unit costs	1% after first five years	1% after first five years	3% from outset
Average annual real unit cost increases in schemes environment	3%	3%	5%
<b>OTHER VARIABLES</b>			
UC administration costs (as % of all other costs)	3%	2%	5%

Table 6 provides a summary of the resource requirements for universal coverage for the different sub-scenarios and the estimated spending via medical schemes by those who chose to retain scheme cover in addition to their entitlements under a universal coverage system. The results indicate a wide variation in the potential resource requirements of a universal health system (from R231 billion to R 1,098 billion within 15 years). The 'best guess' sub-scenario indicates that the resource requirements for a universal health system would be nearly R300 billion after full implementation over a 15 year period.

The main reason for the very high resource requirements under the 'highest cost' sub-scenario is that the unit cost level is assumed to be the full private sector cost. In addition, the annual real increase in unit costs is assumed to be 3% rather than 1% (given that the trend in private sector real cost increases has been greater than in the public sector). Assumptions about the ultimate utilisation rate level are the same across the 'highest cost' and 'best guess' sub-scenarios, but it is

assumed that this utilisation level is achieved in a shorter time period in the 'highest cost' sub-scenario. It should be noted that the 'highest cost' sub-scenario is *not* regarded as a realistic possibility. This approach to achieving UC is clearly unaffordable for any country and, hence, this sub-scenario simply indicates that it is not feasible to extend the current private sector model to the entire South African population.

Spending on and by medical schemes ranges from R76 billion within 15 years (under the assumption that as many as 60% of current scheme members chose to rely purely on their entitlements under the universal system, which translates into only 6% of the population being covered by schemes within 15 years) to R200 billion (under the assumption that none of the current scheme members 'opt out' of schemes, which translates into scheme population coverage of 15%).

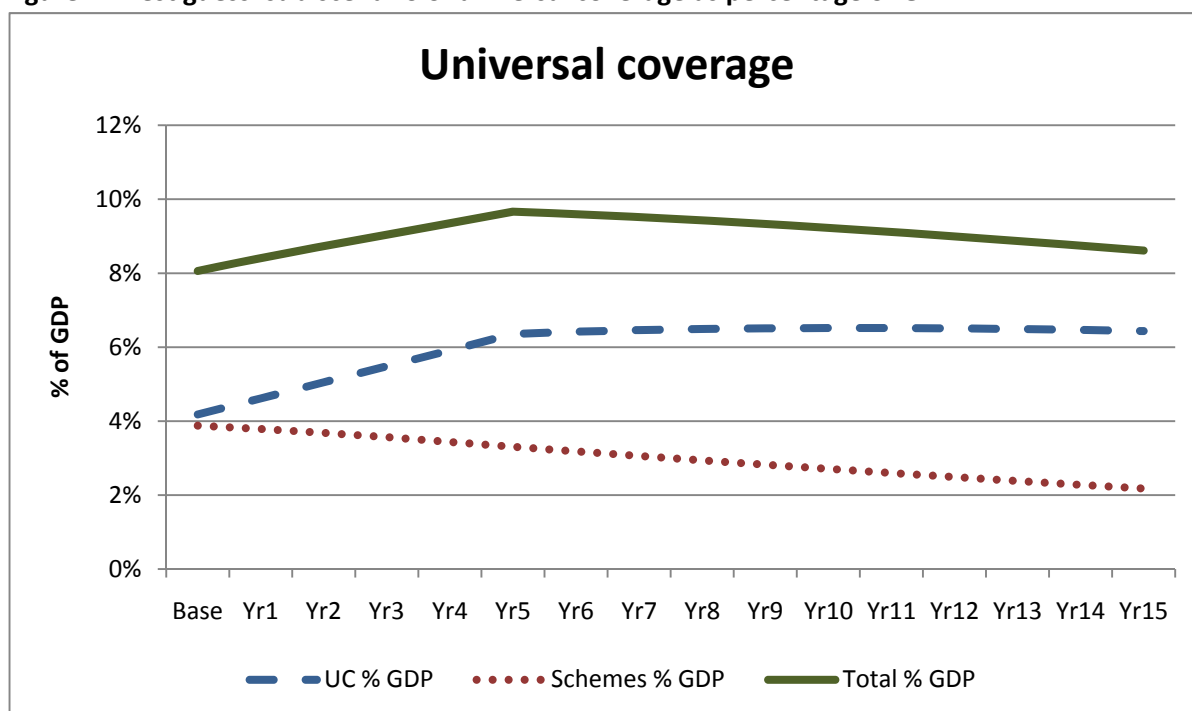
**Table 6: Results of sub-scenarios for the universal coverage scenario (R billion; 2010 terms)**

	Base	Year 5	Year 10	Year 15
<b><i>'Best guess' sub-scenario</i></b>				
UC component	102	187	240	295
Schemes	94	98	100	100
<b>TOTAL</b>	<b>196</b>	<b>285</b>	<b>339</b>	<b>394</b>
<b><i>'Lowest cost' sub-scenario</i></b>				
UC component	99	160	198	231
Schemes	94	83	66	76
<b>TOTAL</b>	<b>193</b>	<b>242</b>	<b>263</b>	<b>307</b>
<b><i>'Highest cost' sub-scenario</i></b>				
UC component	104	645	846	1 098
Schemes	96	123	156	200
<b>TOTAL</b>	<b>200</b>	<b>768</b>	<b>1 002</b>	<b>1 298</b>

It is clear from these estimates that moving towards a universal health system requires considerable resources. This is driven by a substantial increase in utilisation rates (of over 100% at primary care and district hospitals and in the region of 50% for level II hospitals in order to move from current utilisation levels to the 'Need Norms' and HSP norm levels) as well as improved resourcing, particularly in relation to human resources.

However, as indicated in Figure 1, the ultimate level of spending on health care in South Africa as a percentage of our GDP would be very similar to the current situation (i.e. 8% of GDP). The key change is that public funds (i.e. funds used to provide services that benefit the entire population) would account for a greater share of spending than at present, while spending on and by medical schemes (to which about 9% of the population would belong) would account for a relatively lower share of expenditure.

Figure 1: 'Best guess' sub-scenario of universal coverage as percentage of GDP



It is important to consider the resource implications of the proposed universal health system within the context of what is likely to happen in the health system if UC were not implemented (the 'status quo' scenario) or if an alternative health system reform were implemented (the 'mandatory extension of medical scheme' scenario).

**Status quo scenario**

The key assumptions for each of the sub-scenarios in the status quo scenario are summarised below. These assumptions are based on the current situation (e.g. extent to which scheme members use different types of public sector services and extent to which those who are not medical scheme members use private sector services on an out-of-pocket basis) and on recent trends (e.g. growth in medical scheme membership and rate of increase in real expenditure). The 'highest cost' sub-scenario represents most closely what the current situation is and the recent trends in the South African health system. The 'best guess' sub-scenario makes assumptions about improvements in the medical schemes environment (e.g. more effectively controlling the rate of expenditure increases, limiting the use of public sector services on a largely unfunded basis, etc.).

**Summary of key assumptions for status quo scenario**

<b>POPULATION VARIABLES</b>			
	<b>Best guess</b>	<b>Lowest cost</b>	<b>Highest cost</b>
Size of annual change in scheme membership	2%	1%	3%
<b>UTILISATION VARIABLES</b>			
Projected utilisation level in public sector	'Realistic'	'Realistic'	'Realistic'
Phase-in period for public sector utilisation changes	20 years	20 years	15 years
Use of public PHC services by scheme members	5%	0%	10%
Use of public district & regional hospital services by scheme members	10%	5%	20%
Use of public central and provincial hospital services by scheme members	25%	10%	33%
Usage of private PHC services by non-scheme members	10%	10%	20%
<b>UNIT COST VARIABLES</b>			
Annual real increase in public sector unit costs	1%	0%	1%
Average annual real unit cost increases in medical schemes environment	5%	3%	7%

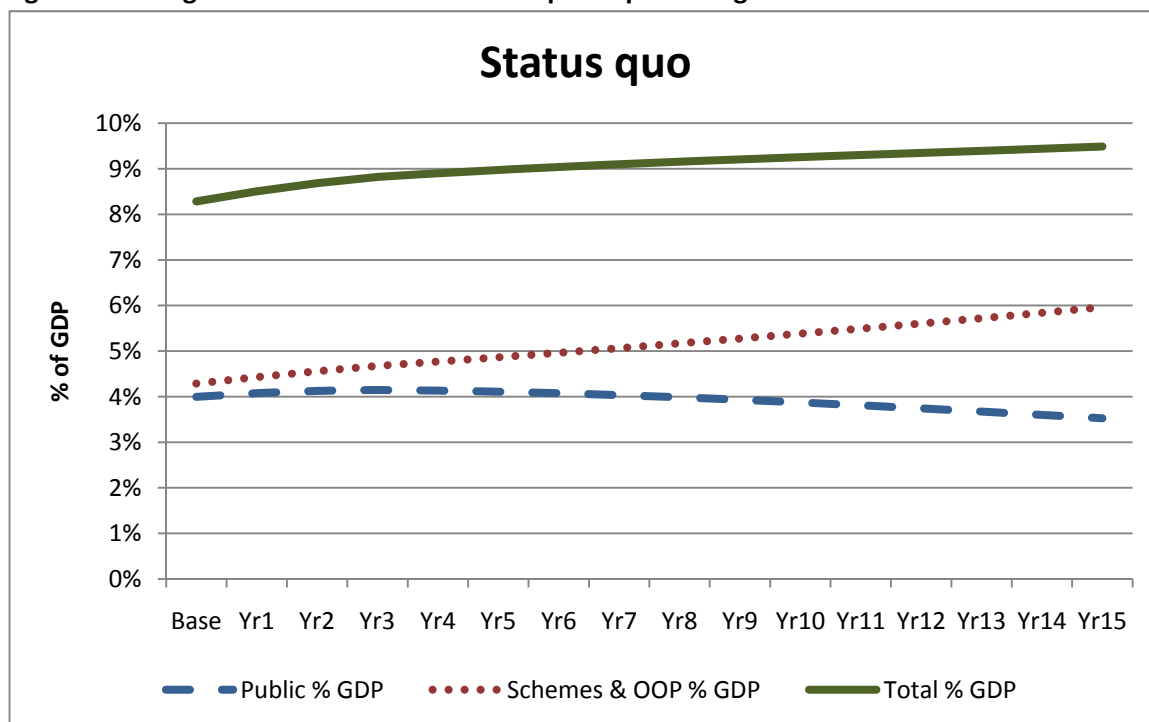
Table 7 summarises the main results of the status quo scenario. It shows that using conservative assumptions about very gradual improvements in the public sector, through consistent yet small increases in real unit costs (reflecting marginal improvements in staffing etc.) and improvements in access translating into improved, yet still quite low, utilisation rates, resource requirements in the public sector would increase to around R161 billion within 15 years (or R145 billion using very constrained assumptions). There is a wider range of estimates across sub-scenarios in relation to medical schemes, ranging from R178 billion to R438 billion. The main factor driving these variations is the estimate about the pace of annual real increases in medical schemes' costs. As indicated above, the 'highest cost' sub-scenario is closest to the recent reality of schemes. Spending by medical schemes within 15 years under this sub-scenario is equivalent to nearly 10% of GDP; at that stage about 24% of the population would be covered by medical schemes (if membership is able to grow as rapidly as has occurred in the last few years due to the introduction of GEMS). Total spending on health care would be over 13% of GDP.

**Table 7: Results of sub-scenarios for the status quo scenario (R billion; 2010 terms)**

	Base	Year 5	Year 10	Year 15
<b>'Best guess' sub-scenario</b>				
Public sector	97	121	142	161
Schemes and OOP	104	143	198	273
<b>TOTAL</b>	<b>201</b>	<b>265</b>	<b>340</b>	<b>434</b>
<b>'Lowest cost' sub-scenario</b>				
Public sector	96	116	132	145
Schemes and OOP	101	122	147	178
<b>TOTAL</b>	<b>198</b>	<b>238</b>	<b>279</b>	<b>323</b>
<b>'Highest cost' sub-scenario</b>				
Public sector	98	124	147	167
Schemes and OOP	114	179	279	438
<b>TOTAL</b>	<b>212</b>	<b>302</b>	<b>426</b>	<b>606</b>

Figure 2 indicates that, in terms of the 'best guess' sub-scenario, while spending on public sector services as a percentage of GDP declines slightly from 4% to 3.5%, spending on and by schemes (and a small component of OOP payments, accounting for about 6% of combined scheme and OOP spending) increases from 4.3% to 6% of GDP within 15 years (medical schemes would cover nearly 21% of the population at that point). Total health care spending would increase from 8.3% to 9.5% of GDP, which is higher than in many high-income countries.

**Figure 2: 'Best guess' sub-scenario of status quo as percentage of GDP**



### ***Mandatory extension of private medical scheme cover***

The key assumptions for the scenario of extending medical scheme cover to all formal sector workers above the income tax threshold through making such membership mandatory are summarised below.

#### **Summary of key assumptions for mandatory extension of medical scheme cover scenario**

<b>POPULATION VARIABLES</b>	<b>Best guess</b>	<b>Lowest cost</b>	<b>Highest cost</b>
Annual growth in formal employment	2%	1%	3%
Phase-in period for extending scheme membership to all formal sector employees above income tax threshold	4	5	4
<b>UTILISATION VARIABLES</b>			
Projected utilisation level in public sector	'Realistic'	'Realistic'	'Realistic'
Phase-in period for utilisation changes (UC)	10 years	15 years	5 years
Usage of public sector services by scheme members	10%	0%	25%
Change in use of GP services by scheme members	5%	7%	0%
Change in use of specialist and private hospital OPD services by scheme members	-2%	-3%	0%
<b>UNIT COST VARIABLES</b>			
Annual real increase in public sector unit costs	1%	1%	1%
Average annual real unit cost increases in schemes environment	5%	3%	7%
<b>OTHER VARIABLES</b>			
Scheme administration costs	13%	10%	16.5%

In this scenario, there is little variation in the ultimate level of spending on public sector services across the sub-scenarios, but there is wide variation in the estimated spending via the mandatory extension of schemes coverage, ranging from R287 billion to R763 billion within 15 years (see Table 8). The major reasons for the range of estimated expenditure levels in these sub-scenarios are differences in the estimated growth in formal employment (1% annual growth in formal employment would translate into 33% of the population being covered within 15 years while 3% annual growth in formal employment would result in 45% of the population being covered over this period), and the estimated rate of increase in unit costs within the medical schemes' environment. As with the status quo sub-scenarios, the 'highest cost' sub-scenario reflects most closely the pace of increases in spending by medical schemes over the past decade. The same is true in relation to administration costs. The 'best guess' sub-scenario thus assumes that medical schemes are able to control these costs more effectively than at present.

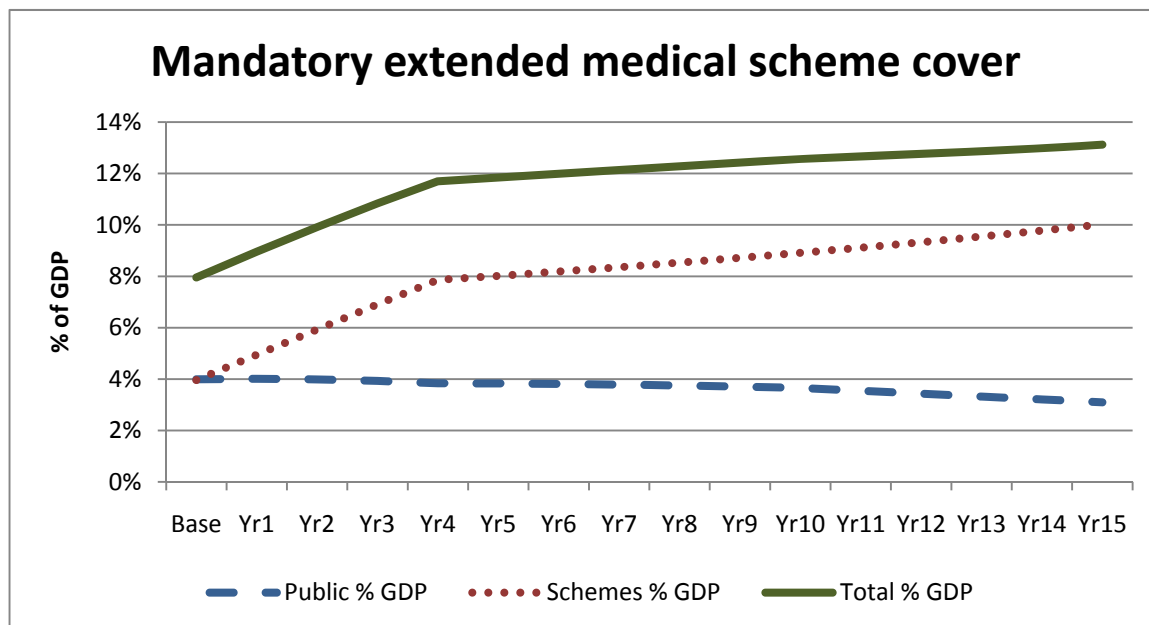
**Table 8: Results of sub-scenarios for the mandatory extension of private medical scheme scenario (R billion; 2010 terms)**

	Base	Year 5	Year 10	Year 15
<b><i>'Best guess' sub-scenario</i></b>				
Public sector	97	113	134	142
Extended schemes	96	236	327	459
<b>TOTAL</b>	<b>193</b>	<b>349</b>	<b>462</b>	<b>601</b>
<b><i>'Lowest cost' sub-scenario</i></b>				
Public sector	96	108	127	144
Extended schemes	92	194	233	287
<b>TOTAL</b>	<b>188</b>	<b>302</b>	<b>359</b>	<b>430</b>
<b><i>'Highest cost' sub-scenario</i></b>				
Public sector	99	128	137	143
Extended schemes	101	292	472	763
<b>TOTAL</b>	<b>200</b>	<b>420</b>	<b>609</b>	<b>907</b>

Figure 3 shows that public spending will decline from 4% to 3.1% of GDP within 15 years, while spending by schemes will increase from 4% to 10% of GDP. By the end of the 15 year period 39% of the population would be covered by schemes which would account for health care spending equivalent to 10% of GDP, while the remaining 61% of the population would be dependent on publicly funded services which would account for spending equivalent to 3.1% of GDP. Total health care spending in South Africa under the mandatory extension of medical scheme cover scenario would increase from 8% to 13% of GDP in the next 15 years.

The reason for the steep increase in schemes spending in the first 4 years is due to the assumption that when membership of medical schemes is made compulsory for all formal sector employees above the income tax threshold, this would be implemented in a relatively short period of time. Thereafter, scheme membership would increase in line with growth in formal sector employment.

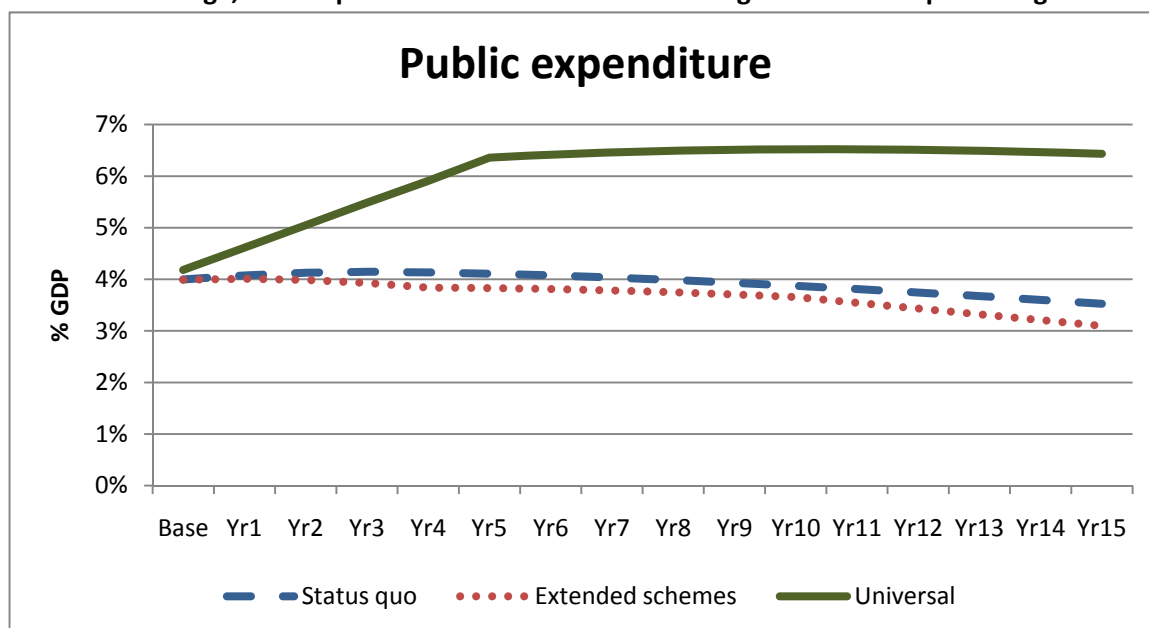
**Figure 3: 'Best guess' sub-scenario of mandatory extension of medical scheme cover as percentage of GDP**



**Comparison of the three scenarios**

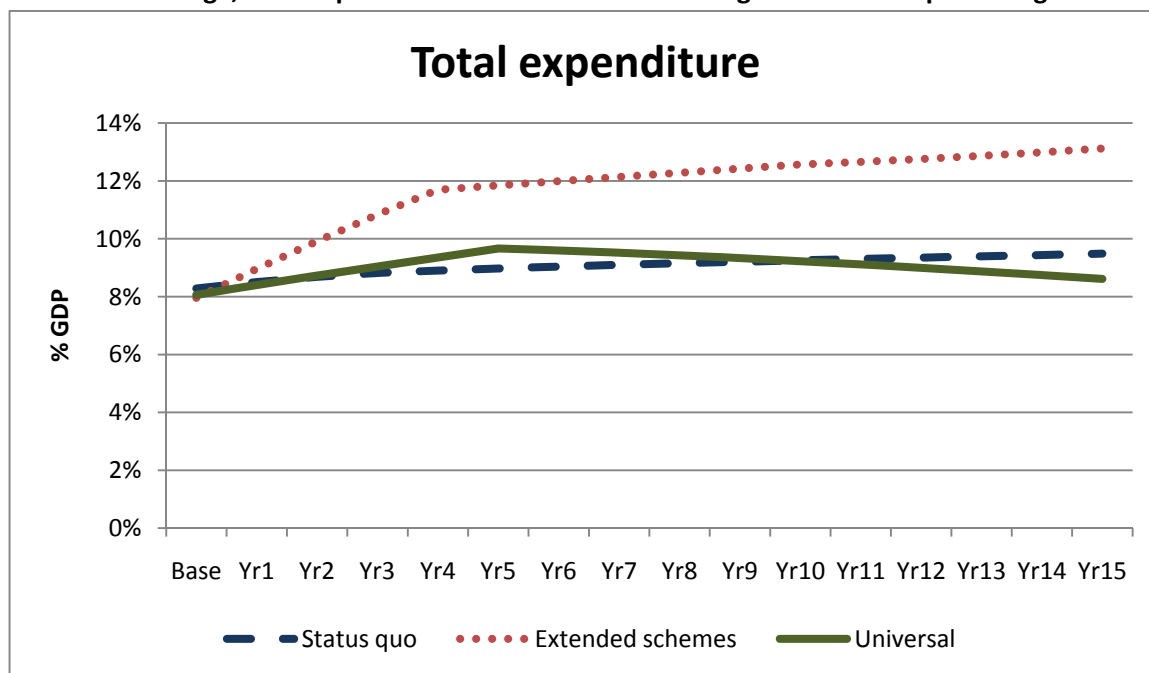
The three scenarios (universal coverage, status quo and mandatory extension of scheme coverage) are compared in Figures 4 and 5 focussing on the 'best guess' sub-scenario. Figure 4 indicates that the highest level of public spending would occur under the universal coverage option; it would increase from just over 4% of GDP at the outset to about 6.4% of GDP at the end of the 15 year phase-in. Public spending would decline as a percentage of GDP under the other two scenarios, with the decline being greatest for the mandatory extended scheme coverage scenario.

**Figure 4: Comparison of public health care expenditure for 'best guess' sub-scenario across universal coverage, status quo and extended scheme coverage scenarios as percentage of GDP**



However, as indicated in Figure 5, total health care expenditure will be lowest in the universal coverage option (8.6% of GDP), followed by the status quo (9.5% of GDP) and with the mandatory extension of scheme coverage having the highest expected total spending level (13.1% of GDP). The universal coverage option results in the smallest overall increase in health care expenditure.

**Figure 5: Comparison of total health care expenditure for ‘best guess’ sub-scenario across universal coverage, status quo and extended scheme coverage scenarios as percentage of GDP**



### Revenue generation estimates

All revenue estimates are presented for the ‘best guess’ sub-scenario of each scenario.

Under the status quo scenario, the percentage share of the government budget required for health spending would remain within the range within which it has been over the past decade. It would range from 10.5% - 12.5% over the 15 year period achieving the lowest levels at the end of this period. In the case of the mandatory extended medical scheme scenario, the allocation from the government budget to fund public sector health services would decline from about 12.2% in the base year to 9.4% in year 15. **However**, there would be a substantial increase in payments from the government budget for medical scheme membership for civil servants. To provide some insight into this burden on the government budget, by the end of the 15 year period, scheme contributions per person (in real 2010 terms) would on average be at least R23,000, or at least R60,000 for a civil servant plus his/her dependents (assuming the current average of 1.61 dependents). It is unclear what portion of this contribution government would have to fund.

As is evident from Figure 4, a substantial increase in public funding would be required for the universal coverage scenario. While gradually increasing the allocation to the health sector from the overall government budget to 15% would go some way towards meeting the additional revenue requirements, other sources of revenue need to be found if one is to avoid ‘crowding out’ the claims of other sectors (particularly other social sectors) on the general government budget.

If a **proportional** dedicated income tax is applied, the maximum rate needed would be less than 4% of taxable income (with most of this being shared between employers and employees). This would represent a substantial increase in tax as a percentage of income for the lowest income earners, but would represent around a 5% increase in income tax for the highest income earners (e.g. the highest income tax payers currently pay about 41% of their income in tax and this would increase to about 43% - 44%).

If a **progressive** dedicated income tax is implemented, the maximum tax rate would be 6% (with most of this being shared between employers and employees) while the minimum tax rate would be 1.2% (i.e. 0.6% for employers and 0.6% for employees). Once again, this would represent a substantial increase in tax as a percentage of income for the lowest income earners, but far less (less than a quarter) than under a proportional system. It would, however, represent a larger increase for the highest tax group than under a proportional system of over 7% (from 41% to about 44% - 45%).

To provide an indication of the phasing in of these revenue changes, if the percentage share of the overall government budget allocated to the health sector increased as follows:

Base: 12.7%

Year 1: 13.2%

Year 2: 13.7%

Year 3: 14.2%

Year 4: 14.7%

Year 5: 15% (and in each year thereafter);

additional taxes equivalent to about 1% of taxable income would need to be introduced by the second year, increasing to 3.6% in the sixth year and thereafter.

## Discussion

To reiterate the perspective adopted at the outset, we do not see a model, such as those presented above, as *"a crystal ball; it does not predict the future. Rather, models project a possible future state on the basis of observations and assumptions on future conditions"* (Cichon et al., 1999). The intended purpose of these models is not to attempt to miraculously predict exactly what the resource requirements of alternative health system changes will be in 15 years time. Instead, the intention was to explore the potential resource requirements of the proposal to move towards a universal health system and to assess the associated revenue generation implications. When considering substantial health system change, it is advisable to consider alternative health system changes as well to compare these with the status quo.

A core set of assumptions has been adopted that have been based on as strong an evidence base as possible and that has been presented for each assumption. Nevertheless, these are *assumptions* and there is likely to be some debate around these assumptions. For example, some may be more optimistic about the potential for medical schemes to break the historical patterns of rapid increases in real expenditure and contributions than assumed here. For this reason, extensive sensitivity analyses have been undertaken and 'lowest cost' and 'highest cost' sub-scenarios presented, as well as a 'best guess' sub-scenario, to provide an overview of how the estimated resource requirements vary as key assumptions change.

In order to provide a reliable basis for comparison across the three scenarios, the core assumptions have been used consistently unless there was a sound basis for using a different assumption in a particular scenario. For example, for the 'best guess' sub-scenario, the assumption that annual real increase in scheme costs would be 5% (which is lower than over the past decade) was used in both the status quo and mandatory extension of medical scheme cover scenarios. However, an even

lower assumption (3%) was used in the universal coverage scenario because schemes will be under considerably more pressure in attracting scheme members in this scenario than in the other two scenarios. Therefore, while the precise magnitude of the resource requirements for each scenario may ultimately diverge from that estimated, the overall pattern between the three scenarios should hold.

The summary comparison of the three key scenarios in Table 9 highlights that the mandatory extension of medical scheme coverage scenario is the most costly option. It would result in total health care spending in the country exceeding 13% of GDP. Spending at this level is far higher than in even the highest income countries, with only one exception, namely the USA. This is despite assuming a quite substantial shift towards primary care services and away for specialist services within the schemes environment and assuming annual real cost increases and administration cost levels that are lower than at present. Under these circumstances, the prospect of extending medical scheme cover to all formal sector workers above the tax threshold seems not a feasible option. The major 'attraction' of this scenario is that it allows the demand on public resources for health to be kept to a minimum, and for the health sector to consume a declining share of the total government budget.

**Table 9: Comparison of resource requirements for the three scenarios ('Best guess' sub-scenario)**

	Universal coverage	Status quo	Extended schemes
<b>Base – total expenditure (R billion; 2010 terms)</b>			
Public funds	102	97	97
Schemes (& OOP)	94	104	96
<b>Total</b>	<b>196</b>	<b>201</b>	<b>193</b>
<b>Year 15 – total expenditure (R billion; 2010 terms)</b>			
Public funds	295	161	142
Schemes (& OOP)	100	273	459
<b>Total</b>	<b>394</b>	<b>434</b>	<b>601</b>
<b>Year 15 – per capita expenditure (Rands; 2010 terms)</b>			
Public funds	6,262	3,936	4,466
Schemes (& OOP)	20,921	25,285	22,891

The status quo scenario would similarly not place a greater demand on public resources by the health sector than at present. However, it is likely to result in an even greater gap in spending between those covered by schemes and those not. While spending per medical scheme member is currently about 5 times greater than those reliant on public sector services, it would have increased to nearly 6.5 times greater for scheme members than non-members within 15 years. This would occur despite assuming that annual real schemes' cost increases would be lower than in the last decade. Equally importantly, total health care expenditure under this scenario would be greater than under the universal coverage scenario. This is largely due to the relatively larger coverage of the population by schemes under the status quo scenario and the higher per capita costs of schemes. The per capita estimates contained in Table 9 also highlight that if there are only marginal improvements in the schemes environment (in this case through lower annual real cost increases but no major improvement in administration costs or in use of primary care services relative to specialist services), future medical scheme contribution levels are likely to be far more onerous than at present (average scheme spending will be over R25,000 per person in 2010 terms within 15 years which is almost double what it currently is).

The universal coverage scenario is likely to translate into the lowest overall level of total health care expenditure. In addition, while there would still be a differential in the resources devoted to those covered by schemes and those not, the differential in per capita spending would be lowest under

the universal coverage scenario. This is largely due to the substantially improved resourcing of publicly funded services, but also partially attributable to the pressure that schemes would be under to contain increases in contribution levels to attract members. The key drawback of this scenario is that it requires a very substantial increase in public funding – an almost three-fold increase in real resources. The magnitude of this challenge should not be underestimated. However, it should be recognised that at least part of this real increase in resourcing would be required under the status quo scenario; even if there are no substantive health system changes, it should not be assumed that there will be no real changes in the budget required for health services.

The choice between moving towards universal coverage or retaining the status quo is a policy decision that needs to draw on a wider range of information than presented in this report. For example, the health status improvements and the other social benefits of dramatically improved financial protection and access to needed health services for all in South Africa need to be taken into account when considering moving from the status quo to a universal health system. These have to be weighed against the need to increase the health sector's share of the government budget funded from general revenue to 15% as well as introduce a dedicated tax on income for the health sector (or some other combination of percentage share of general revenue for the health sector and dedicated health taxes or contributions).

The models presented do not only provide insights into the resource requirements of alternative health system reforms relative to the status quo, but also provide insights into the factors that can influence the sustainability of these reform pathways. Particularly important with respect to the proposals to pursue universal coverage are the following:

- The resource requirements for universal coverage will be heavily influenced by the level of unit costs of services purchased (see Table 6). In particular, if the current 'full private sector' fee level is paid per service used, universal coverage would require public funding equivalent to 24% of GDP. This is clearly unaffordable and unsustainable for any country. This implies that vastly improved resourcing of public sector services should be the core of the universal system and that careful design of purchasing of services from private providers (particularly in terms of reimbursement mechanisms and rates) is required.
- Administration costs should be kept to a minimum; careful attention needs to be paid to avoiding duplication of administrative functions and to ensuring an efficient administrative system.
- Utilisation increases must be managed carefully. While the 'highest cost' and the 'best guess' sub-scenarios use the same assumption on the final service utilisation level, the 'highest cost' sub-scenario has a much more rapid increase in utilisation than the 'best guess' sub-scenario. Comparing the results of the 'lowest cost' and 'best guess' sub-scenarios indicate that UC can be achieved at much lower cost if utilisation increases are limited to the 'realistic' utilisation levels as opposed to the 'mid' utilisation levels. If the 'lowest cost' sub-scenario is achievable, universal coverage could be funded almost entirely by increasing the health budget's share of the total government budget to 15% (i.e. with no additional dedicated income tax needing to be levied). Potentially the most important pre-conditions for appropriate utilisation are: to ensure that there are good community level services that will reduce the need to visit a health facility; to provide high quality, accessible primary level services; and to implement a strong gatekeeping system at primary level facilities with referral to specialists and hospitals only as necessary.
- The pace of change must be carefully assessed. Potentially the greatest concern to policy makers of the universal coverage scenario results is the rapid increase in the required public

funding projected under this model. This pattern is particularly related to the assumption that there should be a dramatic improvement in resourcing of public sector services in the first five years. This is in line with the recommendations of the DBSA's 'Roadmap' report (Development Bank of South Africa, 2008). While it is critical to achieve demonstrable changes in public health services in the shortest time possible in pursuit of a universal health system, the pace of change should be reconciled with the likely availability of public funds.

### **Concluding comments**

This is an admittedly simple model designed to produce 'high-level' estimates of the resource requirements for a universal health system under different conditions and to compare this with not introducing health system changes (maintaining the status quo) and an alternative reform of mandatory extension of medical scheme coverage. There are undoubtedly areas where further refinement is possible. However, as indicated in the introduction, the purpose of this modelling process is not to come up with a definitive, immutable estimate of the resources required to achieve universal coverage or the other scenarios. Instead, it provides information that may assist in evaluating the desirability of universal coverage as opposed to maintaining the current system or pursuing an alternative reform path. It also provides helpful insights into the 'highest cost', 'lowest cost' and 'best guess' sub-scenarios and through the modelling process, highlights the key elements of the UC system design that need to be addressed to ensure that universal coverage is affordable and sustainable within the South African context. It will be critical during the piloting and/or roll-out phase to capture accurate and comprehensive data on utilisation patterns (demographic characteristics, disease presentation, etc. of those using health services) in order to undertake rigorous actuarial analyses to predict resource requirements on a short-term basis.

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## References

- ADAM, M. & JOHNSON, L. (2009) Estimation of adult antiretroviral treatment coverage in South Africa. *South African Medical Journal*, 99, 661-667.
- ADAM, T. & EVANS, D. B. (2006) Determinants of variation in the cost of inpatient stays versus outpatient visits in hospitals: A multi-country analysis. *Social Science & Medicine*, 63, 1700-1710.
- AU (2010) Actions on maternal, newborn and child health and development in Africa by 2015: Resolution of the Fifteenth Ordinary Session of the Assembly of the Union, 25-27 July 2010, Kampala, Uganda. Addis Ababa, African Union.
- BARNUM, H. & KUTZIN, J. (1993) Public Hospitals in developing countries: Resource use, cost, financing. Baltimore, The Johns Hopkins University Press for the World Bank.
- CHITHA, W., CLEARY, S., DAVAUUD, E., JIKWANA, S., MAKAN, B., MASILELA, T., MCINTYRE, D., PILLAY, Y., SEBOKEDI, L., THOMAS, S. & WILSON, T. (2004) Financial resource requirements for a package of primary health care services in the South African public health sector. Pretoria, National Department of Health.
- CICHON, M., NEWBRANDER, W., YAMABANA, H., WEBER, A., NORMAND, C., DROR, D. & PREKER, A. (1999) *Modelling in health care financing: A compendium of quantitative techniques for health care financing*, Geneva, International Labour Office and International Social Security Association.
- CLEARY, S. & MCINTYRE, D. (2010) Financing equitable access to ART in South Africa. *BMC Health Services Research*, 10, S2, 10 pages.
- CLEARY, S., MCINTYRE, D. & BOULLE, A. (2006) The cost-effectiveness of Antiretroviral Treatment in Khayelitsha, South Africa - a primary data analysis. *Cost Effectiveness and Resource Allocation*, 4.
- CLEARY, S., MCINTYRE, D. & BOULLE, A. (2008) Assessing efficiency and costs of scaling up HIV treatment. *AIDS*, 22, S1-S8.
- COUNCIL FOR MEDICAL SCHEMES (2008) Annual Report, 2007-8. Pretoria, Council for Medical Schemes.
- COUNCIL FOR MEDICAL SCHEMES (2009) Annual Report, 2008-9. Pretoria, Council for Medical Schemes.
- DEPARTMENT OF HEALTH (1995) Restructuring the national health system for universal primary health care: Report of the Committee of Inquiry into a national health insurance system (Broomberg, Shisana Committee). Pretoria, Department of Health.
- DEPARTMENT OF HEALTH (1997) A social health insurance scheme for South Africa. A policy document. Pretoria, Department of Health.
- DEPARTMENT OF SOCIAL DEVELOPMENT (2002) Transforming the Present - Protecting the Future: Consolidated Report. Report of the Committee of Inquiry into a Comprehensive System of Social Security for South Africa. Pretoria, Department of Social Development.
- DEVELOPMENT BANK OF SOUTH AFRICA (2008) A roadmap for the reform of the South African health system. Johannesburg, Development Bank of South Africa.
- GILSON, L. & MCINTYRE, D. (2005) Removing user fees for primary care in Africa: the need for careful action. *British Medical Journal*, 331, 762-765.
- LOMBARD, C., STEGMAN, J. & BARNARD, A. (1991) Modelling net expenditure of hospitals in the Cape Province. *South African Medical Journal*, 80, 508-510.
- MCLEOD, H. (2004) Social Health Insurance: An introduction for practitioners. Pretoria, School of Health Systems and Public Health, University of Pretoria.
- MINISTERIAL TASK TEAM (2004) Final recommendations concerning the implementation of Social Health Insurance in South Africa: Report 1. Pretoria, Department of Health.
- MONITOR COMPANY, HEALTH PARTNERS INTERNATIONAL, CENTRE FOR HEALTH POLICY & INSTITUTE, N. L. A. D. (1996) Hospital Strategy Project: Overview and Final Report. Johannesburg, Monitor, HPI, CHP and NALEDI.

- NATIONAL TREASURY (2009a) Medium Term Budget Policy Statement. Pretoria, National Treasury.
- NATIONAL TREASURY (2009b) Provincial budgets and expenditure review: 2005/06 - 2011/12. Pretoria, National Treasury.
- NATIONAL TREASURY (2010) 2010 Budget Review. Pretoria, National Treasury.
- NATIONAL TREASURY AND SARS (2010) 2009 Tax statistics. Pretoria, National Treasury and South African Revenue Service.
- O'DONNELL, O., VAN DOORSLAER, E., WAGSTAFF, A. & LINDELOW, M. (2008) *Analyzing health equity using household survey data: A guide to techniques and their implementation*, Washington, D.C., The World Bank.
- OAU (2001) Abuja Declaration on HIV/AIDS, tuberculosis and other related infectious diseases. Organisation of African Unity.
- OECD (2010) OECD Economic Surveys: South Africa, July 2010. Paris, Organization for Economic Cooperation and Development.
- RISPEL, L., PRICE, M. & CABRAL, J. (1996) Confronting need and affordability: guidelines for primary health care services in South Africa. Johannesburg, Centre for Health Policy, University of Witwatersrand.
- SAUERBORN, R., NOUGTARA, A., HIEN, M. & DIESFELD, H. J. (1996) Seasonal variations of household costs of illness in Burkina Faso. *Social Science and Medicine*, 43, 281-290.
- STATISTICS SOUTH AFRICA (2009) Labour market dynamics in South Africa 2008. Pretoria, Statistics South Africa.
- WORLD HEALTH ORGANISATION (2005) *Social Health Insurance: Selected case studies from Asia and the Pacific*, New Delhi, SEARO, WHO.