

# FORESIGHT HEALTH REPORT

## Foreword

South Africa's National Research and Technology Foresight Project addressed specific aspects of the South African economy. The Foresight Health Sector report is one of twelve sector reports that represent critical input into the shaping of South Africa's research and technology agenda.

Why undertake a foresight exercise for health? Health is among those sectors that are evolving rapidly in response to technological advancement. It is sector that draws upon advances in other sectors, such as the information sector (telemedicine), the military sector (global positioning systems) and the environmental sector (malaria control) to name but a few.

The farsighted initiative of the Minister of Arts, Culture, Science and Technology in launching the project is highly commended. The leadership, drive and enthusiasm of the Foresight Project Director, Dr Philemon Mjwara, the dedication of the team of sector coordinators and their support staff over the two years are gratefully acknowledged.

This particular report represents the consolidation of intense work carried out by the Sector Coordinator, Glaudina Loots, and the members of the Working Group. The Working Group brought together skills from all the areas that make up the environment of health care in South Africa.

A full list of the members of the Health Sector Working Group is provided in Appendix C of this report.

The contribution of the 220 survey respondents was also highly influential in determining the final recommendations.

The report attempt to address the science and technology challenges that would be faced in providing health care in South Africa from a medium- to long-term perspective. This report should be seen as a document that tries to illuminate the part ahead and fully recognises that the path that is eventually taken will be shaped by a much broader cross-section of players. It is hoped that this report will provide the vehicle for robust dialogue in determining the research agenda of this country.

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# Executive Summary

Shortly after the establishment of the Ministry of Arts, Culture, Science and Technology in 1994, then Minister Dr Ben Ngubane announced his Department's intention to carry out a foresight exercise. The project was formally inaugurated in July 1996. In the White Paper on Science and Technology, DACST committed itself to using the results of the Foresight exercise as an important input into its investments in research and development within the science budget. The Foresight results would also be used as input into the management of the proposed Innovation Fund and guide research capacity-building programmes in the higher education sector.

Twelve sectors were selected for this first Foresight exercise, and health was seen as one of the important issues that should be investigated. A Health Sector Working Group was formed, and for the purposes of the Health Sector Foresight process, the following Mission and Focus areas were decided upon:

## **Mission:**

To prioritise research and technology strategies in the SA health sector in order to ensure sustainable development in South Africa.

Focus areas:

- Health policy and legislation
- Measurement and health information
- Education and training
- Health promoting activities
- Health technology
- Health services.

The World Bank classifies South Africa as a middle-income country, and 8,5% of its GDP is spent on health care, of which as much as 60% is spent in the private sector. The Medical Aid Schemes industry has shown healthy growth for most of the past 10 years. Currently, 7,5 million lives are covered by some form of medical insurance, and medical aid schemes spent around R20 billion in 1997. The public sector has to take care of the health needs of the rest of the population.

One of the main problems in the health sector is the fact that statistics reflecting health status are not readily available. For example, reliable mortality statistics, the cornerstone of health status data, are not available. The most recently published data refers to 1994 and it has been estimated that only 18% of the births and 56% of the deaths were registered in that year.

The overall pattern of mortality reflects the triple burden experienced in South Africa - the combination of poverty-related diseases, chronic diseases and a high death toll due to intentional and unintentional injuries.

Mortality data only partly measures the burden of disease in a country. It is important to remember that non-fatal conditions such as poor mental and oral health, blindness and arthritis are all conditions that contribute to the burden of disease. A full analysis of the burden of disease in South Africa must give due weight to such non-fatal conditions.

Many infectious diseases are preventable and access to primary health care during pregnancy and childbirth is known to reduce maternal and peri-natal morbidity and mortality. In many respects, these conditions can be considered to be the unfinished agenda, which could have been virtually eliminated with the appropriate provision of services. Issues that need to be resolved are malnutrition, tuberculosis, malaria, parasitic infections, HIV/AIDS and sexually transmitted diseases, and chronic diseases of lifestyle.

Based on the outcomes of a series of workshops, the Health Sector Working Group have identified four research and technology themes that should form the core of the Research and Development effort for the next 10 years. They are:

**Health information system:** Health information has been identified as a crucial component of the effective delivery of health care in the future. Institutional and technological challenges will have to be met so that the potential benefits of an appropriate Health Information System may be fully utilised.

**Health service delivery:** The quality of the South African Health Service has been identified as a major determinant of health care in the country. It has also been identified as suffering from mismanagement and deficiencies at all levels. Issues like telemedicine and private/public partnerships should be addressed.

**Self-management technologies:** The underpinning values of this theme are self-empowerment and personal responsibility. It should be seen by the health authorities not as a means for shirking responsibility, but rather as part of a better and more efficient health management process. The information and technologies used for self-care should be cost-effective, easy to use, robust, accessible and well supported by the health system. Issues that demand particular emphasis are chronic diseases, reproductive health and rehabilitation.

**Cost-effective prevention and treatment technologies:** This last theme is the most important for the medical science research base in South Africa. It embraces basic, applied and developmental research and, as such, necessitates cooperation and partnerships between academic institutions, national research institutes and industry. These must take the form of a dual strategy involving both modern biological sciences

and indigenous knowledge systems. Vaccine and drug development relating to the major diseases affecting the health of the nation and the development of robust, rapid, on-site diagnostic technologies and biotechnology is highlighted as an essential area of research.

South Africa's commitment to human rights and to capacity building should be part of the guiding principles of the research and development themes.

For research and development to have an impact on the quality of life of the country's people and on the country's competitiveness, the research portfolio should focus on local issues, including niche areas that may or may not form part of the global agenda. The major causes of mortality and morbidity in South Africa and the Southern African region in general should determine the priorities of health research and development. International best practice and cutting-edge science are essential to enhancing local research.

Certain research and development competency clusters became evident when the human resource capabilities for the research priorities were analysed. The creation of world-class, specific competencies that will form the essential combinations of intellectual resources necessary for the delivery of the Foresight priorities should be encouraged and should be a prerequisite for involvement in the Foresight priority areas. Attention should also be given to local and international collaboration.

To ensure a complete process, it is recommended that the Department of Arts, Culture, Science and Technology should specifically look at ways to implement and monitor the recommendations of the Foresight process.

# Chapter 1:

## Introduction to the Process

### 1.1 Introduction to the Foresight Process

Foresight is a family of processes intended to capture the dynamics of change by placing today's reality within the context of tomorrow's possibilities. It acknowledges a range of potential futures and seeks to add new dimensions to our thinking by providing—

- a way of thinking about the longer-term future and how it could differ from the present;
- a means of testing our current views and policies; and
- a way of overcoming the difficulties of static or retrogressive analyses.

Foresight provides a valuable mechanism for serious consideration of significant technical trends and their relationship to socio-economic needs. Foresight is inherently proactive and reflects the belief that the future is influenced by today's decisions and actions. By building complex pictures of alternative futures we are better able to assess how well current research and technology systems might address our future needs.

Although Foresight may use several forecasting techniques (e.g. Delphi analysis, trend analysis, scanning, scoping), the outputs differ significantly. The emphasis in Foresight is not on prediction but on the realisation that addressing the future necessitates the management of uncertainty. A richer and well-informed context for current decisions is developed via dialogue, involving all relevant stakeholders, which emphasises the human abilities of forethought, creativity, systems thinking, analysis and judgement. The wider the range of perspectives that are explored, the more broadly the benefits will be felt.

### 1.2 South Africa's Foresight Process

The National Research and Technology Foresight (NRTF) Project is one of a number of initiatives launched by the Department of Arts, Culture, Science and Technology (DACST) as part of its mandate to review and reform the S&T system in South Africa. The interest in foresighting started in 1993 when the International Development Research Centre (IDRC) of Canada, at the request of the Mass Democratic Movement, did a project, the Mission on S&T Policy for a Democratic South Africa. The mission report outlined the steps that needed to be taken into account when transforming S&T, and also assessed the status of the system. The report emphasised, as part its recommendations, that a foresight exercise should be conducted.

Shortly after the establishment of the Ministry of Arts, Culture, Science and Technology in 1994, the then Minister announced the ministry's intention to carry out a foresight exercise. The project was formally inaugurated in July 1996. In the White Paper on Science and Technology, DACST committed itself to using the results of the Foresight exercise as an important input into its investments in research and development within the science budget. The Foresight results will also be used as input for the management of the proposed Innovation Fund and guide research capacity-building programmes in the higher education sector.

### 1.3 South Africa's Approach to Foresighting

The foresight exercise in South Africa, though informed to some extent by the approaches of other countries, had to adopt its own approach to fit the South African context. Some of the unique features of the South African foresight are addressed below:

#### **Consultation:**

Possibly one of the most distinguishing features of South Africa's foresight is the extent of wider community involvement in the process. The Foresight programme has been deliberately designed to involve stakeholders such as industry, government, labour and civil society. This inclusive participatory approach is an attempt to give ownership of the process to all sectors of our population.

#### **Methodology:**

The methodological approach adopted in our foresight uses a combination of techniques. These include a strengths, weaknesses, opportunities and threats (SWOT) analysis, a scenario analysis and surveys of opinions on research and technology trends.

The South African methodology also differs from that of other countries in that, in order to contextualise sector work, macroscenarios for S&T in South Africa have been developed to provide a uniform frame of reference for all sectors. The section on methodology addresses all of the techniques to be used in the South African Foresight exercise in more detail.

#### **Objectives:**

The objectives of the South African Foresight project are —

- to identify those technologies and latent market opportunities that are most likely to generate benefits for South Africa;
- to sharpen the choices made by government and the private sector in allocating funds;
- to ensure that full advantage is taken of existing technologies;
- to build on the strengths and redress the weaknesses identified through the Technology Audit; and

- to encourage greater spending on Research and Development by government and the private sector.

### **1.3.1 Foresight sectors**

In order to fulfill these objectives, the instrument decided upon for Foresight sector selection was a series of countrywide workshops for organisations and institutions that have a stake in research and technology. Care was taken to ensure that participation in each workshop was as diverse as possible, with the workshop delegates drawn from a wide range of stakeholders. Eight such workshops have been conducted. Three workshops were held in Gauteng and one each in KwaZulu-Natal, the Western Cape, the Eastern Cape, the North-West and the Northern Province.

Despite the diversity of participation and regional bias there was a great deal of consensus on research and technology development focal areas for the project. The composite outputs of the workshops were subjected to a preliminary analysis and rebundling by the Project Management Team to yield a list of 16 sectors that were presented to the Advisory Board and circulated to all the workshop participants for comment.

A data sheet for each of the sectors was prepared from available data. This included current and projected employment figures, GDP contributions, export and other significant statistics. In addition, some local and international trends in each sector were traced and current policy initiatives noted. Finally, some key drivers and constraints for sectoral development were identified. These analyses have been presented to the Advisory Board and DACST who, together with the Foresight Management Team, decided on the 12 final sectors to be run in this Foresight exercise.

### **1.3.2 The final 12 Foresight sectors**

- Agriculture and agroprocessing
- Biodiversity
- Business and financial services
- Energy
- Environment
- Health
- Information and communication technologies
- Manufacturing and materials
- Mining and metallurgy
- Crime prevention, criminal justice and defence
- Tourism
- Youth

In addition to the identified sectors, three important cross-cutting issues were also highlighted. These areas have an impact on two or more of the Foresight sectors, and additional attention should also be paid to these cross-cutting issues:

- Education/HRD/skills development
- Beneficiation
- Business development

### **1.3.3 Sector Working Group**

The Sector Working Group (SWG) was the operational arm of the project. The group's task was to analyse the sector and identify issues, and also to do research and find technology solutions to sector challenges. The members of Health Sector Working Group are listed in Appendix C.

#### **1.3.4 Terms of reference**

The Health Sector Working Group agreed that their responsibilities are to —

- agree on proposed sector foci;
- analyse the current status of the sector;
- identify the future challenges and trends that may affect the health sector;
- identify research and technology approaches that address these challenges and trends;
- make recommendations on the identified cross-cutting issues/areas; and
- compile a prioritised list of research and technology topics.

### **1.3.5 Identification of expertise for the Foresight Sector Working Group**

Different methods have been applied by different countries that have embarked on similar exercises. In the United Kingdom a method known as co-nomination was used, while in France the exercise was primarily carried out by appointed panels of experts. Co-nomination is a survey-based technique that allows the major stakeholders and the broad community to participate fully in an open exercise of identifying those individuals who are to participate in SWGs. For the NRTF project, DACST suggested that a combination of methods be used. These were —

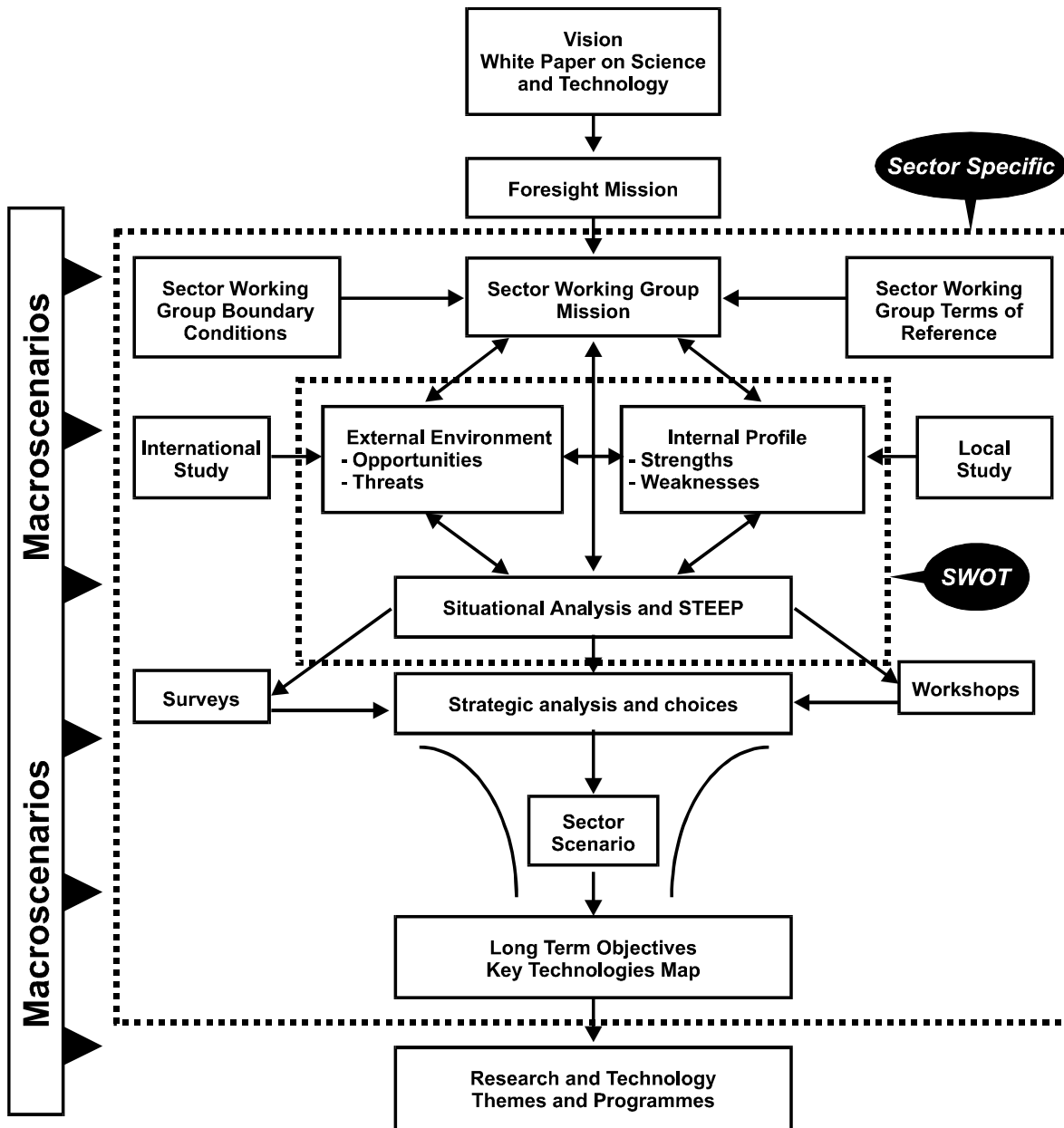
- co-nomination, adapted to the SA situation, to identify members for the SWGs;
- direct appointment by DACST in consultation with the Advisory Board and Project Management Team.

The co-nomination objectives were to —

- identify key individuals who would serve as members of the SWGs in the Foresight project; and

- build a database of experts who would be consulted by SWGs at later stages of the project.

Figure 1 — Detailed Foresight Methodology



Four iterations of the co-nomination survey have been carried out. The response rate was above 30% and 2 573 names were generated. Most of the respondents were from higher education institutions (35,3%) and 88,2% were male. Very few individuals from previously disadvantaged backgrounds and from labour organisations were identified through co-nomination. To make sure that the make-up of Working Groups was representative, other individuals were appointed directly into these groups. For the full list of nominees see Appendix C.

## 1.4 Foresight Methodology

Figure 1 shows a schematic representation of the Foresight methodology.

A brief description of the process follows:

### **Vision:**

The White Paper on Science and Technology envisages a future where all South Africans will enjoy an improved and sustainable quality of life, participate in a competitive economy by means of satisfactory employment and share in a democratic culture.

In order to attain this vision three goals will have to be achieved:

- the establishment of a system of technological and social innovation;
- the development of a culture which values the advancement of knowledge as an important component of national development;
- improved support for innovation, which is fundamental to sustainable economic growth, employment creation, equity through redress and social development.

### **Foresight mission:**

To promote technological innovation and deployment by identifying opportunities for economic and social development through a National Research and Technology Foresight project.

### **Macroscenarios:**

These are scenarios of the S&T system in South Africa over a 20-year period. They provide a futures frame of reference for the sectors. For more detail see Chapter 4.

### **Sector mission, boundary conditions and foci:**

Each sector has developed its own mission and focus areas within the broader S&T environment. The aim of the mission and focus areas is to ensure that the Working Group is unanimous in its purpose and also to ensure integration and linkages with other sectors (see Appendix A for the foci of the Health Sector Working Group).

The following mission was formulated by the Health Sector Working Group for the purpose of the Health Sector Foresight process:

**To prioritise research and technology strategies in the health sector in order to ensure sustainable development in South Africa**

The boundary conditions define sector foci, which were formulated on the basis of inputs from other sector stakeholders. The sector working groups finalised and expanded these foci. The following main foci have been identified:

- Health policy and legislation
- Measurement and health information
- Education and training
- Health promoting activities
- Health technology
- Health services.

**Local and international study:**

The International Study examines current technological, market, policy and strategic trends of the health sector internationally, while the Local Study reviews the current status of the health sector in South Africa with the focus on research and technology.

A summary of the International and Local Studies appears in Chapter 2.

**Identification of SWOT and STEEP factors:**

On the basis of the above information, a SWOT analysis is performed. In addition, major social, technological, economic, ecological and political (STEPP) factors within the sector are identified. These processes provide a picture of the current sector situation and are reflected in Chapter 3.

**Sector-specific scenarios:**

As the benefits from the outputs of the NRTF project will only be realised in the long term (10-20 years), sector-specific scenarios are developed and analysed. These are informed by the macroscenarios for South Africa's S&T. The sector-specific scenarios appear in Chapter 4.

**Survey:**

The opinions of knowledgeable people in the sector on various issues are sought in a questionnaire-based survey. It focuses on perceptions of South Africa's status (current and future), as well as on appropriate strategies that may improve our competitiveness (see Chapter 5 for a more detailed analysis).

**Strategic analysis and choices (recommendations):**

Finally, future research and technology challenges and market opportunities over the next 10-20 years are identified and strategies are developed around them (see Chapter 6).

# Chapter 2:

## International and Local Studies

### 2.1 Introduction

In order for the Sector Working Group to obtain an overview of the current research and technology status in the health sector, studies of international and current trends were done. The International Study examines current technological, market, policy and strategic trends of the health sector internationally, while the Local Study reviews the current status of the health sector in South Africa particularly with regard to research and technology.

### 2.2 International Study: Summary

Worldwide improvements in health care and health status have led to a number of demographic changes, such as increased life expectancy, lower mortality rates, rapid population growth, reduced fertility and population ageing. Notwithstanding — and often because of — these improvements, new health challenges for the future are emerging. For instance:

- over the next few decades more than 80% of the world's population will be living in less developed countries, which are the least equipped to meet the increasing demands for food, clean water, education and other basic necessities;
- population ageing is often accompanied by an increase in non-communicable diseases and mental health problems; and
- rising life expectancy will exert increasing pressure on public pensions and health care systems.

Other global social trends include —

- an increase in the scale and diversity of international migration, often creating severe health and environmental problems);
- urbanisation, which, if it outstrips the capacity of the infrastructure to meet people's needs, may exacerbate the spread of infectious diseases and, because of overcrowding, lead to anxiety, depression and chronic stress (although urbanisation has also meant an improvement in the quality of life and health in many countries); and
- industrialisation, which has profound environmental health implications (for e.g. occupational injuries, pollution and public exposure to hazardous substances).

Globally, governments are no longer defining themselves as sole providers of essential services and social development, but rather as facilitators and regulators.

One of the implications of this is that governments are increasingly faced with tough political struggles to contain the rising cost of health and to distribute scarce resources equitably.

Although agricultural development has permitted world food production to grow faster than population, the rate of growth of food production is slowing, and a number of countries — including 22 in sub-Saharan Africa — are facing critical food security indexes.

Other environmental trends with a health implication include a growing number of people living in water-scarce countries, water degradation, the depletion of fish resources, deforestation, biodiversity loss (over 3 000 antibiotics are derived from micro-organisms), global warming (which will encourage the spread of infections such as bilharzia and malaria) and ozone layer depletion.

Changes in the nature and structure of the global economy are expected to lead, *inter alia*, to the globalisation of problems such as pollution and drugs, loss of job security among low-skilled workers, and even more constraints on resources for health care.

Despite remarkable progress in reducing poverty during the past 50 years, more than half a billion people are still chronically malnourished, more than 1,2 billion people lack access to safe water, and about 800 million lack access to health services. These facts are crucial when it is considered that poverty is a major cause of malnutrition and ill health which, in turn, compromises productivity, economic growth and development which are prerequisites for good health. Therefore, public investment in health is an economically efficient and politically acceptable strategy for reducing poverty and alleviating its consequences.

Although there is a link between per capita health expenditure and the burden of disease, health spending alone cannot fully explain the variation in health among regions and countries. For instance, South Africa has a poorer health status than other developing countries where health spending is often a smaller percentage of the gross domestic product (GDP).

A meaningful improvement in the state of health of South Africans would be a function of two broad thrusts, viz. socio-economic development and a more efficient utilisation of health resources. Moreover, one of the health-care goals for the country over the next few years should be to design holistic governmental structures that recognise the fact that health is not the sole responsibility of the Department of Health. The country also needs to refocus on 'prevention' rather than 'cure' (while bearing in mind that, over time, advances in the health status of the population will create a growing demand for more sophisticated curative care).

International health foresight/futures studies indicate, *inter alia*, that patients will become more proactive and their health care will be more customised. Also, the medical paradigm will broaden from an almost exclusively biomedical approach to a bio-psycho-socio-economic approach.

Technology through innovation is the key to the economic development of a nation and the improvement of the quality of life of its citizens, and successful nations are those that have a culture of and infrastructure for innovation. The current dominant technologies, which are the major drivers of global change at present and will continue to be so for the next two or three decades, are information technologies, materials technologies, genetics and biotechnologies and energy technologies, with environmentalism as an enabling or driving issue.

Despite rapid advances in health-care technology, relatively little effort has been made to develop improved technologies to solve some of the most frequent occurring health problems such as headaches, mental disturbances, or problems facing the handicapped and elderly.

The challenges ahead for medical/health research and development are:

- the 'unfinished agenda' of childhood infectious diseases and poor maternal and perinatal health;
- re-emerging infectious diseases as a threat to human health;
- an epidemic of non-communicable diseases and injuries in low and middle-income countries; and
- inefficiency in health service delivery.

No government in the world apportions more than 5,0 per cent of its health spending to research; for most the share is below 2,0 per cent (South Africa's is 1,7 per cent). The amount spent globally on R&D in three conditions (pneumonia, diarrhoeal disease and TB, which make up almost one-fifth of the global disease burden) represents only 0,2 per cent of the total health R&D expenditure.

Specific technologies for health-care delivery, whether through treatment, care and prevention, or improvements in methodology, cost-effectiveness or availability, revolve around the dominant technologies listed earlier. Particular applications identified include the following:

- Telemedicine (although the development of policies on health informatics and telematics has been slow).
- Medical databases.
- Expert systems (of particular value in the field of managed health care and preventative health care).
- Diagnostic procedures (e.g. recombinant DNA techniques for parental screening).

- Therapeutic procedures (e.g. microsurgery and implanted muscle stimulators).
- Nanotechnology (e.g. devices which interact with tissues within the body to boost the immune system).
- Biotechnology which, as an expanding series of enabling technologies, has the potential to raise quality of life, increase productivity and stimulate demand for highly skilled labour.

Promising developments over the next few years are expected to include the following:

- Vaccines against infectious diseases
- The ability to predict, delay, prevent and even cure cancer, heart disease, and certain neurological diseases.
- Genetic engineering (e.g. the human genome project)
- Continuing developments in biomaterials for prostheses and advances in robotics.

Advances in evidence-based medicine (which involves finding, critically appraising and using current best medicine in making health-care decisions).

A key issue regarding health technology revolves around its appropriateness. A technology is deemed to be appropriate when it is scientifically sound, acceptable to those who apply it and to those for whom it is used, simple, easy to maintain and affordable over its life cycle. For a country like South Africa where health resources are limited, it would seem that the construction of a list of essential technologies for basic health-care delivery is imperative.

In South Africa the control of medical devices has now been improved through a new comprehensive set of regulations currently being considered by the Department of Health. South Africa faces an increased demand for primary health care level drugs and the government intends to streamline the delivery of health-care services to provide cost-effective care for a broader spectrum of the population. In the light of these changes, pharmaceutical companies in South Africa will need to prepare for the resultant emphasis on, and growth in, generic products.

## 2.3 Local Study: Summary

### 2.3.1 National Trends

#### *Social and Health Trends*

The first census to cover the reintegrated South Africa was conducted on 10 October 1996. Preliminary estimates suggested that there were 37,9 million people living in South Africa in 1996, almost double the population of 1970. Over the last decade, South Africa has experienced considerable population growth. The average growth rate during the early 1990s has been estimated to be 2,06% per annum, slower than the

rate for earlier periods. Despite the expected decline in fertility rates, the population growth rate is unlikely to decline to less than about 1,9% per annum in the next few decades. This is because of the young age structure of the population. A Draft White Paper for Population Policy was released in September 1996 with social justice, the eradication of poverty, sustainable development and reducing unsustainable consumption as the key elements. Improved reproductive health and the empowerment of women were identified as important determinants of sustainable population growth.

### ***Demographic Characteristics***

There are slightly more women (50,5%) than men (49,5%) in South Africa. Seventy six per cent of the population are black, 13% are white, 8,5% are coloured and 2,5% are Asian.

Age distribution shows a young population, with nearly half (45%) of the population younger than 20 years of age. This, however, differs substantially for different groups in South Africa. There is a preponderance of women and children in the rural areas.

The fertility levels in South Africa have been declining. Estimates of the total fertility rate (TFR) range from 3,9 to 4,09. There is a relatively high incidence of high-risk fertility in South Africa. In 1993, 15% of the births were to teenagers and 16% to women over 35 years of age.

### ***Ageing***

South Africa is experiencing demographic transition and over the next 20 years, the proportion of elderly in the population is expected to increase. The population aged 60 years and over comprised 6,1% in 1995 and will comprise 9,2% by the year 2020.

## **2.3.2 Infrastructure**

The October Household Survey conducted in 1995 indicated that there are still many households that do not have basic facilities. The availability of these facilities correlates to the implementation of apartheid policies and it is clear that rural blacks are worst off.

Data reviewed by Lerer and Delport (published in the South African Health Review) gives more insight into the services available in urban areas. They estimate that of the urban population, 15% had minimal access to water (boreholes, vendors or taps shared by more than 25 households) and 27% had minimal access to sanitation (bucket latrines or unimproved pits). The government's R1,3 billion Municipal Infrastructure Programme 17 aims to benefit over 12 million people with the basic infrastructure for water, sanitation, roads, refuse collection and community health care.

## **2.3.3 Health Status**

Statistics reflecting health status are not readily available. For example, reliable mortality statistics, the cornerstone of health status data, are not available. The most recently published data refers to 1994 and it was estimated that only 18% of the births and 56% of the deaths were registered in that year.

The Departments of Health and Home Affairs, together with Statistics South Africa, are currently reforming the system of registration. However, this is proving to be a lengthy process. In addition, the Department of Health has planned a national Demographic and Health Survey, which will provide information on child and adult mortality rates in South Africa. Coordinated by the Medical Research Council, fieldwork for this survey began during early 1998.

### ***Mortality***

Mortality rates in South Africa have been decreasing for both children and adults, resulting in increased life expectancy. These trends, however, are likely to be increasingly challenged by HIV/AIDS and increased smoking levels among the population.

### ***Child Mortality***

Deaths amongst one- to four-year-old black children are predominantly caused by infectious diseases. Many of these deaths would be prevented by improved environmental conditions and access to primary health care. Injuries cause a large proportion of the deaths of white children. Many of these could also be prevented through an active injury control programme.

### ***Adult mortality***

Although levels of adult mortality have been declining, they are still high. The probability of a 15-year-old dying before the age of 60 (45Q15 index), is a valuable indicator of premature adult mortality. Adult mortality in South African males is as high as that in the rest of sub-Saharan Africa. Even though the rates for white South Africans are lower than those of other race groups, these too are much higher than those of other industrialised countries.

### ***Cause of death***

The causes-of-death profile was estimated for 1990. A high proportion of deaths are classified as 'ill-defined' as the exact cause is unknown. It is assumed that in these cases, the person who died was not seen by a doctor at the time of death, possibly reflecting poor access to health care. The top ten causes of death are: stroke, senility, perinatal conditions, ischaemic heart disease, upper respiratory tract infections, tuberculosis, diarrhoea, unintentional injury, injury (cause unknown) and diabetes.

The overall pattern of the deaths reflects the triple burden experienced in South Africa — the combination of poverty-related diseases, chronic diseases and a high toll due to intentional and unintentional injuries

Mortality data only partly measures the burden of disease in a country. It is important to remember that non-fatal conditions such as poor mental and oral health, blindness and arthritis are all conditions that contribute to the burden of disease. A full analysis of the burden of disease in South Africa must give due weight to such non-fatal conditions.

#### **2.3.4 The Unfinished Agenda: Malnutrition, Infectious Diseases, Maternal and Perinatal Mortality**

Many infectious diseases are preventable and access to primary health care during pregnancy and childbirth is known to reduce maternal and perinatal morbidity and mortality. In many respects, these conditions can be considered the unfinished agenda which could have been virtually eliminated with the appropriate provision of services.

##### ***Malnutrition***

Iodine deficiency was identified as a problem in the Vitamin A survey, with 1% of children found to have visible goitre. A survey in four communities in the Langkloof area of the Western Cape found prevalences of endemic goitre ranging from 14% to 30%. These were found to be related to mild to severe iodine deficiency levels. Similar findings in school-aged children in the rural Ndunakazi area of KwaZulu-Natal province suggest that the problem may be quite widespread. Compulsory iodation of table salt was introduced in 1995.

##### ***Tuberculosis***

As in other countries, tuberculosis (TB) is being affected by HIV. It has been estimated that there were 160 000 TB cases in 1996, of which 42 000 cases could be attributed to HIV. The prevalence of HIV in adult TB patients in the Hlabisa health district of KwaZulu-Natal rose from 36% in 1993 to 58% in 1995. The disease caseload in the service has tripled and the clinical features of the disease are changing. Furthermore, HIV-infected patients were three times more likely to fail to complete their treatment.

##### ***Malaria***

The entire southern African region has experienced one of the most severe malaria epidemics recorded in recent times. South Africa experienced 20 960 cases and 108 deaths due to malaria from January to May 1996. Increases have been attributed to high rainfall during the previous summer, the resistance of mosquitoes to insecticides and the resistance of the parasite to chemotherapy.

##### ***Parasitic Infections***

Bilharzia remains a neglected public health problem. Bilharzia has been found to be endemic in parts of the Transkei region. In a survey of schoolchildren undertaken in the Port St Johns district, a prevalence of 42% was found. Untreated intestinal parasitic

infections are also a public health problem. A study in Durban found that a parasite, cryptosporidium, was the second most common enteric pathogen related to gastroenteritis admissions to hospital. The three main worms found in South African children are roundworm, whipworm and hookworm. Research in three communities in different settings found whipworm in 25% of children in a rural area, 71% in a serviced urban area and 85% in a partially-serviced metropolitan area.

#### ***HIV/AIDS and sexually transmitted diseases***

The HIV/AIDS epidemic has been on the horizon since the late 1980s. At the end of 1996, there were an estimated 2,4 million adults infected with HIV. Antenatal surveillance has revealed an increased prevalence from 10,4% in 1995 to 14,1% in 1996, to 16,1% in 1998. HIV/AIDS is now the biggest single disease influencing the health of the nation.

#### ***Chronic diseases of lifestyle***

Chronic diseases related to lifestyle are becoming increasingly important as the health transition proceeds. According to the 1995 Survey of Inequalities in Health, 70% of people over the age of 65 reported that they had a chronic disease.

### **2.3.5 Economic and market trends**

#### ***Health-care expenditure***

South Africa is classified by the World Bank as a middle-income country, and 8,5% of GDP is spent on health care, of which as much as 60% is spent in the private sector.

The health-care expenditure may be even more than 8,5% of GDP because public sector expenditure excludes indirect cost, such as maintenance of buildings and equipment. Nor does the figure reflect expenditure on health at local authority level, e.g. immunisation clinics, and expenditure on hygiene and environmental health. Some statisticians predict that health-care expenditure will be 9,2% of GDP by 2000.

#### ***The medical aid schemes industry***

The medical aid schemes industry has shown healthy growth for most of past 10 years. Currently, 7,5 million lives are covered by some form of medical insurance, with around R20 billion spent by medical aid schemes in 1997.

#### ***The cost of health care***

The price of medical and pharmaceutical goods has outstripped the overall consumer price index inflation rate by 1,4% per annum during a fifteen-year period ending in 1996. The price increases for medical services consumed by the household sector escalated by an average of 2,2% per annum faster than the CPI inflation rate over the same period. In 1960 spending on medical goods and services was just over 3% of household spending. In 1995 it was 6%.

### ***The pharmaceutical industry***

South Africa is a key player in the pharmaceutical industry in Africa. The country has a relatively well-developed pharmaceutical industry, comprising a complex network of pharmaceutical manufacturers, distributors and dispensers. The 1995 value of sales in the medical and pharmaceutical sector amounted to R3 200 million, which constituted some 0,3% of the total sales in South Africa for the same year. The total GDP at factor cost for the sector amounted to some R945 million in 1995, which contributed some 2,2% to the total economy. Econometric forecasts expected the sector's GDP to grow by 3% to R975 million in 1998.

The end markets of the pharmaceutical industry can be categorised as belonging either to the private sector or the public sector. The public sector serves approximately 80% of the population, but contributes only around 15% in monetary terms. The private sector makes up 85% of rand value sales, and 20% on a volume basis. The market is largely determined by the prescribing doctor, although pharmacists are allowed to dispense more highly scheduled drugs than previously. Patients are becoming more cost conscious and are beginning to request generic alternatives to ethical drugs.

### ***Manufacturing***

Although pharmaceuticals manufacturing in South Africa is somewhat fragmented and there is only limited local production of generic active ingredients, formulations and last-step synthesis are common among the local subsidiaries of multinational drug companies.

An exceptionally strong export performance was recorded during the period 1991 to 1996. Export growth averaged close to 10% per annum and the sector's export propensity rose to some 15%. Medicaments represent approximately 75% of the export basket and Zimbabwe is the principal country of destination.

### ***Medical devices***

Instruments and appliances used in medical sciences makes up 13.2% of all imports within this sector. The sector as a whole is responsible for 4,61% of all imports into the country. Products are mostly imported from the USA, the United Kingdom and Germany.

There is some local manufacturing, but this only represented 36% of all sales (domestic and export) in 1996, while the import goods penetration was almost 80% within the local market. Production is therefore focused on exports, which represented 56% of total sales in 1996. The export potential of the sector is hampered by the high import content of inputs in the instrument and control apparatus industry which has detrimental effects because of the depreciating rand and the relatively high levels of import protection on many of these items. Despite these negative factors and because of the specialised focus of the sector, exports grew significantly by 7.6% p.a. between

1991 and 1996. These exports were mainly to the USA, Germany, the United Kingdom, Zimbabwe and the Netherlands.

### **2.3.6 Relevant white papers, bills and acts**

#### ***White Paper for the Transformation of the Health System in South Africa***

The object of the White Paper is to present a set of policy objectives and principles upon which the Unified National Health System of South Africa will be based. In addition to these objectives, this document presents various implementation strategies designed to meet the basic needs of all South Africans, given the limited resources available.

Areas that are highlighted are:

- The role and functions of national, provincial and local government
- The National Drug Policy
- Essential National Health Research
- Health information
- Various specific programmes, e.g. Communicable Diseases, Maternal and Child Health, etc.

#### ***Medicines and Related Substances Control Amendment Act, No. 90 of 1997***

The Medicines and Related Substances Control Amendment Bill was tabled in Parliament in May 1997, but was later withdrawn by the Minister of Health. This Amendment Bill was drafted in order to bring the Medicines and Related Substances Control Act of 1965 in line with the National Drug Policy (NDP) of the Department of Health. The NDP is an integral part of the government's policy for the transformation of the National Health Service, which is outlined in the White Paper published in April 1997.

### **2.3.7 Strategic plans of important stakeholders**

#### ***National Health Information System of South Africa***

The development of a national policy for NHISSA started in April 1995. The overall aim of NHISSA is the collection of timely, accurate and complete data on a wide range of aspects of the health-care system, which will be used to improve health-care delivery in South Africa. To this end, the conceptual view of NHISSA is that of '*...an overall parent national health information system, comprising various component systems, individually and collectively providing the various types and formats of information (managerial, statistical, epidemiological, etc.) on and for the Health Care Services of South Africa.*'

#### ***Essential National Health Research (ENHR)***

ENHR is an integrated strategy developed in order to facilitate advancement toward attaining the goal of equity in health research, and to operationalise the concepts of equity and social justice, by advocating a national consultative process for priority setting and identifying people and organisations to implement decisions reached by consensus.

The task of ENHR is to manage health research on a national basis and to use that research effectively in order to promote health rationally and equitably. In order to achieve these goals, it is necessary to obtain the knowledge found within a wide variety of disciplines, including social as well as natural and medical sciences.

In April 1994, the MRC and the alliance of progressive health NGOs, in line with the ANC endorsement, also endorsed the ENHR. During December 1994, the new Department of Health took the initiative by organising a national meeting of stakeholders in research to plan the implementation of ENHR.

In March 1995, the Minister of Health appointed a National Technical Committee to further develop recommendations for the implementation of Essential National Health Research.

### ***Recommendations of the ENHR Task Team***

#### *Promotion and advocacy of ENHR*

The task group recommends that a task force be formed to facilitate the initiation and establishment of the ENHR process.

#### *Priority setting for health research*

The national priority-setting process needs to include the participation of civil society with a special focus on coordinating the multidisciplinary, intersectoral district and provincial priority-setting processes at various levels. Moreover, the principles of the priority-setting process should be goal/solution oriented and guided by the analysis of health status, burden of disease and developmental needs. Workshop participants recommended that priority setting be coordinated by a national body with task teams for specific health and developmental issues.

#### *Funding for health research*

The funding of health research should occur within the framework of the ENHR and should be incentive-driven, with special cognisance given to the capacities of different institutions and organisations. Research funding should be coordinated and negotiated by the Department of Health (DOH) between itself, DACST and the national Department of Education (DoE).

### ***National Drug Policy (NDP), January 1996***

The Minister of Health appointed a Drug Policy Committee in 1994. The committee compiled and presented a report and during 1995 a series of consultative workshops followed, which culminated in the formulation of the NDP.

According to the policy document, the purpose of the NDP is to offer 'a clear description of the approach by which pharmaceutical services in the country will be managed'. It also offers 'guidance to stakeholders, including health care providers, suppliers of goods and services, and governmental and non-governmental agencies of ways in which they can contribute to achieving the policy's main aim'.

The NDP also 'follows a clear and logical system for reducing inefficiency and waste and improving efficiency and effectiveness through the development of an adequate pharmaceutical infrastructure'. It further claims to facilitate the 'design, production and implementation of appropriate programmes for human resource development in health care'.

Issues that are addressed in the NDP are:

- Legislation and regulations
- Drug pricing
- Drug selection
- Procurement and distribution, including local manufacturing
- Rational use of drugs
- Human resource development
- Research and development
- Technical cooperation with other countries and international agencies
- Traditional medicine
- Monitoring and evaluation.

***South African Medical Research Council: SETI Review: 19-28 November 1997***

Under the guidance of DACST, the current functions and structure of the South African Medical Research Council (MRC) was reviewed by a panel of experts.

The following recommendations are of importance to the Foresight process:

**ENHR systems:** the role of the MRC: Given its new mission, the MRC should become the lead agency to facilitate and manage an ENHR system in the country, and it should restructure its resources to increase alignment with ENHR priorities.

**Core competencies:** Given its new mission, and a clear role within the ENHR framework, the MRC should perform the following core functions: facilitation of national research, capacity development, research performance and technology transfer.

**Intellectual property/technology transfer:** In order to increase the exploitation of inventions and technologies, the MRC should strengthen this office. The process of technology transfer must be transparent to all participants.

**Centralised facilities/resources established by the MRC:** The MRC should advertise its specialised research-support services and facilities more widely and assist distant research units to use these facilities in support of their programmes.

**Comprehensive National Research Policy:** The MRC and the Department of Health should accelerate the development of a comprehensive national research policy for South Africa. Special attention should be paid to issues such as ethics in research, surveillance and monitoring of health indicators, the balance of research funding between internal and external sources, and the rational allocation of the Science Vote between competing Science, Engineering and Technology Institutes (SETIs).

**Ethics:** The MRC should strengthen its role in ensuring a high level of ethical standards in health research by contributing to policy development (as discussed above), distributing its publications, helping institutions to create and strengthen institutional review boards, and providing training opportunities.

**Health Information System:** The MRC should initiate dialogue concerning an optimal national health information system for the country, involving all relevant stakeholders. This should be done in collaboration with the Department of Health.

# Chapter 3: Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis

## 3.1 SWOT Definition

A situational analysis of the internal and external environment of the South African Health Sector was done on the basis of the information contained in the International and Local Studies, as well as the knowledge of the members of the Health Sector Working Group. The current Strengths, Weaknesses, Opportunities and Threats were identified.

The SWOT analysis technique was utilised to —

- match the environmental threats and opportunities with the weaknesses and especially strengths within the Health Sector;
- identify relationships between these factors and base strategies on them;
- use this rational systematic approach to anticipate, respond to and even alter the future environment.

Opportunities and threats originate in the external environment and are the issues that make the external environment attractive or unattractive. They influence the way people react to the external environment. Strengths and weaknesses originate within an organisation or structure, and take into account resources, advantages and deficiencies, as well as relative standing with regard to 'competitors'.

## 3.2 SWOT Results

The following is a short summary of the results of the SWOT analysis that was done by the Health Sector Working Group.

### 3.2.1 Opportunities

#### 1. Information and communication

The explosion of information and communication technology provides the capacity to provide health services to remote and underserved areas. Telemedicine can be delivered through the use of satellites, cellphones, telephones, TV and computerised medical systems.

#### 2. Commercialisation of new technology

The export of technologies and safe medical transportation assist in the development of new health service delivery systems. More local technologies are developed.

### **3. Technology development**

International technological advances and the development of new technologies in industrialised countries lead to new vaccines and therapeutics and diagnostics. Biotechnology is used in preventative, rehabilitative, environmental, diagnostic and therapeutic medicines. South Africa is also in a position to access techniques and technologies for other countries.

### **4. SA as a regional health resource**

Regionalisation and outreach into Southern Africa within the health sector are becoming increasingly required and South Africa has to provide more private health care for non-nationals.

### **5. International collaboration**

As a result of the changes within South Africa, collaboration with UNDP, UNICEF, USAID, etc. is easier, and exchange programmes are more readily available. Information and resource exchange and the internationalisation of knowledge, including the accessibility of health research experience, can help South Africa, while access to global funding for research and development through international research funding leads to more opportunities.

### **6. Development-related economic growth**

The political and social stability of South Africa, with clear development-oriented policies, enhance human development and empowerment, especially of women, within the science and technology field.

### **7. National disease burden**

The national burden of disease opens up opportunities for further research. Some of these disease patterns are fairly unique to the region.

## **3.2.2 Threats**

### **1. Economic threats**

The overall state of the South African and international economies had led to a situation where the GDP growth is less than the growth of the South African population. There is also a decrease in local job opportunities and job creation, with unemployment and poverty on the increase, while the restricted health budget has to service an increased number of people.

### **2. Rising costs of health care**

As a result of medical inflation, expensive technologies and the high commodification of health, the cost of health care has soared, while expectations also increased.

**3. Lack of human resources**

The erosion of academic medicine leads to a brain drain of health workers and researchers to the private sector and the world market. This severely threatens the future of academic medicine in South Africa.

**4. New, emerging and re-emerging diseases**

These diseases load the already over-burdened health-care system, and the impact of diseases like HIV/AIDS is on the increase.

**5. Social, political, economic and health dislocation in Africa**

A regional and national culture of violence is emerging, with more people exposed to trauma that goes untreated.

**6. Global environmental pollution**

The impact of the global environmental pollution has not been exposed and experienced in all its severity.

**7. Globalisation**

Economic, fiscal and ethical imperialism is rife, with an increased feeling that the USA rules.

**3.2.3 Strengths**

**1. Broad experience of diseases and Africa-specific health care**

South Africa has skilled and knowledgeable health workers who are educated to international standards at our own academic health centres. A strong ethos and commitment to public health and research and development for the people also prevail, along with a commitment to human rights and the development of underdeveloped groups. Exposure to international contracts, collaboration, links and the use of emigrants and exiles with skills leads to the improvement of health care. The interest in and commitment to training and affirmative action are enhanced by skilled, innovative, organised and committed health personnel. The private health-care sector in South Africa also has excellent skills and capacity.

**2. Medical research capabilities**

Currently, there is a strong health research capability and there are centres of excellence at institutions like the MRC, SAMHS, medical schools and pharmacy academic departments. This capacity is strengthened by local financial investment in research and development, both from the private and the public sectors.

### 3. **Health policy**

The sound and enabling health policy leads to greater emphasis on women and children, primary health care and disease prevention.

### 4. **Good infrastructure with growth potential**

South Africa has a good road, electricity and communication infrastructure. The health infrastructure of hospitals, pharmaceuticals, medical schools, SAMHS and mines' health services results in a strong health-service capability and capacity.

### 5. **Strongest economy in Africa**

South Africa has a relatively good overall health budget and expenditure.

### 6. **Community participation**

The strong culture and commitment to community participation can be utilised for the enhancement of the health services

## 3.2.4 **Weaknesses**

### 1. **Corruption**

A culture of wastage, theft and fraud is underpinned by a lack of ethics and discipline, with a tendency to over-servicing in the private sector.

### 2. **Poor utilisation and wastage of resources and capabilities**

The management and administration in the public health sector is inadequate with regard to systems, information, skills, standards, facility maintenance and availability. The public health sector also suffers from inadequate resources and weak provincial capacity, resulting in poor implementation, control and monitoring of national health policy and other policies.

### 3. **Burden of inadequate health-care system**

Maldistribution of health resources and skills causes inequities in all sectors, and remnants of apartheid, uneven development and gaps in the training of some health-care professionals result in the majority of people in South Africa not having access to appropriate and good-quality health services. The low morale of health workers, which is due to bad working conditions, lack of support, work overload and lack of caring for caregivers, leads to a lack of patient-oriented attitudes and service.

### 4. **Lack of R&D resources**

The appropriateness and funding mechanisms of research and development is questionable. The private health sector lacks research and development, while the public sector research and development is burdened by uneven allocations.

### 5. **Lack of coordination between public and private sector**

One of the main problems is the abuse of affirmative policy with regard to procurement in the tender system.

**6. Services and financial cut-backs.**

The extension of services to private health care has resulted in the cut back to hospital care.

# Chapter 4:

## Sector-specific Scenarios

### 4.1 Macroscenarios

The Foresight Macroscenarios were developed to assist in identifying research topics, technologies and market opportunities that are likely to generate maximum benefits for South Africa in the next ten to twenty years. These macroscenarios were useful in identifying the key concerns of opinion-makers and improving the quality of strategic debate by creating a common concept of the future.

Scenarios are stories about possible futures, that is, what could happen, and not what *will* or *should* happen. They are internally-consistent hypotheses about the future and are not predictions or forecasts. Scenarios are useful if they are relevant, novel, plausible and clear.

The following macroscenarios were used as points of reference to develop the more focused Health Sector scenarios:

#### **'GLOBAL HOME'**

In line with global trends and opportunities, government embraces global liberalisation, and facilitates private-sector empowerment to respond to global market forces, leading to a 'hands-off' role for government, with initially good economic growth. This is fine for those who are able to pay, but internally, this results in limited social development and a loss of national identity and self-determination.

#### **'FROZEN REVOLUTION'**

The non-implementation of government policy intended for socio-economic upliftment leaves the masses dissatisfied and key players fragmented and individually focused.

#### **'OUR WAY IS THE WAY'**

South Africa believes in its ability to challenge the conventional route to globalisation by rallying developing countries' support for the development of a significant South-South economic bloc. This catalyses isolation by the developed world.

#### **'INNOVATION HUB'**

South Africa's comparatively developed infrastructure creates opportunities for strategic regional investment. Building on the S&T skills base and knowledge generates comparative advantage and a competitive edge regionally and globally. The regional identity is strengthened, although some national identity is lost. Initial economic growth

will be slow. The incremental social development leads towards a shared regional vision.

## 4.2 Sector Key Uncertainties

Scenarios are based on current key uncertainty areas. The Sector Working Group was asked to list its key concerns within the health sector. These key concerns were then grouped and the following final list was generated:

1. What will the budget for health care be?
2. The type of health-care delivery (including private/public cooperation).
3. The level of crime and corruption within the public and private health-care industry.
4. The process of policy formulation that will be followed.
5. The capacity within the country to implement policy and priorities.
6. Changes in the burden of disease.
7. The level of research.
8. The change in social values.
9. The impact of demographic change.
10. Damage to the academic health sector and health services.
11. Development of health information delivery systems.
12. The extent of rational health care.
13. The impact of new technologies.

These key concerns were then used to develop health-sector-specific scenarios within the context of the macrosenarios. The following is a summary of these *health sector-specific scenarios* (see Appendix C for the full content):

### **GLOBAL HOME**

In this scenario there is increased economic growth, but government spending on health care decreases, with an increased reliance on the private health-care system. Foreign technology is imported and health-care options are increased, with a private academic health sector developing. There is no real change in the crime situation, with decreased accountability in the private health-care sector and a reduction in the ethos of caring.

International policies are adopted, but they are not always relevant. As a result, the local priorities diminish and diseases of poverty increase, but the ability to respond to international epidemics increases.

### **FROZEN REVOLUTION**

As a result of the decrease in economic growth, less money is spend in the health sector. This leads to a decline in services and academic medicine. Exclusive private health-care services cause antagonism between public and private health-care

systems. Services are available for those who can pay and health-care technology has to be imported as entire kits, without any adaptation to South African conditions.

Health-care policies are developed but there is limited implementation, with the result that diseases of lifestyle and poverty increase dramatically. As a result of the decline in academic medicine and health spending, South Africa experiences an outward brain drain.

#### **OUR WAY IS THE WAY**

As a result of the isolation, slow economic growth leads to limited funds being available for public and private health care and more collaboration between the public and private health sectors. Local technology is developed, with more emphasis on indigenous knowledge.

National and selective regional policies are developed and implemented. The ethos of caring increases, with a greater commitment to accountability.

#### **INNOVATION HUB**

Increased economic growth leads to greater spending in the public health sector, as well as an increase in the private health-care sector, which have an increased focus on external markets. The development of local technology is encouraged, with more exports to the SADC region.

Regional health policies are developed with selective integration of global health policies, with the result that there is a decrease in diseases of poverty. However, diseases of lifestyle do increase. Centres of excellence in research remain, and in general there is more emphasis on local conditions, and knowledge is developed.

### **4.3 SWOT from Scenario Process**

Based on these four scenarios, the Health Sector Working Group was requested to go through a process in which they assumed that the scenarios were occurring and the sector was as it is now. They then had to answer: What would be its important strengths, weaknesses, opportunities and threats? This information would then be used when robust research and technology topics are identified. The following is a short summary of the SWOT for the four different scenarios:

#### **Global Home**

##### ***Strengths:***

Basic good infrastructure makes more training and better experience possible in specific aspects of health care. Progressing health policies also lead to access to better health-research capabilities and external financing.

##### ***Weaknesses:***

Corruption and crime continue. The balance of technologies used is inappropriate and 'junk science' prevails. Falling morale/motivation leads to lower social values and malaise, with South Africa suffering from 'moral yuppie flu'. A lack of managerial and administrative capabilities and competencies leads to closed alignment between the public/private sectors.

***Opportunities:***

Technology development leads to better information/communication technologies and the commercialisation of technology. International collaboration is more prominent and the private health-care sector flourishes.

***Threats:***

Health services, research etc. for the poor and the majority of South Africans are very limited and social values/caring/cohesion are lessened. The brain drain leads to marginalisation of the economy, culture and sovereignty.

**Frozen Revolution**

***Strengths:***

There is some optimism about the future and good policies are maintained. The infrastructure in the health sector is fairly good. The democratic system is in place and cultural diversity is maintained.

***Weaknesses:***

The good policies suffer from a lack of implementation and a lack of adaptation as a result of a lack of a specific focus and the inability to prioritise adequately. Vested interests lead to an increase in corruption with the eventual collapse of health sector.

***Opportunities:***

The chaos in government creates an opportunity for NGOs and private health care to flourish. Short-term international investments are available. There is international recognition of policy development, meaning adapted short-term solutions. International networking based on world knowledge systems is available.

***Threats:***

South Africa is exposed to international exploitation because of the lack of decision making, e.g. clinical trials, and is vulnerable in the international finance market. The threat of a renewed revolution looms over South Africa. There is a lack of support and development of indigenous knowledge systems.

**Our Way Is The Way**

***Strengths:***

Social cohesion, national identity (the rainbow nation), community participation and equity prevail. There is a culture of local research and technology. There is development of indigenous and local capacity that is relevant to the health needs of

Southern Africa and developing countries. A high standard of academic training is maintained. There is a decrease in the cost of health care as a result of the control of new expensive technology. Coherent priorities in research, health services, etc. also lead to greater opportunities for rationalisation and transformation, and therefore stronger public health services.

***Weaknesses:***

Introversion caused by being locked into outdated or obsolete policies, programmes and services. The brain drain leads to a decline in standards and the deterioration of centres of excellence. The lack of 'blue skies' research leads to a decrease in innovation and a loss of the competitive edge in most areas. There are insufficient funds to maintain services, education and training, but at the same time there is an inordinate dependence on government delivery and the cost of development is high.

***Opportunities:***

South Africa has a common capacity to negotiate and cooperate with the developing world. There is an ability to pick and choose from the best technologies of the world. Cooperation with developing countries and alliance partners provides added value.

***Threats:***

Isolation leads to decreased availability of appropriate technology education and training, drugs, etc., and this has an impact on the competitive edge. International health-care companies withdraw and financial and trade sanctions are encouraged, especially if we break intellectual property rights (WTO). There might be a failure of regional collaboration owing to cross-border problems.

**Innovation Hub**

***Strengths:***

Economic growth and stability lead to a reduction in petty crime. There is universal access to public health services. Increased nationally and regionally relevant research leads to the sharing of knowledge and regional capacity building.

***Weaknesses:***

The entrenchment the two-tier health system and higher cost of private health care. The development of the country and its people is initially slow and bogged down in complacency.

***Opportunities:***

National and regional policies are developed; they make provision for sharing and exchange of human resources and skills. The development of health-service contracts (including research and technology) leads to increasing diversity of research and development. South Africa becomes a regional leader. There is a decrease in the

health-care cost burden as a result of the utilisation and development of local resources.

***Threats:***

With regard to regional policies, regional cooperation could be questionable. The model will be threatened by regional instability (politically and economically). There is a change in the disease pattern, with more diseases of lifestyle. Xenophobia might be a problem and there could be an increase in white-collar crime.

# Chapter 5: Survey Analysis

## 5.1 Introduction

This report covers a survey undertaken for the South African Department of Arts, Culture, Science and Technology to identify the long-term research and technology needs of the health sector in South Africa. The survey elicited the views of pre-selected participants regarding the importance, timing, opportunities and constraints of specific energy-related and some crosscutting topics.

Two response options were available to the respondents. They could either complete a paper-based postal questionnaire and return it to DACST by a specific date, or make use of an Internet-based survey instrument to enter their responses directly into a computerised database on the DACST home page. Only 7% of the respondents made use of the computerised questionnaire, the rest preferring the paper-based questionnaire.

The interpretations presented here are based exclusively on the empirical evidence at hand. For practical and strategic reasons the wider context and implications are not discussed. The contextualisation of the findings and a guideline for their prioritisation and implementation are the responsibilities of others.

## 5.2 Profile of the Respondents<sup>1</sup>

The age-gender profiles of the respondents are given in Table 5.1.

**Table 5.1: Age-gender profile of the respondents**

Age group (years)	Males		Females		Total	
	Number	%	Number	%	Number	%
Younger than 20	0	0	0	0	0	0
20–30	1	1	3	5	4	2
31–40	17	14	8	15	25	15
41–50	48	40	23	43	71	41
51–60	37	31	13	24	50	29
60 +	16	14	7	13	23	13
TOTAL	119	100	54	100	173	100

There is no evidence of over-representation in terms of gender or age among the respondents. The findings can therefore be accepted as unbiased.

In Table 5.2 the organisational affiliations of the respondents are given. The majority (51%) were affiliated to higher educational institutions at the time of the survey, with

government officials (18%) and representatives of research councils/institutions (11%) forming the bulk of the remaining respondents.

**Table 5.2: Organisational affiliation of the respondents**

Affiliation	Number	%
Government	30	18
Higher education institutions	85	51
Industry—large company	12	7
Industry—parastatal	2	1
Industry—small, medium or micro enterprise (SMME)	1	1
Labour	2	1
Non-governmental organisation (NGO)	7	4
Research Councils/ Institutions	19	11
Other	10	6
TOTAL	168	100

### 5.3 Structure of the Questionnaire

The questionnaire dealt with the subsections indicated in Table 6.3, and reflected the indicated range of the 'state of development' in respect of every individual topic. The 'state of development' was reflected in each topic by means of reference to (a) some form of elucidation (in order to scientifically and theoretically identify principles or phenomena), (b) development (in order to attain a specific technological goal or complete a prototype), (c) practical use (the first practical use of an innovative product or service) or (d) widespread use or 'significant use' (significant market penetration to a level where a product or service was in common use), or an equivalent wording that implied any of these aspects. Of the 72 topics (statements) covered in the questionnaire, half (36) were linked to the category 'widespread use', while more than a third (25) were linked to the category 'development'.

**Table 5.3: The questionnaire: Subsections and the state of development**

Subsection title	Number of topics	Topic number range	State of development			
			Elucidation	Development	Practical use	Widespread use
Health policy	4	1–4		2		2
Health services and health-care delivery	4	5–8		2		2
Information systems	5	9–13		1		4
Information usage	7	14–20		2	2	3
Telemedicine	3	21–23			1	2
Education and training	5	24–28				5
Afrocentric health care	4	29–32		3		1
Regional health care	5	33–37		1		4
Health promotion	1	38		1		
Health technology: General	2	39–40		1	1	
Vaccines	3	41–43	3			
Therapeutics	8	44–51	2	3	1	2
Diagnostics and instrumentation	13	52–64		8	1	4
Reproductive health	2	65–66		1		1
Research	6	67–72				6
TOTAL	72	-	5	25	6	36

Table 5.4: Details of the Top Twenty Topics

(The topics appear in descending order in terms of the index for "quality of life")

Rank-order position	Topic No.	Topic	Number of respondents	Subsection	Wealth creation index	Index of quality of life	Most likely time frame for realisation	Most effective way to acquire	Three most important that could prevent So acquiring the techno that is nee	
									1	2
1	42	An effective HIV/AIDS vaccine is available.	153	Vaccines	59	87	2010–2014	Engage in joint ventures (59%).	Technology (57%)	R&D infrastructure (44%)
2	47	The development of an effective prophylactic for tuberculosis	153	Therapeutics	46	85	2010–2014	Engage in joint ventures (54%)	Financial (88%)	Technology (52%)
3	38	The development of a school-based health promotion system that will enable children to take responsibility for their own health.	159	Health promotion	24	81	2000–2009	Develop in SA (69%)	Human resources (67%)	Financial (67%)
4	1	The development of a novel Health-care Delivery System that optimises interaction between the public and the private sector.	172	Health policy	10	78	2005–2009	Engage in joint ventures (40%)	Financial (65%)	Human resources (54%)
5	43	The development of a malaria vaccine.	158	Vaccines	41	76	2005–2009	Engage in joint ventures (53%)	Financial (85%)	Technology (61%)
6	51	Development of a maize with high protein, vitamin and trace element content for the prevention of nutritional disorders	158	Therapeutics	41	74	2005–2009	Develop in SA (53%)	Financial (68%)	Technology (44%)
7	17	Most human settlement developments are planned with due consideration of epidemiological information available for that particular area (e.g. no rice paddies in malaria areas).	157	Information usage	12	70	2010–2014	Develop in SA (57%)	Financial (52%)	Policy (50%)
8	62	Development of cheap, rapid, easy-to-use, on-site diagnostic tools for rural clinics and hospitals (e.g. urine dipstick for HIV/AIDS and other sexually transmitted diseases)	156	Diagnostics and instrumentation	24	67	2005–2009	Engage in joint ventures (46%)	Financial (76%)	Technology (50%)
9	4	Widespread implementation of a Health Bill of Rights, which includes women's right to health and health care	165	Health policy	2	65	2000–2004	Develop in SA (62%)	Social/cultural (58%)	Financial (50%)
10	18	Health and safety impact assessments are part of the routine planning of development projects	161	Information usage	10	65	2005–2009	Develop in SA (47%)	Financial (58%)	Policy (50%)
11	7	The development of a Southern African Centre for Disease Control to respond to the threat of emerging and re-emerging diseases within the SADC region.	164	Health services and health-care delivery	-2	63	2005–2009	Engage in joint ventures (57%)	Financial (85%)	Human resources (63%)

**Table 5.4: Details of the Top Twenty Topics**  
(The topics appear in descending order in terms of the index for "quality of life")

Rank-order position	Topic No.	Topic	Number of respondents	Subsection	Wealth creation index	Index of quality of life	Most likely time frame for realisation	Most effective way to acquire	Three most important that could prevent South Africa from acquiring the technology that is needed	
									1	2
12	35	SADC countries selectively develop a common set of health policies and implementation programmes with regard to HIV/ AIDS TB, malaria, trauma, etc.	150	Regional health care	8	63	2005–2009	Engage in joint ventures (61%)	Financial (64%)	Policy (56%)
13	65	Widespread use of less invasive and longer-acting female contraceptives	158	Reproductive health	22	60	2005–2009	Engage in joint ventures (54%)	Financial (62%)	Technology (42%)
14	8	Development of specialised health teams to address health problems that cannot be handled by local, provincial or national authorities (e.g. malaria control, environmental disaster management, i.e. flooding).	160	Health services and health-care delivery	-23	58	2005–2009	Develop in SA (42%)	Financial (84%)	Human resources (66%)
15	14	Widespread utilisation of Health Management Information Systems to assist with monitoring of health status, drug utilisation and health planning.	161	Information usage	6	57	2005–2009	Engage in joint ventures (34%)	Financial (76%)	Human resources (55%)
16	61	The development of cheap and effective self-management tools for the most common chronic diseases (e.g. rheumatoid arthritis, arthritis, diabetes, renal failure, hypertension, HIV/AIDS, etc.).	155	Diagnostics and instrumentation	20	56	2005–2009	Engage in joint ventures (47%)	Financial (77%)	Technology (52%)
17	21	Telemedicine and advanced communication technology (including telemedicine) will increase the range of health-care delivery at primary health-care venues.	161	Telemedicine	-5	52	2005–2009	Engage in joint ventures (46%)	Financial (84%)	Technology (58%)
18	46	The development of new drug-delivery systems that enable the targeting of chemotherapeutic agents with minimal side-effects.	151	Therapeutics	16	48	2005–2009	Engage in joint ventures (50%)	Financial (80%)	Technology (58%)
19	9	The development of a South African information technology network that has the ability to provide full clinical, diagnostic, treatment, usage and geographic information about each registered patient on an acceptable, ethical and comprehensive basis.	166	Information systems	-7	45	2005–2009	Engage in joint ventures (45%)	Financial (84%)	Human resources (54%)
20	70	The development of community-oriented evaluation methods for health-care service delivery and new health technologies.	151	Research	-8	42	2005–2009	Develop in SA (67%)	Financial (62%)	Human resources (55%)

The main results obtained from the survey pertaining to the top 20 topics are discussed in this section.

#### 5.4.1 Importance to South Africa: wealth creation and quality of life

Two indices were developed to denote 'importance to South Africa'. These were obtained from the variables 'wealth creation' and 'quality of life' by combining the two beneficial percentage scores ('medium' and 'high'). The topics were then sorted, in descending order, by the index on quality of life.<sup>1</sup> The top 20 topics are listed in Table 5.4.

The details of the bottom 10 topics, which are seen as the least beneficial to South Africa in terms of their contribution to quality of life, are provided in Table 5.5 below (to ensure a picture that is as complete as possible) but will not be discussed here.

**Table 5.5: The bottom ten topics: Quality of life**

Rank-order position	Topic No	Topic	Quality of life
63	30	Development of Afro-centric health-care facilities to provide a greater choice of health-care providers	-12
64	2	The novel South African Health-care Delivery System is used as a model internationally	-14
65	20	Widespread use of information terminals such as ATM s (Automatic Teller Machines) to provide health information for the purpose of self-diagnosis and self-treatment	-17
66	26	The undergraduate education of health professionals routinely includes African traditional medicine	-17
67	69	All research projects require the inclusion of both males and females in the subject sample	-17
68	6	Widespread use of medical treatment packages designed for non-South Africans, offering access to medical services in South Africa	-26
69	29	Afro-centric health care: The routine use of African traditional medicines in health services (e.g. for impotency and malaria)	-31
70	63	Development of a new and simple bio-recognition system (e.g. DNA techniques) that can be used to uniquely identify a person	-33
71	3	Development of "safe" recreational drugs as alternatives to heroin, crack, mandrax, etc.	-34
72	48	Selective use of human cloning to help childless couples	-69

#### 5.4.2 South Africa's comparative standing

For every topic respondents were required to indicate South Africa's position relative to three categories of countries: (a) other southern African countries, (b) other developing countries in general, and (c) developed countries. The respondents were asked to indicate whether South Africa was 'behind' these countries or whether it was 'equal to' or 'ahead of' them.

Figure 5.1: Comparative standing - average of all statements

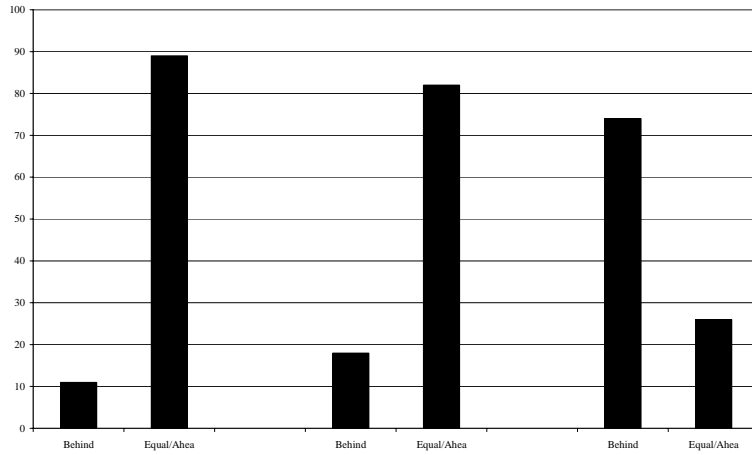


Figure 5.2: Likely time frame for realisation (Average of the top 20 statements)

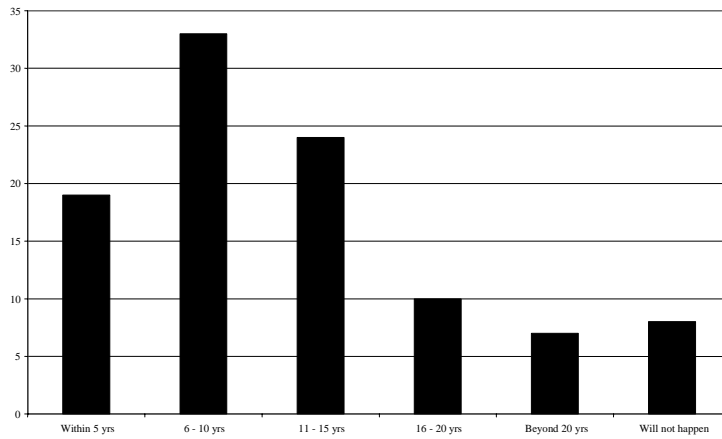


Figure 5.3: Acquiring the technology/capacity (Average of all the statements)

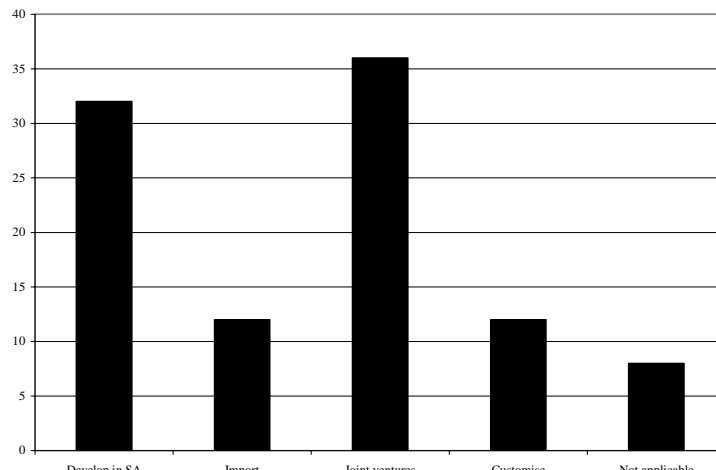


Figure 5.1 shows the averages of responses in respect of all the topics. An inspection of the averages for the top 20 and bottom 10 topics indicates no notable difference from the pattern of Figure 5.1: The respondents perceived South Africa to be at the very least on par with the developing countries, but behind the developed world.

**5.4.3 Likely time frame for realisation**

As indicated in Table 5.4, which gives the modal value of the expected time frame, South Africa was seen to be unlikely to acquire the necessary technology or capacity for the vast majority of the top 20 topics before the period 2005-2009. The only two exceptions are Topic 38 (health promotion among school children), which has a bimodal distribution (with modes for 2000-2004 as well as 2005-2009) and Topic 4 (dealing with the implementation of a health bill of rights). Figure 5.2 shows that, as far as the average of all the second-round topics is concerned, most respondents were of the opinion that the most likely time frame would be the period 2005-2009.

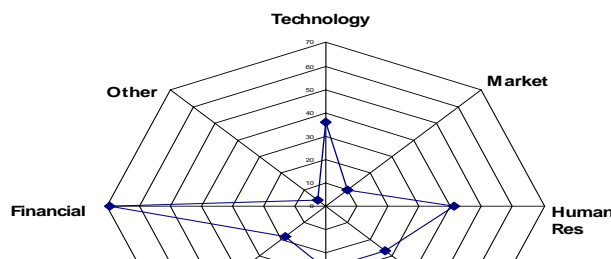
**5.4.4 Acquiring the technology/capacity**

What is needed for South Africa to acquire the necessary technology and capacity to achieve the required state of development for the top 20 topics within the time frames indicated? The respondents indicated only two possibilities: (a) engage in joint ventures (13 out of the 20 topics), and (b) develop the technology/capacity within the country (7 out of 20). Neither the 'importing of the complete technology/capacity' nor the 'customisation of existing technology/capacity' was supported by the respondents as a means to achieve any of the top 20 objectives (see Figure 5.3.)

**5.4.5 Key constraints on occurrence in South Africa**

Figure 5.4 shows that perceived financial constraints stand out as the main set of reasons why South Africa was perceived to be unable to acquire the necessary technology and capacity within the indicated time frame. Financial constraints were seen as the most serious threats to South Africa's achievement of its main objectives in the field of energy technology/capacity. Other constraints, namely those related to technological deficiencies, human resources, research-and-development infrastructure and policy issues were expected to play a significantly less important role than the financial constraints. Social/cultural factors were seen as even less important.

**Figure 5.4: Key constraints to occurrence in South Africa**



#### 5.4.6 Overall perspective: The ten most promising topics for research and technology development

The information provided so far is likely to be overwhelming to the reader who has not actively participated in the Foresight project. Hence the ten most promising topics for research and technology development in South Africa are highlighted below.

The selection of the ten topics has been informed by a composite index of all the variables used in the analyses so far. This index allowed the analysts to weight the topics that are of greatest importance to South Africa in terms of wealth creation and quality of life. In addition, research and technology development in respect of these topics are expected to give value for money sooner rather than later. The composite index was constructed in the following manner:

- (1) A 'potential index' was constructed by calculating the mean of the proportions of respondents who (a) rated South Africa as 'equal to' or 'ahead of' other southern African and developing countries and the developed world; (b) expected the likely time frame for the realisation of the objective concerned to be 15 years or less (i.e. before the year 2015); (c) suggested that South Africa acquire the necessary technology/capacity through the most beneficial means for the country, namely developing it locally, engaging in joint ventures or customising existing technology/capacity; and (d) indicated that the key constraints were easier to overcome through investment in local technology, human resources, and research and development infrastructure.
- (2) The mean proportion calculated in (1) above was thereafter weighted with each topic's 'importance index' (i.e. its perceived importance to South Africa) by multiplying it with the mean proportion of the respondents who rated each topic as having a high or medium potential for (a) wealth creation and (b) quality of life.
- (3) The result of (2) was then weighted with the 'confidence index' (i.e. the proportion of respondents with a high or medium level of confidence in their response regarding the topic concerned).

The top 10 topics in terms of this index are listed in Table 5.6 below. It should be clear that the development of an effective HIV/AIDS vaccine is a matter that should receive sufficient attention in the prioritisation of research-and-development funding. School-based health promotion and a public-private sector partnership for the design of a novel Health-care Delivery System are two other approaches that seem to be high on

the priority list. The needs of the rural population, in particular, need to be addressed by the development of appropriate diagnostic tools, health-technology packages (including devices, training of technicians, and technical support), and an effective malaria vaccine. Utilisation and the exportation of South Africa's expertise and technological/research infrastructure is another field that requires attention. Another area that should clearly be high on the priority list is the development of appropriate Health Management Information Systems.

Table 5.6: The ten most promising topics in terms of the composite index

Rank-order position	Topic No.	Topic description	Potential index	Importance index	Confidence index	Composite index
1	42	An effective HIV/ AIDS vaccine is available	67	95	91	86
2	38	Health promotion: The development of a school-based health promotion system that will enable children to take responsibility for their own health	65	90	90	81
3	1	Health policy: The development of a novel Health-care Delivery System that optimises interaction between the public and the private sector	66	87	91	79
4	62	Development of cheap, rapid, easy-to-use on-site diagnostic tools for rural clinics and hospitals (e.g. urine dipstick for HIV/ AIDS and other sexually transmitted diseases)	72	89	87	77
5	43	Development of a malaria vaccine	71	91	84	76
6	39	South Africa is a major exporter of health-technology packages, including devices, training of technicians, and technical support, to sub-Saharan Africa	68	87	88	76
7	72	International pharmaceutical companies conduct more research in South Africa because of unique local expertise in HIV/ AIDS and hypertension, and the technological and research infrastructure	73	84	90	76
8	47	Development of an effective prophylactic for tuberculosis	71	93	81	75
9	49	Widespread use (locally and internationally) of specific South African developed drugs	69	91	83	75
10	14	Widespread utilisation of Health Management Information Systems to help with the monitoring of health status, drug utilisation and health planning	65	84	89	75

The conclusions reached elsewhere in this study are not replaced by the findings that are reported in Table 5.6. The purpose with the construction of the composite index was merely to provide a different perspective on the empirical data obtained

from the survey. Prioritisation of investment and activities should always be done on the basis of the results of the entire study, supplemented by information obtained from other sources.

## 5.5 Summary and Conclusions

The details of the top 20 topics (in terms of their perceived importance to South Africa) have been presented in the report. The bottom 10 topics have been given for comparative purposes only, as the respondents in all probability perceived them to be 'far-fetched'.

A composite index was developed to identify the ten most promising topics for research and technology development. The development of an effective HIV/AIDS vaccine and prophylactic for tuberculosis is a matter that should receive the top priority in research-and-development funding. Development of a school-based health promotion system and a public-private sector partnership for the design of a novel Health Care Delivery System are two other approaches that should be second and third on the priority list. The needs of the rural population, in particular, need to be addressed by the development of appropriate diagnostic tools, health-technology packages (including devices, training of technicians, and technical support), an effective malaria vaccine, and a maize with a high nutritional value. Utilisation and the exportation improvement of South Africa's expertise and technological/research infrastructure is another field that requires attention. Also required to be high on the priority list is the development of appropriate Health Management Information Systems.

The survey succeeded in focusing attention on health-related topics that have the potential for enhancing quality of life in South Africa. However, the key financial constraints must be overcome first.

Methodology used to identify research and development issues and priorities based on the results of the survey of the top twenty research and development priorities for South Africa were identified. The following methodology was applied:

- The top 20 statements with regard to quality of life were identified.

### **TOP 20 ISSUES FROM THE SURVEY: BASED ON QUALITY OF LIFE INDEX (numbers in brackets refer to the statements in the survey)**

- 1 Development of an AIDS vaccine (42)
- 2 Development of a TB vaccine (47)
- 3 Health promotion targeted at the youth (38)
- 4 Development of enriched and fortified staple foods (51)
- 5 Development of a novel health system (1)
- 6 Development of a malaria vaccine (43)

- 7 The utilisation of health and safety assessments (18)
- 8 The use of common policies throughout SADC (35)
- 9 Development of on-site diagnostic tools (62)
- 10 EPI-basis for planning
- 11 Development of Southern Africa CDC (7)
- 12 Utilisation of specialised health teams (8)
- 13 Development of female contraceptives (65)
- 14 Health Bill of Rights (4)
- 15 Self-management tools (61)
- 16 MHIS — Development of a National Health Information System at all levels of care (14)
- 17 Telemedicine, including CME (21)
- 18 New drug delivery systems (46)
- 19 Export of technology (39)
- 20 Development of new SA drugs (49)

- A final list of research and development topics was then collated.

**TOP RESEARCH AND DEVELOPMENT ISSUES:**

- 1 Development of an AIDS vaccine
- 2 Development of barrier methods and microbicides for sexually transmitted diseases and HIV
- 3 Development of a TB vaccine
- 4 Development of new TB drugs
- 5 Development of malaria vaccine
- 6 Development of malaria drugs
- 7 Food fortification
- 8 Injuries and violence prevention
- 9 Health promotion targeted at the youth
- 10 Safer fertility regulation (male and female)
- 11 Self management tools for chronic diseases (e.g. hypertension, diabetes, diarrhoea, psychiatric conditions)
- 12 Rehabilitation
- 13 Novel way of developing private/public partnerships for health care
- 14 Cost-effective on-site diagnostics
- 15 Telemedicine
- 16 Southern African CDC
- 17 Health and safety assessment techniques
- 18 National Health Information System
- 19 Use of smart cards
- 20 Commercial application of indigenous knowledge
- 21 Research into the effectiveness of alternative therapies
- 22 Tissue regeneration and gene therapy
- 23 Rational drug design and delivery

# Chapter 6: Recommendations

## 6.1 Guiding Principles

### 6.1.1 Human Rights and Ethics

South Africa has determined for itself a strong human rights culture, with its precepts forged into the Bill of Rights and the Constitution. The Foresight Committee endeavoured to ensure that this culture pervaded and guided all our deliberations and decisions, and we trust that that is reflected in this report. In particular, the issues of equity, access, the free flow of information and personal empowerment, as these affect an individual's health, were considered to be of prime importance.

Since Hippocrates, the Nuremberg Code and the Declaration of Helsinki, there have been professional codes of conduct, common oaths and bonds and intrinsic trusts that have guided the practice of medicine and research. Recent technological advances have substantially changed modern clinical and research practice and now present enormous ethical challenges. In the context of increasing health-care costs, the allocation of national resources for health should be based on the best available scientific and economic evidence. The extension, interpretation and protection of ethics in health care and research, as an intrinsic value system, should guide all health professionals.

### 6.1.2 Capacity Development

Development of research capacity is recognised as one of our greatest needs and challenges. While we invest in the future, we should recognise and preserve valuable expertise and infrastructure. Funding for the new research agenda must be such that we will be able to recruit the best scientists from both local and overseas institutions, and the ensuing research must actively include capacity building, skills transfer and on-site training. There are serious shortages in funding, human resources skills and institutional capacity, all of which are needed to address the country's health problems.

### 6.1.3 Focus: Regionally Specific Diseases

For research and development to have an impact on the quality of life of the country's people and its competitiveness, the research portfolio should focus on local issues, including niche areas that may or may not form part of the global agenda. The major causes of mortality and morbidity in South Africa and the Southern African region in general should determine the priorities of health research and development. Best international practice and cutting-edge science are essential to enhance local research.

#### **6.1.4 Research and Development Themes**

The final list of research and development topics was grouped in specific research and development themes.

The analysis of the identified research and technology issues resulted in four major themes, namely:

- 1 Health information system
- 2 Health service delivery
- 3 Self-management technologies
- 4 Cost-effective prevention and treatment technologies.

Underpinning all these themes are various and completely different research and technology topics. In this discussion we will merely mention some ideas, so as not to stifle creativity and to influence the researcher.

### **6.2 Health Information System**

Health information has been identified as a crucial component of the effective delivery of health care in the future. The following institutional and technological challenges will have to be met so that the potential benefits of an appropriate Health Information System may be fully utilised:

#### **6.2.1 National Health Information System**

A modular and flexible national health information system that has the ability to be integrated into a national information system has to be developed and implemented. The systems should enable the following:

- Management of services;
- Surveillance;
- Clinical decision making;
- Integration of health data into broader development planning.

Advanced communications technology will increase the range of health-care delivery at primary health-care venues. Technologies that are very useful in this regard and that should be developed further and applied to South African circumstances are the utilisation of the Global Information System and the interaction and convergence of satellite, cellphone and computer technology. The development of a South African information technology network that has the ability to provide full clinical, diagnostic, treatment, usage and geographic information about each registered patient on an acceptable, ethical and comprehensive basis is also a definite challenge.

#### **6.2.2 Creation of a Disease Control Institute (DCI)**

Such an institute should be established and should be responsible for the collection and dissemination of national statistics. It should also fulfil the role of a surveillance and outbreak control centre. It should be created through the adaptation of existing infrastructure or institutions. The South African DCI could also be extended for mutual cooperation with other countries. Within this DCI the emphasis should be on the development and implementation of diagnostic fieldwork methods that are applicable to Southern Africa.

### **6.2.3 Individual health information**

Advances in information and communication technologies should be utilised to provide information and access to health care for the majority of the population. A potential area of future growth is the utilisation of smart cards for patient information retention, as well as the development of virtual database software. The following information should be included in these records:

- Demographic information
- Financial information on health-care funders
- Health Information.

The right to access the information poses ethical issues which will have to be resolved.

## **6.3 Health Service Delivery**

The quality of the South African Health Service has been identified as a major determinant of health care in the country. It has also been identified as suffering from mismanagement and deficiencies at all levels. The following issues were highlighted for the enhancement of health service delivery:

### **6.3.1 Optimisation of the management of health services**

The optimisation of health services incorporates both health-care delivery and health technology management. Health services management includes the validation of problems, audits, assessments, training and maintenance, and the implementation of an essential health package in order to achieve optimal care.

### **6.3.2 Telemedicine**

Telemedicine is a unique method of providing specialised service delivery and clinical support to remote areas. Research needs to be undertaken into the range of services that can be offered and their implementation, sustainability and impact. The development and use of micro-imaging techniques to assess injuries and diseases in remote areas should be encouraged.

### 6.3.3 Novel ways of developing public/private partnerships for health (Issue 13)

South Africa's current limited public health budget falls below the necessary health expenditure per person per year to provide the health-care services that are determined by health policy. The development of a novel Health-care Delivery System that optimises interaction between the public and the private sector should assist in the facilitation of this. Synergies and collaborations between the private, private not-for-profit and public health systems are required to enable the country's health goals to be met.

## 6.4 Personal Health-care Technologies

The underpinning values of this theme are self-empowerment and personal responsibility. It should not be seen as a means of shirking responsibility by the health authorities, but rather as part of a better and more efficient health management process.

The information and technologies used for self-care should be cost-effective, easy to use, robust, accessible and well supported by the health system.

The three areas highlighted by Foresight are chronic diseases, reproductive health regulation and rehabilitation.

### 6.4.1 Chronic diseases

Sound management of many of the chronic diseases relies on the measurement of simple physical or biochemical parameters (e.g. blood pressure, weight) and the adaptation of drug dosages or lifestyle behaviour patterns (e.g. exercise, diet).

The highlighted conditions are:

- hypertension
- diabetes
- depression and other psychiatric conditions
- malnutrition and obesity
- TB
- asthma
- cancer
- HIV/AIDS.

Research and technology that will make it possible to reach this priority are the following:

- Practical use of gene-therapy (e.g. in treatment of breast cancer).

- Development of new drug-delivery systems that make it possible to target chemotherapeutic agents with minimal side effects.
- Widespread use of self-screening (pre-onset) and self-diagnostic tools.
- Development of cheap and effective self-management tools for the most common chronic diseases (e.g. rheumatoid arthritis, arthritis, diabetes, renal failure, hypertension, HIV/AIDS, etc.).
- Development of cheap, rapid, easy-to-use, on-site diagnostic tools for rural clinics and hospitals (e.g. urine dipstick for HIV/AIDS and other sexually transmitted diseases).

#### **6.4.2 Reproductive health regulation**

Self-determined reproductive health regulation by both males and females underpins this issue and is supported by —

- research into technologies that provide affordable, easy-to-use, acceptable, safe and reliable reproductive health control methods;
- a vigorous and focused health-promotion campaign that takes into account the sensitive nature of the issues and their ramifications; and
- an environment which addresses the moral and lifestyle choice issues.

#### **6.4.3 Rehabilitation**

This covers all the chronic diseases of lifestyle as well as impairments that result in physical or emotional dependence and that prevent or seriously inhibit an independent existence for the affected individual.

Often simple technologies, the administration of medication or substance detection mechanisms are all that is required for their management. The highlighted conditions in South Africa are strokes, polytrauma, physical disablement and substance abuse.

Technologies that might assist in this are the following:

- Easy-to-apply artificial skin for wound protection and the treatment of burns.
- 'Intelligent' artificial limbs and prostheses.
- Development of new prosthetic materials that offer greater durability (e.g. for heart valves).
- Widespread use of personal body-sensor technology for the detection and monitoring and diagnosis of diseases.
- Development of computer-based 'intelligent' systems to assist in diagnosis and treatment decisions.
- Development and practical use of tissue-regeneration technology (morphogenic factors) in the treatment of permanent disability and disease (e.g. heart, liver, bone, neuronal and pancreatic regeneration).

### **6.5 Cost-effective Prevention and Treatment Technologies**

This last theme is the most important for the medical science research base in South Africa. It embraces basic, applied and developmental research and, as such, necessitates cooperation and partnerships between academic institutions, national research institutes and industry. These must take the form of a dual strategy involving both modern biological sciences and indigenous knowledge systems.

Research priorities have been identified in the following areas:

- Vaccine development relating to the major diseases affecting the health of the nation, with special emphasis on HIV/AIDS, TB and malaria.
- Drug development relating to the treatment of cancers, HIV/AIDS, TB and malaria.
- The development of robust, rapid, on-site diagnostic technologies (e.g. dipstick, lung function screening, Doppler ultrasound) as part of an Essential Technology Package.
- Biotechnology with emphasis on food fortification, gene therapy and tissue regeneration.

Specific technologies in this regard are the following:

- Vaccination (e.g. against polio, TB and measles) through 'transgenic' fruits (e.g. apples, bananas and tomatoes).
- Development of an effective HIV/AIDS vaccine.
- Development of a malaria vaccine.
- Widespread use of gene-therapy (e.g. in treatment of breast cancer).
- Development of new drug-delivery systems that enable the targeting of chemotherapeutic agents with minimal side effects.
- Development of an effective prophylactic for tuberculosis.
- Development of implantable drug-delivery biosensors which monitor and respond to drug levels in the body (e.g. for the treatment of unipolar depression).
- The development of therapeutic alternatives (drugs, herbs, other techniques) that are locally available and/or locally manufactured to reduce our need for expensive 'global type' products.

In addition to the research and development priorities above, two important prevention initiatives were highlighted:

- National health promotion and prevention specifically relating to campaigns aimed at safety, occupational health and the prevention of violence and injury (issue 8).
- Healthpromotion campaigns involving and targeted at the youth of the country (issue 9).

#### **6.5.1 Prerequisites**

A number of necessary prerequisites have also been identified as important in attaining the objectives defined in the four priority areas above.

### **6.6 Special Project Teams**

Certain research and development competency clusters became evident when the human resource capabilities for the research priorities were analysed. We envisage the creation of world-class, specific competencies as outlined below. These research clusters (or special teams) are recognised as the essential combinations of intellectual resources necessary for the delivery of the Foresight priorities. In most instances the competencies exist in SouthAfrica. Where there are deficiencies, the skills should be sought internationally in the spirit of cooperation and partnership.

An important component of the special project teams would be to add to and develop the team's capacities, expertise and scope and to provide for growth, succession and reward.

### Proposed Special Project Team Assignments

YEAR TO REALISE	THEMES	Special Teams					
		Social sciences	Drugs designing	Basic sciences and technologies	Health promotion and campaigns	Health systems research	Information technology
0 – 5	Barrier methods and microbicides	X	X	X			
0 – 5	Food fortifications	X		X	X		
0 – 5	Health promotion targeted at youth	X			X		
0 – 5	National Health Information System	X				X	X
0 – 5	Operational research into failure to implement essential existing technologies and services	X				X	X
0 – 5	Smart cards					X	X
0 – 10	Cost-effective, on-site diagnostics (rapid)			X			
0 – 10	Research into effectiveness of alternative therapies	X				X	
0 – 10	TB drugs		X	X			
6 – 10	Chronic diseases, e.g. hypertension, diabetes, diarrhoea, psychiatric conditions	X		X	X		
6 – 10	Commercial applications of indigenous knowledge	X	X		X	X	
6 – 10	Rehabilitation	X					
6 – 10	Health and safety assessment techniques	X				X	
6 – 10	ICD					X	X
6 – 10	Malarial drugs		X	X			
6 – 10	Malarial vaccines		X	X			
6 – 10	Novel way of developing private/public partnerships for health care	X				X	
6 – 10	Rational drug design and delivery		X	X			
6 – 10	Safer fertility regulation	X	X	X	X	X	

### Composition of Special Project Teams

Social Sciences	Drug Designing	Basic Sciences & Technologies	Health Promotion & campaigns	Health Systems Research	Information Technology
Psychologists Sociologists Epidemiologists Social Anthropologists Legal Administrators/ Managers	Pharmacologists Chemists Biochemists Computation scientists Molecular biologists Botanists IK Specialists Microbiologists Virologists Pharmacists Engineers	Molecular biologists Basic medical sciences Microbiologists Physiologists Biomedical engineers Virologists Neurologists Statisticians Computer specialists	Public and community health specialists Sociologists PR and media (communication specialists) Relevant medical specialists	Epidemiologists Biologists Statisticians Health economists Systems specialists Health management consultants	Electrical engineers Systems analysts Programmers Network controllers Managers Administrators

As a cardinal aspect of human resource development capacity in South Africa, broad institutional and departmental support and funding are implicit in their creation.

### 6.7 Collaboration

South Africa's relatively limited expenditure on Research and Development (less than 1% of the GDP) and its limited human resource capacity necessitates novel models of collaboration and cooperation between academia, industry and government. The issue of partnerships is also stressed in the new research agendas, which call for iterative, non-linear processes of innovation and protection of our proprietary

knowledge. International exchange programmes and cooperation should also be sought. South Africa should, as far as possible, lead such international and regional co-operative endeavours.

## 6.8 Economic Benefits

The DACST White Paper is structured on the two concepts of 'innovation' and a 'national system of innovation'. The aim is to foster and promote South Africa's scientific and technological advancements so as to enable South Africa to become economically competitive on a global scale and to be able to provide essential and sustainable social services locally. As a result, the Foresight Project has been based on identifying the prioritised research and development agendas that are most likely to contribute to 'wealth creation' and 'improvement to quality of life' for the people of South Africa. The World Bank's 1993 'World Development Report' highlighted the fact that the health of a nation and sustainable economic growth are interdependent. Burden-of-disease research from the MRC has shown that, of the deaths of people in South Africa who fall in the economically active age group of 24-64 years, 40% are due to chronic diseases of lifestyle which could be prevented.

For this health sector report, 'Improvement to Quality of Life' issues from the National Survey were used to obtain the prioritised health research and development agenda. Many of these prioritised 'Quality of Life' issues have also been identified as possessing high 'wealth creation' potential. This implies that certain outputs could result in novel technologies with concomitant intellectual property rights, new business opportunities, increased jobs and wealth creation, while others may have limited commercial opportunities yet possess significant social, cultural and developmental benefits.

In order to build a healthy workforce and a healthy nation, both the economic and social benefits resulting from the strategic research agenda need to be optimised through balanced partnerships between industry and government.

## 6.9 Implementation and Monitoring

It is clearly important for stakeholders in the health sector to be fully informed of the deliberations and recommendations of the Health Foresight initiative. As part of the implementation process, it is strongly advised that through inter alia report distribution, roadshows and the media, the issues contained in these recommendations are understood and debated by government, academia and industry.

Funding for the research priorities needs to be at a level capable of achieving the desired outcomes within the time-scales presented. An annual review by the Health Sector Foresight Working Group is recommended to evaluate and monitor progress of the research initiatives.

As part of the ongoing development of Foresight methodologies it is recommended that close ties be maintained with similar international initiatives and that this Foresight review should be repeated within five years.

# Appendix A:

## Health Sector Working Group: Foci

This list of foci was identified by the Health Sector Working Group during its first meeting. These foci are clustered and the subpoints are retained. The foci must still be finalised and agreed upon. They will also be used to formulate a Vision and Mission for the Health Sector Working Group.

### Health Policy and Legislation

- Developing/adaptive/learning systems
- Equity
- Gender
- Governance
- Citizen identification
- Legislation (MCC)
- Prioritisation
- Community involvement
- Regionalisation
  - SA Internal
  - SADC

### Measurement and Health Information

#### Information systems

- Health Insurance
- Medical Schemes
- Health Information Systems, including distribution
- Telemedicine and e-communications

#### Health measurements

- Demography
- Surveys
- Epidemiology
- Measurement of:
  - Status
  - Service
  - Effectiveness
- Burden of disease:
- New and emerging diseases/patterns

### Health Research and Development

- Public Industry
- Research Focus

## Education and Training

### Facilities

- including Public Health Training/Schools

### Human Resource Development

- Problem-solving ability
- Counselling
- Self-awareness/Individual care
- Creative interaction between disciplines

### Health Science Education

#### *Formal Training and Education:*

- What has been done to the curriculum
- Undergrad./Postgrad./CME
- Doctors/Nurses/Paramedical Officers (Physios, OTs, etc.)
- Researchers
- Professional ethos

## Health Promoting Activities

### School curriculae

### Public health

### Health workers

#### **Community/individual:**

- Ability of people to manage themselves and others
- Role of information technology
- Behavioural changes
- Effective parenting
- Leisure

#### **Disease prevention and public health education and promotion**

- Cancer/Immunisation/Malaria/AIDS/STDs
- Genetics
- Nutrition and nutritional diseases
- Tourism
  - Health and safety
  - Public awareness

- Prevention and treatment of intentional/unintentional injuries

## Health Technology

### **Current and future technologies:**

- Gene therapy/Biotechnology R&D
- Ethics/ethical issues/regulation thereof
- 'Marketing' and exporting health products
- New frontiers in health
- Intellectual property
- Miniaturisation
- Applications (1st and 3rd World)
- Appropriate technologies
- Local development of technologies
- Management, social and physical technology
- Communications

### **Pharmaceuticals/Rational drug design and use**

- Vaccine development
- Drug manufacture

### **Diagnostics and medical devices for use in laboratories and clinics**

## Health services

### **Financing health care**

- Insurance
- Macro-economic policies
- Resource allocation/cost-effective management
- NGO/Public/Private
- Reimbursement
- FFS
- Salary
- Capitation

### **Quality of Services**

- GCP/GLP/GMP/GDP
- Audits
- Harmonisation (SADC) of standards and practices (à la FDA)

### **Health services and systems development**

- Systems/levels/quality
- Affordable, appropriate, equitable, accessible
- Management/effectiveness

- Integration
- Community health programmes
  - prevention
  - Promotion
  - Curative
  - Rehabilitative
- New frontiers
- Infrastructure
- Transport
- Emergency medical/disaster relief
- General medical care/child care
- Occupational/environmental health services
- Military and voluntary
- Emergency services (trauma/violence)
- Core package, methods of delivery
- Community needs and influences
- 'One-stop' shops
- Health economics
- NGO/public/private interface
- Rural/urban
- Orthodox/complementary mix
- Human resources: who?/values/ethos
- Do we adopt a primary health-care approach?

#### **Complementary health care**

- Practitioners (traditional healers, chiropractors, etc.)
- Interventions (procurement, regulations, etc.)
- Interactions
- Alternative/traditional
- Traditional knowledge systems
- New-age healing/alternative belief systems

#### **Ongoing identification of diseases peculiar and common to our country**

- Occupational health
- Nutritional diseases
- Substance abuse
- Violence
- Cancers
- Environmental health
- Maternal and perinatal
- Communicable diseases: HIV/AIDS, TB, Malaria, STDs

#### **Emerging and re-emerging chronic diseases and conditions**

- Viral/parasitic/bacterial/lifestyle/environmental/CAs/mental health/substance abuse

### Special issues

- Ageing
- Women's and children's health
- Disabilities

### Cross-cutting issues

- Housing/building health-related standards
- Environmental impact of health
- Nutrition
  - Household food security
  - Food processing
  - Food safety
- General education with regard to healthy individuals
- Preservation of medicinal plants
- Welfare: disability, assessment, rehabilitation
- Economics: health budget, financing systems
- Occupational health, safety and standards
- Global issues with regard to health technology, international health collaboration
- Health and social policies (advocacy)
- Business: accessibility, availability, affordability, quality of product

### Excluded issues

- Macro-issues: natural disasters, environment, global economic environment, GDP
- Global issues: WTO
- Economics: macro-policy
- Community: violence/conflict, work availability
- Welfare: policy, provision, financing
- General education: improved educational system, including infrastructure, and literacy
- Environment/control of natural resources
- Water and sanitation provision
- Politics: systems
- Transport

# Appendix B: Health Scenario Table

(within the context of the macroscenarios)

	<b>Key Concerns</b>	<b>Innovation Hub</b>	<b>Global Home</b>	<b>Frozen Revolution</b>	<b>Our Way is the Way</b>
1	What will the budget for health care be? (Indication of the level of economic growth and stability, as well as the position with regard to job creation and unemployment)	Increased economic growth in long term (job creation) Increased overall health spending and government health budget Increased growth in private health market Increase in contracts for public service with SADC Decrease in poverty – inequity decreases Decrease in crime leads to more government money available for health service	Increased economic growth with lower unemployment – no stability Increased spending in health, but decreased government spending Increased reliance on private health care Increased inequity as a result of no centralised social contract Increase in choice, increase in cost, inflationary pressure on health expenditure	Decreased economic growth Health spending down Increase in poor people dependent on decreased public health care Higher inequity and more corruption = lower budget Health sector dependent on external development	Slow economic growth after initial dip erodes both public and private health care Decrease in rich people leads to decrease in private health care, which converges with public service Decrease in inequity (lower level of wealth and services) Increase in government health budget No increase in job creation
2	Type of health-care delivery (including the extent of public/private cooperation)	Private sector grows – focuses on external markets Move to social health care system Increased reliance on local technology/traditional health care Encourage local technology – export Greater role in regional leadership/health care	Increased separation – public/private (less cooperation) Rapid growth in private health care Increased dependence on foreign technology Decrease in public health capacity (e.g. dealing with epidemics) Residual model leads to a split in responsibility - Private (care) / Public (prevention) Private academic medicine becomes reality	Decrease in public health care sector Exclusive curative private Health Care Services Antagonism between public/private health care Rapid decline in academic medicine Increased dependence on foreign technology - "complete kits" Residual model with safety net	Dedining standards/size of private sector Move to social health care system Increased collaboration between private and public Focus on local health problems Local technology Increased involvement of traditional health care
3	The level of crime and corruption (public and private health care)	More concerted effort to deal with crime at regional level More opportunities for crime Decrease in petty crime White-collar crime unchanged	SA benefits from global crime (e.g. drugs, mafia) Decreased accountability by private health care No real change in crime, corruption, mismanagement Corruption probably less in public health sector	Crime increase dramatically Insecurity (lower sense of hope for the future) More patronage	Change in ethos toward greater interest in public good Accountability increases Decrease in petty crime and increase in white collar crime
4	Process of policy formulation	National/ regional policies developed that selectively integrate global policies	Adopts international policy which may or may not address local/regional needs	Comprehensive policies exist - low execution	National/ selective regional policies developed for own benefit
5	Capacity to implement policy and priorities	Commitment to implement policy exists with gradual delivery, but with preferential delivery on national priorities	Capacity to implement international policy strengthened but our capacity to respond to local priorities diminished	Commitment to implement policy exists but no delivery except where it is politically expedient	Commitment to implement policy exists but after initial deterioration limited capacity to deliver with later adequate capacity to deliver

6	Changes in the burden of disease (including the impact of epidemics (e.g. AIDS) and new, chronic and generic diseases)	Diseases of lifestyle increase with changed aetiology of mental ill-health Diseases of poverty decrease including HIV/AIDS Capacity to diagnose and treat diseases/epidemics improved	Diseases of lifestyle increase (including mental ill-health) Diseases of poverty increase among the poor and AIDS persists in this group Individuals' disease treatment improved Response to global epidemics improved Ability to respond to national/ regional epidemics deteriorates	Diseases of lifestyle increase (including mental ill health) Diseases of poverty dramatically increase including HIV/AIDS Capacity to treat disease/epidemics deteriorates	Options situation deteriorates and fails to recover sufficiently to address needs. Situation deteriorates but recovers sufficiently to address needs. Diseases of lifestyle increase (including mental ill-health) Diseases of poverty initially increase dramatically then gradually decrease (including AIDS) Capacity to respond gets better
7	The level of research (capacity, funding, training and implementation)	Increase in national and regional relevant research Increase in diversity of R&D Good policy developed i.r.o property rights	Discord between global imperatives and national needs for research areas, resources, training and priorities	Decrease in health research Absence of funding No implementation S&T sourced elsewhere	Increase in nationally relevant applied research Decrease in "blue skies" research. Unpredictable effect on respect for intellectual property
8	Change in social values (ethos of caring)	Increased cohesion nationally and regionally	Social values influenced by money with a negative effect on caring.	More fragmentation e.g. political, cultural, economic	Increased cohesion and respect nationally
9	The impact of demographic change (including the extent of social disruption)	Most beneficial for health nationally and regionally	Public health services decline, private health services improve. Increase in socially determined disease burden	Collapse of public health services Private medicine improves, then worsens	Beneficial for health nationally
10	Damage to the academic health sector and health services	Centres of excellence remain	Private funding causes a shift in balance in academic health centres and private medical schools Reduced ethos of caring Increased funding for research Erosion of the role of the state	All centres decline	Isolation suppresses development Needs will drive specialisation Short-sightedness in areas identified for research
11	Development of health information delivery systems	Slow development because of lack of infrastructure and large capital outlay.	High availability of technologies and data mining Technology rather than needs-driven development maximises rich/poor gap with more inappropriate technologies	Stagnation in information systems and useless information Technologies and growth stagnant	Technology development more appropriate for SA but not in step with global development, with incomparable data
12	The extent of rational health care	Larger population leads to a level of care that is lower for lower-income groups but development is more feasible owing to bigger market. Higher cost of private care Inward brain drain and xenophobia	Increased rich/poor gap Increase in corruption and inappropriate services Possible collapse of cost-effective public health care Outward brain drain	Burden resides on communities Public sector declines and private sector stagnant Donor control of health care Outward brain drain	Private/public health care converge General improvement NHS. Private health care deteriorates/ public health care improves.
13	The impact of new technologies	Expertise development in few selected areas Expertise in South Africa enables IT to keep/maintain leadership role	Inappropriate technologies increase cost of health care, resulting in increased rich/poor gap	Financial constraints frustrate public and professionals, owing to growing gap between expectations and deliverables	Late exposure to new technologies leads to public and professional discontent SA-specific technology basis contributes to socio-economic development

# Appendix C: Sector Working Group Members

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