

Small Applied Research  
Paper No. 3

---

**An Essential  
Hospital Package  
for South Africa:  
Selection Criteria,  
Costs, and  
Affordability**

*May 1998*

*Prepared by:*

**Neil Söderlund, M.D., Ph.D.**  
**Enoch Peprah, M.Sc.**  
Consultants  
Center for Health Policy  
Johannesburg, South Africa



Partnerships  
for Health  
Reform

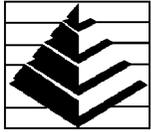
**PHR**



Abt Associates Inc. # 4800 Montgomery Lane, Suite 600  
Bethesda, Maryland 20814 # Tel: 301/913-0500 # Fax: 301/652-3916

*In collaboration with:*

Development Associates, Inc. # Harvard School of Public Health #  
Howard University International Affairs Center # University Research Corporation



Partnerships  
for Health  
Reform

**PHR**

## **Mission**

*The Partnerships for Health Reform Project (PHR) seeks to improve people's health in low- and middle-income countries by supporting health sector reforms that ensure equitable access to efficient, sustainable, quality health care services. In partnership with local stakeholders, PHR promotes an integrated approach to health reform and builds capacity in the following key areas:*

- > *better informed and more participatory policy processes in health sector reform;*
- > *more equitable and sustainable health financing systems;*
- > *improved incentives within health systems to encourage agents to use and deliver efficient and quality health service; and*
- > *enhanced organization and management of health care systems and institutions to support specific health sector reforms.*

*PHR advances knowledge and methodologies to develop, implement, and monitor health reforms and their impact, and promotes the exchange of information on critical health reform issues.*

May 1998

### **Recommended Citation**

Söderlund, Neil and Enoch Pephrah. 1998. *An Essential Hospital Package for South Africa: Selection Criteria, Costs and Affordability*. Small Applied Research Paper No. 3. Bethesda, MD: Partnerships for Health Reform Project, Abt Associates Inc.

For additional copies of this report, contact the PHR Resource Center at [PHR-InfoCenter@abtassoc.com](mailto:PHR-InfoCenter@abtassoc.com) or visit our website at [www.phrproject.com](http://www.phrproject.com).

**Contract No.:** HRN-5974-C-00-5024-00

**Project No.:** 936-5974.13

**Submitted to:** USAID/Johannesburg  
**and:** Robert Emrey, COTR

Policy and Sector Reform Division  
Office of Health and Nutrition  
Center for Population, Health and Nutrition  
Bureau for Global Programs, Field Support and Research  
United States Agency for International Development

---

# Abstract

The Committee of Enquiry into National Health Insurance (NHI) in South Africa recommended in 1995 that formally employed individuals and their employers be required to fund at least a minimum package of hospital coverage for workers and their dependents. This has recently been echoed in a Department of Health Policy paper on Social Health Insurance. This research aims to define and cost a minimum package of essential hospital care for competing (public and private) health insurers in South Africa.

Based on the objectives implicit in the NHI Committee report, the following criteria were used to define the essential package:

- ▲ the extent to which there was another appropriate responsible party who should pay for treatment,
- ▲ the degree of discretion in deciding whether or not to provide treatment, and
- ▲ the costs and effectiveness of treatment.

Of 598 possible hospital interventions, 396 were included in the package based on the above criteria. Using local mine hospital and private sector utilization rates and mine hospital cost data, the research estimates that an essential inpatient package for a person of working age and his or her dependents would cost around R502 per enrollee per year in 1998 prices. The research estimates that age-sex standardized outpatient care costs in the mine hospital population studied would be R183 per person per year. Thus, the total inpatient and outpatient hospital package would cost around R685 per person per year.

The results presented in this paper are intended to inform the process of defining a national essential hospital benefit package. Assuming that contributions were proportionally related to income, and that costs should not exceed 6 percent of payroll, the package should be affordable to all of those earning above R20,000 per year.

Significant additional work is required—first, at a technical level to assess the appropriateness of the prioritization approach used in this study, and second, to take the debate around essential hospital benefits to broader political and public fora.

---



---

# Table of Contents

Acronyms .....	vii
Foreword .....	ix
Acknowledgments .....	xi
Executive Summary .....	xiii
1. Introduction .....	1
2. Defining Essential Hospital Benefits .....	3
2.1 Criteria for Selecting a Mandatory Core Package of Hospital Services .....	3
2.2 Methods—Overview of the Process Followed .....	5
2.3 Defining the Universe of Possible Interventions .....	6
2.4 Prioritizing Interventions by Effectiveness, Degree of Discretion, and Cost .....	8
2.4.1 Effectiveness Rankings .....	9
2.4.2 Discretion Rankings .....	10
2.4.3 Cost Rankings .....	11
3. Assigning Costs to Diagnosis Treatment Pairs .....	13
3.1 Target Population .....	13
3.2 Sources of Cost and Utilization Information .....	13
3.2.1 Mine Hospital Data .....	14
3.2.2 Medical Scheme Data .....	15
3.2.3 UK National Health Service Hospitalization Data .....	16
3.2.4 Suitability of Different Utilization and Cost Data Sources .....	17
3.3 Standardizing Costs to the South African Context .....	18
3.4 Allocating Utilization and Cost Data to Oregon DT Pairs .....	20
3.4.1 Ensuring Code Compatibility .....	20
3.4.2 Mapping Cases onto Oregon Categories .....	21
3.5 Combining Data Sources .....	26
4. Costed Packages .....	29
4.1 Oregon Categories .....	29
4.2 Flexible Package Definition .....	29
4.3 An Optimal Combination of Criteria .....	35
5. Hospital Outpatient Services .....	37
5.1 A Normative Package of Hospital Ambulatory Services .....	37
5.2 Data Sources .....	38
5.3 The Hospital Ambulatory Package .....	39
5.4 Conceptual Issues Regarding Outpatient Services .....	40
6. Changes in Package Costs Over Time .....	43
6.1 Effect of Retired Members .....	43

6.2	The Impact of Aids and HIV .....	43
7.	Affordability .....	47
8.	Conclusions .....	49
Annex A	.....	51
Annex B	.....	59
Annex C	.....	63
Annex D	.....	71
Annex E—Bibliography	.....	77

---

## List of Tables

Table 2.1	Oregon Categories and Underlying Effectiveness and Discretion Ranks .....	9
Table 3.1	Comparison of Different Data Sources .....	18
Table 3.2	Weights Used to Combine Data Sources .....	26
Table 4.1	Spearman Rank Correlation Coefficients between Cost, Effectiveness and Discretion Criteria and the Original Oregon Categories .....	30
Table 4.2	Total Hospital Inpatient Cost per Person per Year (R 1998) Broken Down by Effectiveness, Discretion and Cost Scores .....	32
Table 5.1	Categories for Defining Ambulatory Services and Associated Costs .....	38
Table 5.2	Costs of Hospital Ambulatory Care in Mine Hospital and Medical Schemes Sectors .....	39
Table 7.1	Breakdown of Employed Persons without Current Medical Scheme Coverage plus their Dependents by Income Category .....	47

Table A-B-1 Twenty Most Important Included DT Pairs .....	59
Table A-B-2 Twenty Most Important Excluded DT Pairs .....	61
Table A-C-1 ASSA Model Input Assumptions .....	64
Table A-C-2 Cost Estimates by Stage of Disease .....	67
Table A-D-1 Effect of Flat R300 Subsidy per Enrollee on Overall Costs of Mandatory Coverage, and on Low-income Groups .....	75

---

## List of Figures

Figure 2.1 Adaptation of Oregon Categories .....	8
Figure 3.1 Methods of Allocating Hospital Admissions to Oregon DT Pairs. ....	22
Figure 3.2 Total Predicted Admissions by Oregon Category for Mine Hospital and UK NHS Data .....	23
Figure 3.3 Predicted Surgical Administration by Oregon Category for Mine Hospital and UK NHS Data .....	24
Figure 3.4 Total Predicted Admissions by DP Pair (cat. 11) for Mine, NHS, and Medical Scheme Data ....	25
Figure 3.5 Predicted Utilization Rates using Weighted Combination of Three Data Sources .....	27
Figure 3.6 Weighted Average, Highest Possible, and Lowest Possible Utilization Levels by Oregon Category .....	28
Figure 4.1 Cumulative Cost of Incrementally Added Interventions .....	30
Figure 4.2 A Three-way Priority Matrix .....	31

Figure 4.3	
Package Designed to Exclude All DT Pairs with a Score of 4 (worst) on Any of the Axes . . . . .	33
Figure 4.4	
Package Designed to Exclude All DT Pairs without a Best Score of 2 on Any of the Axes . . . . .	34
Figure 4.5a	
Total Package Cost by Best Rank on All Three Axes . . . . .	34
Figure 4.5b	
Total Package Cost by Worst Rank on All Three Axes . . . . .	34
Figure 6.1	
Ratio of Average Hospital Costs per Year between Age and Sex Groups . . . . .	44
Figure 6.2	
Costs of Treatment of HIV-related and Other Diseases, HIV Prevalence Rates and Percentage of Elderly Persons in Model Population . . . . .	45
Figure A-C-1	
Numbers of HIV-infected Persons in Model Population of 50,000 Members by Stage of Disease . . . . .	67
Figure A-C-2	
The Impact of HIV Infection on Insured Population Demographics by 5-year Interval . . . . .	68
Figure A-C-3	
HIV and non-HIV-related Spending per Enrollee per Year for Model Population . . . . .	68
Figure A-C-4	
Costs of Triple Anti-retroviral Therapy for Stage 4 HIV Disease as a Proportion of Total and HIV-related Expenditure . . . . .	69
Figure A-D-1	
Percentage of Individual Remuneration Spent on Core Package Coverage by Income Category and Number of Dependents . . . . .	73
Figure A-D-2	
Premiums as Percentage of Income by Minimum Income Level Included in the Fund and Level of Capping of Contributions . . . . .	74
Figure A-D-3	
Percent of Payroll Required for Core Package Coverage According to Highest-income Category Receiving Subsidy . . . . .	75

---

# Acronyms

<b>ARV</b>	anti-retroviral
<b>ASSA</b>	Actuarial Society of South Africa
<b>CPT, CPT-4</b>	current procedural terminology
<b>DRG</b>	diagnosis-related group
<b>DT</b>	diagnosis-treatment
<b>EOH</b>	Ernest Oppenheimer Hospital
<b>HES</b>	hospital episodes statistics
<b>HRG</b>	Healthcare Resource Group
<b>ICD-9, ICD-9CM</b>	International Classification of Diseases primary diagnostic codes
<b>ICD-10</b>	International Classification of Diseases primary diagnostic codes
<b>NERA</b>	National Economic Research Associates
<b>NHI</b>	National Health Insurance System
<b>NHS</b>	National Health Service
<b>OHS</b>	October Household Survey
<b>OHSC</b>	Oregon Health Services Commission
<b>OPCS</b>	Office of Population Censuses and Surveys
<b>PHR</b>	Partnerships for Health Reform Project
<b>QoL</b>	quality of life
<b>RAMS</b>	Representative Association of Medical Schemes
<b>SAR</b>	small applied research
<b>USAID</b>	United States Agency for International Development



---

# Foreword

Part of the mission of the Partnerships for Health Reform Project (PHR) is to advance knowledge and methodologies to develop, implement, and monitor health reforms and their impact. This goal is addressed not only through PHR's technical assistance work but also through its Applied Research program, designed to complement and support technical assistance activities. The main objective of the Applied Research program is to prepare and implement an agenda of research that will advance the knowledge about health sector reform at the global and individual country levels.

An important component of PHR's applied research is the Small Applied Research (SAR) program. Small Applied Research grants are awarded, on a competitive basis, to developing country research institutions, individuals and non-profit organizations to study policy-relevant issues in the realm of health sector reform. The SAR program has twin objectives: to provide data and analyses relevant to policy concerns in the researcher's own country, and to help strengthen the health policy research capacity of developing country organizations.

A total of 16 small research grants have been awarded to researchers throughout the developing world. Topics studied included health financing strategies, the role of the private sector in health care delivery and the efficiency of public health facilities.

SAR grant recipients are encouraged to disseminate the findings of their work locally. In addition final reports of the SAR research studies are available from the PHR Resource Center and via the PHR website. A summary of the findings of each study are also disseminated through the PHR In-brief series.

Sara Bennett, Ph.D.  
Director, Applied Research Program  
Partnerships for Health Reform

## *Small Applied Research Grants*

Dr. Joseph K. Konde-Lule (Institute of Public Health, Makerere University). "User Fees in Government Health Units in Uganda: Implementation, Impact and Scope."

Dr. R. Neil Soderlund (University of Witswatersrand). "The Design of a Low Cost Insurance Package."

Pedro Francke (Independent). "Targeting Public Health Expenditures in Peru: Evaluation of Ministry of Health Services and Procedures and Proposal of a Targeting System."

Alfred Obuobi (School of Public Health, University of Ghana). "Assessing the Contribution of Private Health Care Providers to Public Health Care Delivery in the Greater Accra Region."

V.R. Muraleedharan (Indian Institute of Technology, Department of Humanities and Social Sciences). “Competition, Incentives and the Structure of Private Hospital Markets in Urban India: A Study of Madras.”

Dr. George Gotsadze (Curatio International Foundation). “Developing Recommendations for Policy and Regulatory Decisions for Hospital Care Financing in Georgia.”

Dr. Aldrie Henry-Lee (The University of West Indies, Institute of Social and Economic Research). “Protecting the Poor, High Risk and Medically Indigent under Health Insurance: A Case Study of Jamaica.”

Dr. Maria C.G. Bautista (The Institute for Development Policy and Management Research Foundation, Inc.). “Local Governments’ Health Financing Initiatives: Evaluation, Synthesis and Prospects for the National Health Insurance Program in the Philippines.”

Oliver Mudyarabikwa (University of Zimbabwe). “Regulation and Incentive Setting for Participation of Private-for-Profit Health Care Providers in Zimbabwe.”

Easha Ramachandran (Institute of Policy Studies, Health Policy Programme). “Operating Efficiency in Public Sector Health Facilities in Sri Lanka: Measurement and Institutional Determinants of Performance.”

Dr. M. Mahmud Khan (Public Health Sciences Division, Center for Health and Population Research). “Costing the Integrated Management of Childhood Illnesses (IMCI) Module: A Case Study in Bangladesh.”

Dr. Arlette Beltran Barco (Universidad Del Pacifico). “Determinants of Women’s Health Services Usage and Its Importance in Policy Design: The Peruvian Case.”

Frederick Mwesigye (Makerere University, Makerere Institute of Social Research). “Priority Service Provision under Decentralization: A Case Study of Maternal and Child Health Care in Uganda.”

Dr. Gaspar K. Munishi (Faculty of Arts and Social Sciences, University of Dar Es Salaam). “The Growth of the Private Health Sector and Challenges to Quality of Health Care Delivery in Tanzania.”

Mathias L. Kamugisha (National Institute for Medical Research–Amani Research Center). “Health Financing Reform in Tanzania: Appropriate Payment Mechanism for the Poor and Vulnerable Groups in Korogwe District, Northeastern Tanzania.”

Dr. Joses Kirigia, Dr. Di McIntyre (University of Cape Town Health Economics Unit, Department of Community Health). “A Cost-Effectiveness Analysis of AIDS Patient Care in Western Cape Province.”

---

# Acknowledgments

Support for this work was provided by the Partnerships for Health Reform (PHR) Small Applied Research Grant Program (with funding from the U.S. Agency for International Development [USAID]), and the Anglo American Corporation of South Africa. Thanks to the Anglo American Corporation of South Africa, two anonymous medical scheme administrators, and Darren Coffman of the OHPA for supplying data. Thanks also to Margie Rauch, Jose Ravano, Brian Brink, Tennyson Lee, Max Price, Jane Doherty, Alex van den Heever, Patrick Masobe, and the participants at a number of workshops for useful comments on this work. Thanks also to Paul Chapman for the work he undertook on projecting the costs of HIV for medical schemes (Annex C). The opinions expressed in this document, and any factual errors, are the responsibility of the authors alone.

This final report was edited by Courtney S. Roberts, a consultant to Abt Associates Inc.



---

# Executive Summary

The Committee of Enquiry into National Health Insurance (NHI) recommended in 1995 that formally employed individuals and their employers, be required to fund at least a minimum package of hospital coverage for employees and their dependents. This coverage could be provided by private medical schemes or a future state health insurer. It is estimated that this would increase insurance coverage from the current figure of around 8 million persons by a maximum of 19.4 million beneficiaries. It is now more than three years since the NHI Committee released its recommendations, and no further work has gone into the design and implementation of such a package.

This research aims to define and cost a suitable possible minimum package of essential hospital care for competing (public and private) health insurers in South Africa. We realize that much broader input is required to mandate any minimum package, and it is hoped that this work stimulates wider consultation, as well as the necessary political debate to assess the acceptability of the NHI Committee proposal. In particular, we would hope that the Department of Health commission a technical working group to take the minimum benefits work conducted here to broader expert, public, and political fora.

There may be many possible objectives for defining an essential benefit package. These include improving health service efficiency, preventing catastrophic losses due to illness events, reducing reliance on public health services, harnessing cost-escalation, ensuring risk pooling and facilitating participatory democracy in health care spending. While none of these would be out of place in the South African context, the main objective of the proposed employee/employer mandate for a minimum package appears to be to prevent free use of public services by those who could afford low-cost health insurance, but not necessarily the costs of care at point of use. There is thus, by implication, an assumption of market failure in the low-cost health insurance market. The main reason for this is that low-cost care is unintentionally provided as a free good because public hospitals cannot turn away those in urgent need of care. Collecting fees after the event from those who can afford to pay has proven extremely difficult. We thus assumed that the main objective of the core package was to establish a “minimum insurance,” designed to prevent public hospitals from having to fulfil this role.

The criteria used to define the essential package, in order of priority, were:

- ▲ The extent to which there was another responsible party who should pay for treatment
- ▲ The urgency (or degree of discretion) of required treatment, and
- ▲ The cost-effectiveness of treatment

In order to define the essential package, a list of approximately 750 diagnosis-treatment (DT) pairs, describing almost all possible health care interventions, was adapted from the Oregon Health Plan Administration benefit descriptions. Primary care and chronic psychiatric/infectious disease treatments were excluded. It was determined that these services should be funded from tax revenue because delivery of them contributed to upholding the public good. The remaining 598 diagnosis-treatment pairs were allocated to discretion (or urgency), effectiveness, and cost categories in order to facilitate the prioritization process. Interventions were then ranked according

to various mixes of these three criteria, as well as a 17-point priority scale developed by the Oregon Health Services Commission (OHSC). The final “core-package” adopted excluded all interventions that were either very high cost, ineffective, or for non-urgent, non-life-threatening conditions. It included all non-elective surgical procedures, elective surgical admissions for life-threatening conditions, maternity care, comfort care for the terminally ill, and virtually all medical admissions.

In order to cost the essential benefit package, hospital inpatient utilization data were drawn from mine hospitals and private medical schemes (health insurers) in South Africa, and National Health Service (NHS) hospitals in the United Kingdom. Data were age-sex standardized to represent formally employed South Africans without current medical scheme cover. There were problems with the validity, accuracy, and generalizability of each of the individual utilization data sets, and we attempted to combine them in a complementary manner. Unfortunately, no data were available from the largest hospital network in South Africa—provincial acute hospitals. Expected utilization levels were then costed using mine hospital cost data. Data on expected utilization levels of outpatient services could not be broken down into diagnosis-treatment pairs, and it was assumed that current experience of mine hospital users would apply to the insured population. After adding capital and administration costs and adjusting for inflation, it was estimated that the “core inpatient package” would cost around R502 per enrollee per year in 1998 prices.

The same prioritization process could not be completed for outpatient care because of the lack of diagnostic information. Instead, total, actual outpatient care costs were extrapolated from the mine hospital population. Age-sex standardized expected outpatient costs amounted to R183 per person per year. It was thus estimated that the total combined cost of the inpatient and outpatient components of the package would be around R685 per person per year.

We attempted to simulate the potential impact of two future phenomena, population aging and HIV infection rates, on the costs of the core package. It was assumed that the employer mandate would apply, in the first instance, to currently employed persons. If retired persons were to join, however, or a national risk-equalization mechanism were introduced to effect cross-subsidy of the elderly by the young, then we would expect costs to increase. Simulation exercises suggest that this increase would be modest—not more than 10 percent in the case of a risk-equalization mechanism based on age. HIV/AIDS, on the other hand, will almost certainly have a significant impact on core package costs, even if high-cost anti-retroviral treatments are not offered. In the absence of significant advances in either the prevention or treatment of HIV disease, it was estimated that current service levels would require around 50 percent of essential hospital package revenue by the year 2025.

Finally, we attempted to assess affordability of the essential package for currently uncovered formal sector workers and their dependents. Affordability assumptions are based on the type and amount of cross-subsidies for which legislation has been passed. In the absence of such information, estimates should be treated as indicative only. Assuming no income cross-subsidies for workers earning less than around R20,000 per year, the package would impose a significant economic burden. Covering workers below this income level would require either a subsidy from tax revenue or a mandated cross-subsidy from higher income insured persons. A mandate applying to those earning R20,000 or more and their dependents would expand insurance coverage by about 7.5 million persons.

The results presented in this paper are intended to inform both the regulatory reform of private medical scheme coverage in South Africa and the design of a future state health insurance product. Significant additional work is required—first, at a technical level to assess the appropri-

ateness of the prioritization approach used here, and second, to take the debate around essential hospital benefits to broader political and public fora.



---

# 1. Introduction

Health insurance is a natural and widespread response to the unpredictable nature of the need for health care. A rational and risk-averse individual, in the absence of publicly funded health care, will compensate for the risk of needing health care by saving money or buying health insurance coverage. Societies have developed different institutional arrangements under which health coverage is provided.

In South Africa, the majority of the population has access to hospital care through a tax-financed, public hospital system. Free access to this system is granted on the basis of a means test at point of entry. In practice, however, the means test is rarely applied, and most citizens receive care free of charge. The system is under increasing strain due to decreasing budgetary allocations in the face of constant or increasing demand for care (McIntyre, 1995; Van den Heever, 1996). This situation will be aggravated by planned shifts of spending from hospital-based care to primary health care (Van der Heever, 1996; Committee of Inquiry into a National Health Insurance System, 1995).

A relatively small proportion of the population has access to private health insurance, or “medical scheme” coverage. (Estimates range from 18 to 23 percent of the population depending on the type of coverage.) This industry was deregulated in 1989 and again in 1994 to allow schemes to risk-rate premiums and refuse membership to high-risk applicants. The industry also was permitted to refuse benefits to seriously ill members. These changes made medical scheme membership more attractive to young and healthy persons and caused an increase in dumping the seriously ill from medical scheme coverage and forcing them to receive state-sponsored care. The net effect was an increase in demand for hospital care in the public sector.

In summary, the health care financing system in South Africa is encountering the following problems:

- ▲ There is an urgent need to provide basic primary care facilities for the poor, which were not provided in the past.
- ▲ The extra resources required by primary care provision will almost certainly require a reduction in public hospital spending. Most public hospitals are already considerably overburdened and would find it difficult to adapt to cuts.
- ▲ Although hospitals have a theoretical duty to collect revenue from patients who can afford to pay, the means-tested, point-of-service user fee system no longer operates effectively.
- ▲ Private insurance is: unaffordable for most South Africans, rife with incentives that encourage inefficient and/or inappropriate medical services, and increasingly resorts to excluding high-risk individuals from cover. These high-risk ex-members increase the burden on state hospitals.

The South African Committee of Inquiry into National Health Insurance, reporting in 1995, suggested that all formal sector employees be required to purchase insurance coverage for at least a

minimum package of essential hospital services. Existing medical aid schemes or health insurers or a putative state health insurance scheme could provide this coverage. In addition, medical schemes would be re-regulated so that all policies had to offer at least the minimum package. Furthermore, premiums for at least the core benefit package would be the same for all members of a given scheme,<sup>1</sup> and open enrollment and confining membership would be guaranteed.

An alternative to enforced premium regulation would be the introduction of a risk-equalization mechanism between insurers. This would operate with regard to the expected costs of core package coverage, thus enhancing the possibility for transfer between schemes, and protecting schemes that had high levels of bad risks (Söderlund and Khosa, 1997). A number of influential international organizations including National Economic Research Associates (NERA) from the United States, the United Kingdom Kings Fund, and the World Bank (Towse, 1995; NERA, 1996; World Bank, 1993) have advocated the minimum essential package approach to regulating health care coverage. It is envisaged that minimum benefits would apply initially to private and public health insurance. However, there is an implicit understanding that state hospitals would, with time, see it as their obligation to provide the same minima to the indigent population they serve.

The NHI Committee Report is rather vague on the details of the proposed core benefit package, except in that it should cover only hospital care. Many questions need to be resolved in defining how the reformed insurance environment would be constituted and funded. This paper discusses possible objectives in defining a core package for South Africa, and isolates from these objectives key criteria that may be used to define the package. It then uses these criteria to define a suggested core benefit package based on the application of technical criteria alone. Using a variety of utilization data, likely costs of providing the package to a standard South African population are estimated. These costs enable the affordability of the package to be assessed.

We do not propose that the package defined in this report become the essential hospital package for South Africa, but rather that it be used to stimulate and inform debate among experts, the public, and politicians.

---

<sup>1</sup> The term “community rated” is used here to refer to uniform premiums for all members of a medical scheme, or a so-called option within a medical scheme.

---

## 2. Defining Essential Hospital Benefits

Given the South African health care financing context described in chapter 1, it is possible to claim a number of possible objectives for mandating a minimum package of hospital cover. Other countries have applied some of these objectives in their own prioritization exercises, and we would like to refer readers to other sources for a review of the theoretical basis for, and international experience with each of these objectives (Khosa et al., 1997; Söderlund, 1998).

Approaches to defining the essential package may be classified on two axes: 1) whether entitlements are explicitly or implicitly defined and 2) in the case of explicitly defined packages, whether the package is defined in terms of its cost or the actual services available.

An implicit approach—defining a package that consists of all services currently available at public hospitals—has been suggested for South Africa (Department of Health, 1997a). However, there is considerable uncertainty as to what entitlements would be included under such an arrangement. Existing public hospital services are still largely a product of the apartheid state, with previously white urban areas having substantially greater access to care than townships and rural areas. The implicit approach thus entrenches system inequity. It also potentially exposes the funders of such a package to considerably more cost-escalation risk. For example, one only has to demonstrate that a public hospital somewhere in the country does breast reduction surgery to secure an “in principle” entitlement to such services. Hence, the implicit approach to package definition was rejected.

Explicit approaches to package definition would guarantee the individual entitlement, which is enforceable in the same way as any other insurance contract. Conventionally, South African medical schemes have defined the individual entitlement as a financial ceiling on claims. Financial approaches to limiting benefits are easy to specify and limit insurer risk quite predictably. They have a number of disadvantages, however. First, enrollees who exceed financial limits are generally those who are seriously ill and in most need of insurance coverage and for whom the state will have to take responsibility. Second, such limits have no effect on the appropriateness or efficiency of health care delivered. For example, as long as total claims fall below the ceiling, access to cosmetic surgery would be the same as to emergency medical care. Since there is virtually no limit to discretionary types of care, this approach to limiting benefits also contributes to moral hazard and cost-escalation.

In the context of the problems with implicit and explicit approaches to package definition, we propose that entitlements be explicitly defined. The only desirable approach to defining the employer package in South Africa is to specify which services necessary to treat which specific illnesses are covered. The rest of this paper goes elaborates the definition of such a package.

---

### 2.1 Criteria for Selecting a Mandatory Core Package of Hospital Services

From the NHI Committee Report, it would appear that the primary objective of the employer mandate is to generate additional funds for public hospitals from people who can afford to pay, and hence relieve pressure on public hospital budgets. It seems, therefore, that the objective of

introducing a core hospital package was to establish a “minimum public insurance,” i.e., to force individuals to buy insurance for care that the state, because of its position as *de facto* last resort insurer, has no choice but to cover through its hospital network. The core package is thus a mandate on how individuals (and their employers) should spend private resources, and has no direct effect on the rationing of public health resources. This primary objective distinguishes the South African case from other prioritization exercises internationally (Klevit et al., 1991; Kitzhaber, 1993; Cooper, 1995; Bobadilla et al., 1996; Ham, 1997), as well as other public sector prioritization exercises in South Africa (Daviaud and Cabral, 1997).

Consequently, the following three criteria were applied to the development of a core hospital benefit package for South Africa based on the objectives implicit in the NHI Committee Report.

## 1. Exclusion of services for which there are other responsible parties:

At the outset of the core package definition exercise, we determined that some areas of health care should be excluded from the mandatory package, either because there was an *a priori* commitment to provision by other parties, or because such areas of care were unlikely to be amenable to insurance-based financing. The following areas of care were thus excluded.

- ▲ **Primary care** (defined as preventive and promotive care, and basic, clinic level curative services). This was excluded, in the first instance, because of a strong government commitment to the provision of primary care free-of-charge to all citizens. Second, many areas of primary care, especially the preventive and promotive aspects, benefit society at large, rather than simply the individual immediately affected. In economics, such goods are referred to as positive externalities. If simply left to the market, there will be a tendency to under-consume such goods (Donaldson and Gerard, 1993). This provides a strong justification for the provision of primary care services from tax revenue, rather than via an insurance mandate.
- ▲ **Hospital care for mental illness and chronic infectious diseases.** In this case, the externalities argument is likely to apply. Individuals, for example, may be unwilling to pay for coverage for tuberculosis, whereas society as a whole, recognizing the risk of infection spreading, is likely to agree to pay for such care for those who need it. On a practical level, many people with long-term psychiatric disorders requiring hospitalization, or chronic infectious diseases, will be unemployed, and would thus not be affected by mandatory core package coverage for the formally employed.
- ▲ **Occupational illnesses and injuries.** These are covered by the relevant pieces of labor legislation.

## 2. The extent to which the provision of a given treatment is discretionary:

The questions of whether immediate treatment is required to prevent death or permanent disability; whether the attending doctor has some discretion regarding the timing of treatment; or whether treatment should be given at all also were considered in prioritizing basic package coverage. Treating pneumonia, therefore, would be considered of higher priority than surgical removal of a suspicious breast lump, which would in turn be of higher priority than cataract removal, regardless of their relative cost-effectiveness. One form of empirical evidence of the “degree of discretion” in providing a given service is the amount of variation in provision rates given equal levels of need and resource availability (Fisher et al., 1992). Typically, high rates of

variation are evident for elective surgical procedures such as hysterectomies, hip replacements, and tonsillectomies (McPherson et al., 1981).

### **3. The cost and effectiveness of interventions:**

Given that the package size will inevitably be resource constrained, a cost-effectiveness analysis is needed to modify criterion 2 (above). For example, in a case of acute liver failure, where a liver transplant is urgently required to save life, the poor cost-effectiveness of the procedure may still preclude it from being provided. In the prioritization exercise that follows we have treated cost and effectiveness considerations separately to allow greater flexibility in package design and allow for the combination of local cost data with international effectiveness data.

---

## **2.2 Methods—Overview of the Process Followed**

The following steps were followed to define what we felt was an adequate first attempt at a package of inpatient hospital services based on the criteria of need for hospital care, degree of treatment discretion, and effectiveness and cost of care. The details follow in chapters 4 to 6 of this document:

- ▲ **Defining the universe of possible medical interventions that insurance could cover (Chapter 4):**

- Obtain an existing comprehensive list of possible health care interventions (the “Oregon list”).

- Add locally required categories to the list.

- Exclude non-hospital interventions, psychiatric, and long-stay interventions from the list.

- Define a three-way matrix of varying degrees of cost, effectiveness, and discretion in order to “rank” interventions on each of these axes.

- ▲ **Assessing expected costs for each category of care (Chapter 5):**

- Define an appropriate target population who would be covered by the core package.

- Assess suitable data sources and extract utilization rates according to diagnosis and procedure codes.

- Map codes in source data sets onto codes used for the Oregon list in order to obtain utilization rates in a standard form.

- Age-sex standardize utilization rates to represent the target population for insurance coverage.

- Convert utilization rates and/or local costs to standard costs using a purchasing parity equivalence ratio.

Combine weighted cost estimates from different data sources to yield a single cost estimate per person per year for each category.

▲ **Applying prioritization criteria to costed DT pairs (Chapter 6):**

This section contains information on the application of various prioritization approaches in selecting subsets of clinical services to be included in the package.

---

## 2.3 Defining the Universe of Possible Interventions

When defining the universe of interventions, the sheer number possible interventions can be overwhelming. The most recent revision of the International Classification of Diseases (ICD-10) lists a total of just under 10,000 possible diagnoses. Additionally, typical procedure coding systems, such as the U.S. Current Procedural Terminology (CPT) defines more than 30,000 possible medical interventions. Even if we assume, conservatively, that there are around 10 procedures that could be selected for each diagnosis, there is still a list of 100,000 possible medical interventions. If we then take into account other patient characteristics, such as age and gender, the list expands to an unmanageable number.

Fortunately, considerable work has already been done on how to summarize all possible health care interventions into a manageable number of categories. Perhaps the best known example of this work is the diagnosis-related group (DRG) system developed by Fetter and colleagues at Yale University in the 1970s and 1980s (Fetter et al., 1980). This system categorizes all possible reasons for hospital admission into 470+ groups. Numerous derivatives of the DRG approach have been spawned in the United States (McGuire, 1991; Tatchell, 1983; Vladeck and Kramer, 1988; Brewster et al., 1985) and other countries (Hindle et al., 1991; Casas, 1991; Söderlund, 1994). Crucially, these have all attempted to cluster types of hospital admission according to their expected costs. However, because costs *per se* do not feature at all in the list of criteria that were selected to define the South African core package, DRG-like categorization systems might be less than ideal.

“Severity” categorization systems have been developed (Gonnella et al., 1984; Knaus et al., 1986), but these also are less relevant to the South African core package. These systems often require detailed data collection, including case-note abstraction, and may be meaningful only for severely ill patients, for example, ICU admissions.

Only one categorization system, to the best of our knowledge, has attempted to cluster illness episodes with the purpose of defining a package of essential services. This was undertaken by the OHSC as part of the Oregon Medicaid rationing experiment (Oregon Health Services Commission, 1991). A total of 745 DT pairs were defined in terms of primary diagnostic (ICD-9CM) and procedure (CPT-4) codes, according to the latest revision of the Oregon list that the OHSC kindly provided to us. A more detailed description of the relevance of the Oregon rationing approach to South Africa is provided elsewhere (Khosha et al., 1997).

However, because the Oregon DT pairs system was not ideal for the purposes of this study, the following modifications were made:

▲ **Creation of new DT pairs:**

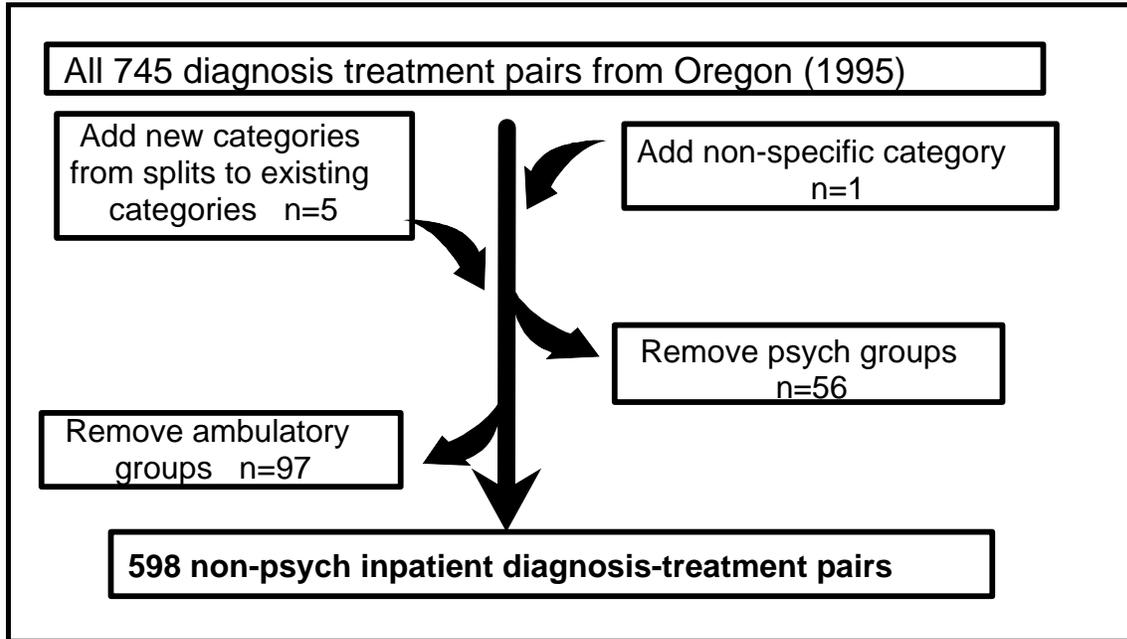
Some Oregon DT pairs appeared to be insufficiently specific with regard to common medical interventions in South Africa. In these instances the Oregon category was split according to local requirements. For example, the low birth weight category in the Oregon list included all babies under 2,500g. In reality, however, we know that the *de facto* cut off point for aggressive resuscitation of such babies in public hospitals in South Africa is around 1,000g, and in the most sophisticated settings, around 500g. Consequently, the low birth weight category was split into three new groups—1,000–2,500g, 500–1,000g and <500g. In other instances, only one treatment option was given for certain conditions, and this treatment option did not accurately reflect practice in South Africa. For example, for certain causes of liver failure, liver transplant was viewed as the only possible treatment by the Oregon system, whereas, in South Africa, supportive or palliative medical therapy might have been more usual. Five new DT pairs were created to reduce these inconsistencies.

Lastly, it was necessary to create an additional non-specific category to account for differences in diagnostic coding among the countries from which data were taken and for non-specific codes or uncoded cases. In total, six new DT pairs were created.

▲ **Elimination of obsolete DT pairs:**

First, for reasons outlined above, all admissions for mental illness were removed from the Oregon list (56 DT pairs). Pairs that referred to interventions conducted almost exclusively in an ambulatory setting were also excluded from our study because of the need to develop a hospital package. Utilization information was unavailable by diagnosis for ambulatory care, and consequently could not be costed. Determining need for hospital, as opposed to for ambulatory care, was done by the first author. An intervention was considered to require hospital care if either hospital-based supportive care or a sterile operating facility were required. Our approach was conservative in that, even where there was a small likelihood (<10 percent) that hospital care was required, a group was included. This resulted in the loss of 97 DT pairs, leaving a total of 598 for use in this exercise. The process used to adapt the Oregon categorization system is summarized in Figure 2.1.

Figure 2.1  
Adaptation of Oregon Categories



## 2.4 Prioritizing Interventions by Effectiveness, Degree of Discretion, and Cost

After excluding non-hospital care, we clustered the residual 598 DT pairs according to degrees of discretion, effectiveness, and cost of care. Fortunately, these were also the key considerations of the Oregon team, whose final classification system (1991) used the joint criteria of effectiveness and degree of urgency to allocate procedures into one of 17 priority categories. Underlying the 17 priority categories are simple urgency and effectiveness classification systems. By combining local cost data with the 17 Oregon categories, therefore, we obtained an idea of urgency, effectiveness, and cost of each of the 598 Oregon intervention groups. Although discretion and effectiveness are combined in the 17 Oregon categories, we separated them into distinct classification axes for the purposes of this exercise. These are illustrated in table 2.1.

Oregon Rank	Oregon Category	Examples	Effectiveness Rank	Discretion Rank
1	Acute fatal—full recovery	Appendectomy for acute appendicitis	1	1
2	Maternity care	Delivery and newborn care	1	1
3	Acute fatal—partial recovery	Surgery for intra-cerebral bleeding	2	1
4	<i>Preventive care for children</i>			
5	Non-urgent fatal—treatment improves life span or QoL	Hysterectomy for uterine cancer	2	2
6	Fertility control	Sterilization and contraception	1	4
7	Comfort care for terminally ill		3	1
8	<i>Preventive dental care</i>			
9	<i>Proven effective preventive care—adults</i>	<i>BP screening, cervical cancer screening</i>		
10	Acute non-fatal—treatment effective	Treatment of dental caries	1	3
11	Chronic non-fatal—one off treatment improves QoL	Hip replacement, cataract surgery	2	4
12	Acute non-fatal—treatment causes partial improvement	Surgery to repair knee ligaments	2	3
13	Chronic non-fatal—ongoing treatment improves QoL	Medication for sinusitis, migraine	3	4
14	Acute non-fatal—treatment symptomatic only	Treatment for acute viral infections	3	3
15	Infertility services	IVF, tubal microsurgery, Clomid	2	4
16	<i>Less effective preventive care—adults</i>	<i>Sigmoidoscopy for under 40s.</i>		
17	Treatment for conditions with minimal symptoms	Cosmetic surgery	4	4

Note: italics indicate non-hospital care categories excluded from this study.

### 2.4.1 Effectiveness Rankings

Effectiveness rankings were taken from the original Oregon priority setting exercise, and were defined as follows:

- 1– Non self-limiting condition and treatment reduces mortality by at least 25 percent at five years for fatal conditions; or net benefit from treatment is greater than 0.01 for non-fatal conditions; and at least 90 percent of those surviving with treatment return to their former health state; or average quality of life following treatment is greater than 0.9.

- 2– Non-self limiting condition and, for acute conditions, treatment reduces mortality by at least 25 percent at five years; and less than 90 percent of those surviving return to former state of health; and quality of life with treatment is less than 0.9 or for chronic conditions, either a sustained benefit of greater than 0.01 is achieved from a single treatment; or 5-year mortality is reduced by at least 25 percent.
- 3– Non-fatal conditions only for self-limiting acute conditions and net benefit from treatment is greater than 0.01 or for chronic conditions; net benefit is greater than 0.01 but is not sustained.
- 4– For non-fatal conditions, net benefit is no greater than 0.01; or for fatal conditions, mortality is reduced by less than 25 percent at five years, and net benefit is no greater than 0.01.

The OHSC applied these algorithms to nine of the 17 categories. Of those excluded, the preventive categories (4, 8, 9, and 16) were not of interest to this study. We allocated categories 2, 6, 7, and 15 ourselves based on the same algorithms. Only category 2 contributed a significant number of cases, and we felt justified in allocating the highest effectiveness score here given high rates of perinatal and maternal mortality in South Africa.

## 2.4.2 Discretion Rankings

Discretion rankings aim to represent the ability of a treatment institution to defer treatment until a later time when more objective rationing procedures could be followed with regard to spending of limited public funds or when individuals could make arrangements to acquire private funds to pay for treatment. Discretion rankings would consequently correspond closely with the notion of “urgency” of required care. A discretion score of 1 implies that an attending doctor would have little choice but to treat a patient, whereas a score of 4 indicates that treatment can be indefinitely delayed without causing an irreversible drop in health status.

Discretion rankings are defined as follows:

- 1– Without treatment, mortality is at least 1 percent, and for treatment to be optimally effective, it must be administered within 24 hours.
- 2– Without treatment, mortality is at least 1 percent, and treatment will still be effective if administered later than 24 hours after diagnosis.
- 3– Without treatment, mortality is less than 1 percent, but one-off treatment must be administered within 24 hours to obtain optimal sustained improvement in quality of life.
- 4– Without treatment, mortality is less than 1 percent, and treatment does not have to be administered within 24 hours in order to obtain any quality of life gains that might accrue.

Once again categories 2, 6, 7, and 15 were not considered by the OHSC. We considered that there were sufficiently high risks of death during pregnancy, and in the event of these, treatment was usually urgently required. Consequently, we gave these categories a discretion score of 1. The

discretion scores allocated to other categories are not that important because few to no cases fell into these categories.

### 2.4.3 Cost Rankings

Unlike the above two ranking systems, which were derived from the OHSC system, cost rankings used were derived using local data. The methods used to calculate cost per enrollee year of treatment are described in a subsequent section. Cost rankings were calculated by dividing the total cost of treating a given condition for the whole standard population by the target population size. Effectiveness information reflects the benefit that accrues to an individual who receives the treatment in question. Since effectiveness rankings measure the gain to an individual, comparable costs should also be per patient treated. To transform costs per person year to costs per patient course of treatment, we followed several steps:

- ▲ Condition-treatment pairs were classified by the first author according to whether admissions were likely to be one-off events or one of a series of admissions for same condition for a given individual. Scores (hereafter termed “readmission scores”) were given such that:
  - 1– A condition-treatment pair where the full course of treatment is likely to be completed in one admission. For example, cataract surgery, varicose vein stripping, treatment for trauma.
  - 2– A condition-treatment pair where a course of treatment might take more than one admission to complete, but where readmissions were sequential and likely to be less than two in total. For example, surgery for congenital heart disease.
  - 3– A condition-treatment pair where admission is for chronic or incurable diseases likely to need repeat admissions indefinitely. For example, HIV-related diseases, epilepsy, incurable cancers, renal failure.

Where there was uncertainty about what score should be allocated, a score of 2 was given.<sup>2</sup>

- ▲ We assumed that DT pairs had average readmission rates ( $R_i$ ) equal to their readmission score per year. This implied that if the number of admissions for the whole population in DT pair  $I$  equaled  $X_i$ , then the number of benefitting individuals is given by  $X_i/R_i$  (That is, for readmission score 1,  $X_i/1$  individuals benefitted, for readmission score 2,  $X_i/2$  individuals benefitted, and for readmission score 3,  $X_i/3$  individuals benefitted from treatment).
- ▲ Costs per complete course of treatment per year were thus calculated as :

$$CY_i = C_i * R_i / X_i \quad (2i)$$

---

<sup>2</sup> For some chronic conditions, however, such as renal failure or hematological conditions requiring repeat chemotherapy, many more contacts than three per year with health services were likely to be required. Hospitals studied, however, had inconsistent policies with regard to whether such episodes were recorded as inpatient or outpatient treatments. We have thus retained a value of three admissions per year as the maximum.

Where  $CY_i$  = cost per complete course per year, and  $C_i$  = total cost of treatment for condition  $I$ .

- ▲ Treatment costs per year were aggregated into four groups according to total cost per course of treatment. The groups were created so that their size was inversely related to the average cost of the group. This was to allow more specific consideration of the highest cost groups.

Group 1– R0–6,000 per treatment course per year.  
Group 2– R6,000–R12,000 per treatment course per year.  
Group 3– R12,000–R24,000 per treatment course per year.  
Group 4– Greater than R24,000 per treatment course per year.

Section 6 describes the approaches that were used to obtain cost and utilization information for each of the Oregon DT pairs. In Section 6, this information is combined with the prioritization approaches suggested in this section (both the 17 original Oregon categories, and the 4 x 4 x 4 matrix ) to suggest a number of feasible essential care packages for South Africa.

---

## 3. Assigning Costs to Diagnosis Treatment Pairs

---

### 3.1 Target Population

The target population assumed for this study is the population of formally employed South Africans without current access to medical scheme coverage and their dependents. Data on this population of approximately 20.7 million people were drawn from the 1995 October Household Survey (provided by Central Statistical Service, 1996). All utilization and cost estimates were standardized to this population according to gender and eight age strata, namely:

- ▲ 0–12 months
- ▲ 1–4 years,
- ▲ 5–14 years,
- ▲ 15–24 years,
- ▲ 25–44 years,
- ▲ 45–59 years,
- ▲ 60–74 years, and
- ▲ 75+ years.

---

### 3.2 Sources of Cost and Utilization Information

Few public or private health sector providers or purchasers in South Africa routinely collect utilization and cost data. Most conspicuously absent were data from public hospitals in South Africa, none of which collect individual patient-level demographic, diagnosis, procedure, or cost data. The data sources that have been used are thus limited in terms of both their generalizability and accuracy. As far as was possible, however, we tried to combine data such that the strengths of one data source complement the weaknesses of others. The result is a hybrid set of utilization and cost data that comes from no single population, but which is thought to best represent the likely utilization and cost patterns of the target population for the core hospital benefit package.

### 3.2.1 Mine Hospital Data

Data were taken from three large Anglo-American Gold Division mine hospitals for the financial years 1992–93 to 1995–96. The hospitals provide all inpatient and outpatient specialist care for two main populations:

- ▲ Low-income mine workers living in mine accommodation or in close proximity to the mine. Dependents are not covered.
- ▲ Middle-income mine employees and their families who are covered by an in-house medical scheme that uses the mine hospital and clinic system as its primary provider (less than 1 percent of scheme spending is on outside care).

The population studied represented a total of 648,000 person years of enrolled members, the vast majority of whom were of working age. While there were significantly lower proportions of women and children in the sample denominator population compared to the target population (12 percent of the population were female, and 9.6 percent were less than 15 years of age), we believe the numbers were sufficient to get relatively robust estimates of likely utilization for these groups. The elderly were virtually absent from the study population, but since the target population was of working age, this was not particularly relevant.

The hospitals studied operate a data capture system for both inpatients and outpatients, which tracks attendance for each category:

- ▲ patient identifiers and demographic information,
- ▲ diagnoses,
- ▲ procedures undertaken, and
- ▲ costs by eight major cost centers—wards, operating theater, outpatient clinics, drugs, pathology, radiology, physiotherapy and occupational therapy. (Capital costs were not included in the data.)

Most major surgical and medical specialty services are offered, and no co-payments are paid by users for inpatient or outpatient services. For the purposes of this analysis, all utilization and associated costs due to occupational disease and accidents, and pulmonary TB in workers exposed to dusty conditions, were excluded from the analysis.<sup>3</sup> Employers of formal employees in the mining sector have a legal obligation to provide care for occupational diseases, and the Workman’s Compensation Fund has the same obligation to industrial sector employees. Thus, the core benefit package would not have to fund this care. We also excluded costs due to long-stay rehabilitation, tuberculosis, and mental illness care since these were excluded from the package at the outset.

While utilization data with diagnosis and procedure codes were recorded for the full sample, cost data were incompletely recorded for all but the largest hospital—Ernest Oppenheimer Hospital (EOH)—for the latest year of analysis (1995–96). Consequently, we drew expected

---

<sup>3</sup> Since we could not determine whether tuberculosis was occupationally related, we assumed that half of the cases developed by underground or surface dusty condition workers were due to work, and half would have occurred anyway.

utilization data from the full sample, but drew actual costs only from EOH for the 1995–96 financial year. These were then used to calculate an average cost per day in constant 1995 rands for each ICD-9, 3-digit code, which was multiplied by lengths of stay for episodes in all other years to yield a cost estimate for every admission in the four-year data set. That is:

$$C_{ij} = ACD_j * L_i \quad (3i)$$

Where :

$C_{ij}$  = Cost of episode  $I$  in diagnostic category  $j$  for hospital year other than EOH 95–96

$ACD_j$  = Average cost per day of diagnostic category  $j$  in EOH 95–96.

$L_i$  = Length of stay of episode  $I$  in category  $j$ .

This simple cost-allocation formula thus assumes that the cost-structures of EOH in 1995–96 applied to all hospitals for all four years. Differences in diagnostic mix among hospitals and over time were maintained by this approach.

### 3.2.2 Medical Scheme Data

Membership and claims data for hospital and outpatient specialist care were obtained from six medical schemes covering a total population of 153,000 enrollee-years (i.e., principal members and dependents). At the request of the administrators, the names of the schemes used have been kept anonymous. Where individuals were members for less than a full year, they contributed only a proportion of a person year to the denominator population. The enrollee population contained a broad mix of employed and retired persons from all regions of South Africa. They included a mixture of open enrollment and company schemes. Data on income and race were not available for all enrollees; however, it is probably safe to assume that most enrollees are middle- and upper-income whites. Data were for the 1995 calendar year.

Utilization and charge data were organized by medical schemes in the form of individual claims records, with multiple claims being made from different providers during a single admission. Very little information on true costs is recorded, and charges were used to represent costs in these data. To state it slightly differently, we studied costs to insurers, rather than true economic costs. For each claim, the following items of information are recorded:

- ▲ enrollee number,
- ▲ provider,
- ▲ type of provider, (e.g., general practitioner, hospital, pharmacy, pathology, etc.),
- ▲ gazette code for service performed,
- ▲ number of units of service provided (e.g., days of stay for hospital claims),
- ▲ date of service,
- ▲ amount claimed, and

- ▲ amount accepted for payment.

There are important differences between the operation of private sector hospitals and that of other providers in South Africa. The most significant is that doctors and many other service providers are not hospital employees, and bill medical schemes on a fee-for-service basis. Consequently, the first step was to aggregate all claims that were made between the dates of admission and discharge into a single discrete hospital treatment episode. Most schemes record codes of procedures performed, but not diagnoses. We thus characterized each set of claims aggregated into an admission episode according to what was deemed the most important procedure performed. The highest-cost medical practitioner procedure code (i.e., Gazette codes 0205-3304) recorded during a hospital admission was deemed the reason for the admission. Diagnostic radiology and laboratory tests were always assumed to be secondary to other reasons for admission.

Cost estimates were inferred from charge data. First, the amounts accepted by the medical scheme for payment, which were generally the centrally negotiated Representative Association of Medical Schemes (RAMS) rates, were assumed to represent the total cost of care. Any co-payments made by patients, could not be identified. Although it was possible to flag instances where the claim was higher than the medical scheme actually paid, it was not possible to determine the reason for this. In many instances, this would have been because claims were duplicates, of dubious justification, or even fraudulent. Consequently, we did not think it advisable to include these unpaid claims as costs.

### **3.2.3 UK National Health Service Hospitalization Data**

A third data set was used from UK hospitals because of deficiencies in the two South Africa sources. This represented all hospital admissions for residents of five NHS regions for one financial year (1994/5), and was drawn from the Hospital Episodes Statistics (HES) data set (Department of Health, 1996). It represents 16.4 million person years of denominator population. All age, gender and socioeconomic groups were represented in the study population.

The NHS identifies hospital admissions according to an admitted patient's area of residence. It is thus possible to accurately link denominator geographic population to associated hospitalizations. The vast majority of hospital care in the UK is provided by NHS hospitals. These data do not include information the small amount of care (approximately 3 percent of total health care spending) that is private hospitals provide. Most of the care provided in the private sector is related to elective surgery, and the utilization estimates obtained from NHS hospitals might thus under-represent true levels of need for this type of care. Utilization levels by diagnostic category in the UK would be expected to differ significantly from that in South Africa because of differing disease incidence, thresholds for admission, and capacity in the primary care sector. Consequently, while utilization estimates from England are likely to be precise, there are problems of inter-country generalizability. UK NHS hospitals do not routinely record cost data at the level of individual admissions. It is possible, however, to infer relative cost weights for each admission, which can then be used to allocate total hospital costs to individual patient admission episodes.

### 3.2.4 Suitability of Different Utilization and Cost Data Sources

Table 3.1 identifies the salient features of each of the data sources. The mine hospital data covered a population very similar to the target population, although estimates for women, children, and the elderly may be inaccurate because of small sample sizes for these groups. Because of some rationing of services within these hospitals, we might also expect there to be “unmet demand”<sup>4</sup> for some non-urgent elective surgical procedures. The quality and range of data from this source were significantly superior to either of the other two sources.

The medical schemes data which was used covered a relatively small denominator population, and although South African in origin, this population was quite different from the target population in racial and socioeconomic terms. It is also possible that some of the costs incurred by medical scheme members, especially for catastrophic or high-cost emergency care, are not included in our data since these members probably exceeded their benefit ceiling and received no payments from the medical scheme. Risk-selection effects might also distort the utilization estimates obtained. Utilization estimates would be too high if adverse selection (or the predominance of higher risk groups in the insured population) predominated, and the reverse would occur if “cream skimming” operated. Since more than three quarters of the studied medical scheme populations belonged to closed company schemes; however, the extent of risk selection is likely to have been fairly small. Furthermore, since only procedure codes were recorded, these data are quite specific for surgical interventions, but largely meaningless for medical interventions for which all treatments appear identical. Medical schemes data would thus seem to be most useful for estimating levels of demand for elective surgery where there are minimal access restrictions.

The third set of data, UK NHS hospital data, were added to the study for two reasons. First, they cover a considerably larger sample size, of roughly the same order as the target population. Very large samples are useful in this type of exercise because of what is known as the indivisibility of small integers. This can be explained as follows. For a small population of say 100 000, the risk of a member suffering from a condition may be say 0.2/100 000 persons/year, that is, we would expect one case in the population every five years. Because illness events are indivisible, in most years this will simply be recorded as an incidence of 0. In a population of 20 million, however, we would expect 40 cases per year. If we multiplied the incidence rate of zero from the sample population, however, we would estimate that zero cases would occur in the target population ( $0 \times 200 = 0$ ), which is clearly incorrect. When rare conditions are also very costly to treat—for example, childhood malignancies or congenital abnormalities—then total cost estimates may be biased. Making use of a large sample considerably reduces this underestimation of the true costs of rare cases.

The second advantage of the UK data is that they cover a more comprehensive range of services for an entire geographically defined population than either of the South African data. They include, for example, high-cost but rare interventions such as organ transplants, which are conducted in neither mine nor private hospitals in South Africa. A deficiency of the UK data is that they do not include care purchased in private hospitals, which is mainly elective surgery in areas where there are long NHS waiting lists.

---

<sup>4</sup> The term “unmet demand” is used cautiously. Many analysts would suggest that the low levels of demand observed for these procedures in mine hospitals are appropriate, and that the high levels observed in other settings are largely supplier induced.

There are problems in translating UK data for the purposes required here. The OPCS-4 procedure codes (Office of Population Censuses and Surveys, 1990) that are used cannot be translated into CPT-4, the format required for mapping onto the Oregon DT pairs.

Characteristic	Mine hospitals	Medical schemes	English NHS
Denominator population size (person years)	648,000	153,000	16.4 mill
Age-sex representation	women, children, and elderly under-represented	Full	Full
Same country as target population	Yes	Yes	No
Racial/socioeconomic mix (relative to target population)	Similar	Black working class under-represented	Significantly higher average income
Complete coverage for non-urgent, elective care	No	Yes	Intermediate
Complete coverage for high-cost events (e.g., transplants)	No	No	Yes
Complete coverage for emergency care	Yes	Intermediate	Yes
Procedures coded	Yes	Yes	Yes, but not CPT-4*
Diagnoses coded (ICD-9)	Yes	No	Yes
Cost data present	Yes	Charges only	Relativities only
Costs meaningful given likely providers for core package	Yes	Partially	Weakly
* UK NHS hospitals use the OPCS-4 procedure coding system. There is no crosswalk between this system and CPT-4 codes, which are required for mapping onto the Oregon categories. Any limited use of procedure codes thus had to be by hand-matching.			

### 3.3 Standardizing Costs to the South African Context

Two of the datasets used, from mine hospitals and medical schemes, yielded estimates of the cost to payers per diagnosis-specific admission, in rands. These amounts differed significantly, however,<sup>5</sup> and we needed an indication of what were the likely costs per adjusted admission at a typical provider in some future low-cost hospital care environment. (It is almost certain that the current relatively sophisticated and luxurious levels of care offered by South African private hospitals would not be affordable under the core package arrangements). We had no information on actual costs from UK hospitals. They could, however, be estimated using Healthcare Resource Group (HRG) costliness weights, allocated to admissions according to diagnoses, procedures

<sup>5</sup> Private sector costs for standardized admissions were 46 percent higher per admission, and 94 percent higher per day. The latter statistic probably reflects excessive lengths of stay in mine hospitals as well as high costs on the part of private providers, however.

performed, age and sex of patients (National Casemix Office, 1994; Söderlund et al., 1996). A more detailed description of how this method is applied is given elsewhere (Propper et al., 1997). While these cost estimates are relatively crude at the individual patient level, they are likely to be accurate when aggregated over such a large sample. This provided a costliness weight, rather than an absolute cost for each admission, however, and consequently these also had to be converted to actual rand values.

Our aim, therefore, was to convert relative charges in the South African medical schemes sector and cost weights in the NHS hospital sector into the likely cost of care in a mine hospital. Put another way, we tried to estimate the likely cost of NHS and medical schemes utilization patterns in a mine hospital setting. A conversion factor for medical scheme charges and NHS cost weights to mine hospital costs was calculated by assuming equivalence in average cost among three standard admissions: appendectomy for appendicitis, grommets for chronic otitis media, and cataract surgery for cataracts.<sup>6</sup> That is, the cost of admission *I* in an NHS hospital or South African medical scheme ( $C_i$ ) was assumed to be:

$$C_i = W_i * C_b^m / W_b^n \quad (3ii)$$

where:

$W_i$  = Weight or cost of case *I* in the NHS or medical scheme environment, respectively

$C_b^m$  = Average cost of cataract, appendicitis, and myringotomy surgery (unweighted) in the mine hospital setting.

$W_b^n$  = Average weight or cost of cataract, appendicitis, and myringotomy surgery (unweighted) in the NHS or medical schemes settings.

The cost estimates that this approach yields are effectively the costs that a mine hospital might incur if it treated the patient mix of an NHS hospital or a medical scheme. This assumes that the relative costs across different diagnoses are constant between countries, and between different financing environments within South Africa.

Second, we wished to translate costs of care in the mine hospital environment into an estimate of the premiums that enrollees would have to pay. To do this, the following adjustments were made:

- ▲ **Capital costs.** Mine hospital costs did not include the costs of capital. In order to estimate these we used data on the proportional total cost of capital for NHS hospitals, adjusted upward to reflect a higher real opportunity cost of capital in South Africa relative to the UK (10 percent in South Africa versus 6 percent in the UK). This yielded

---

<sup>6</sup> Conditions were chosen as contributors to the equivalence scale on the basis of the following criteria:

- They occurred in all three data sources in numbers sufficient to yield stable utilization estimates.
- They always required surgical procedures, and these surgical procedures were never used for other diagnoses.
- They represented a range of specialities.
- Patients in each category were unlikely to have significantly different disease severity, after age-sex adjustment, across treatment settings.
- Technology differences across treatment settings were unlikely to differ much, i.e., each used old technology, which was available to all providers.

an estimated opportunity cost of capital for mine hospitals of 10.1 percent of recurrent costs.

- ▲ **Administration costs.** Adjustment for inflation. Mine hospital costs used were taken from 1995. In order to reflect the costs of policy changes more realistically, these were inflated to 1998 rands using the consumer price index, or projections thereof (Central Statistical Service Internet site, 1997).
- ▲ **Adjustment for inflation.** Mine hospital costs used were taken from 1995. In order to reflect the costs of policy changes more realistically, these were inflated to 1998 rand terms using the consumer price index, or projections thereof (Central Statistical Service Internet site, 1997).

---

### 3.4 Allocating Utilization and Cost Data to Oregon DT Pairs

The first step in combining utilization and cost data with the prioritization information obtained from Oregon (Section 4) was to allocate each admission and its associated costs to one of the 598 DT pairs. Because of differences in the information available in each dataset, different procedures were used to assign admissions to DT pairs. While there were definitely some doubts about the suitability of data (referred to above in terms of sampling precision, accuracy, and generalizability) considerably more imprecision entered the estimates when they were allocated to the standard 598 Oregon diagnosis-treatment pairs. This was a function of the coding systems used in the different data sets and of the fact that even with perfectly coded information, cases did not necessarily map to a single unique Oregon category.

#### 3.4.1 Ensuring Code Compatibility

The Oregon DT pairs were generally defined in terms of ICD-9 and CPT-4 codes, and other data sources had to be converted to these formats prior to being mapped. Both the mine hospital and UK NHS datasets expressed diagnostic information in terms of ICD-9 codes, and consequently could be related directly to the Oregon DT pairs. While a few differences existed between UK and local sources in terms of coding conventions (for example the codes used to represent HIV disease), these were easily corrected manually. Medical scheme data contained no diagnostic information, so only procedure codes were used to allocate cases to DT pairs.

Since none of the datasets had procedural information in CPT-4 form, we had to map available codes onto CPT-4 descriptors to the best of our ability. This was quite straightforward in the case of the mine hospital and medical scheme data: we used a crosswalk which was developed by the Medical Association of South Africa (to navigate between local Gazette codes and the CPT-4 system).<sup>7</sup> Since no crosswalk exists for the UK OPCS-4 coding system and the CPT-4, we could not map all procedure codes using the computer. Instead, we manually matched key procedures (defined as high volume or high cost procedures) in the two systems only so far as was required by the Oregon classification system.

---

<sup>7</sup> There are many more codes in the CPT-4 system than in the gazette codes. In mapping the latter to the former, therefore, specificity loss occurred frequently. While this would be a problem for individuals interested in looking at individual procedure types, this specificity loss was negligible since we were using aggregates of Oregon DT pairs codes.

### 3.4.2 Mapping Cases to Oregon Categories

#### Mine Hospital and UK NHS Data

For mine hospital and UK NHS admissions, cases were allocated to DT pairs solely on the basis of their diagnosis in the first instance. In most cases, diagnosis alone proved sufficient for making a precise assignment because a given diagnosis only occurred in a single DT pair (that is, all treatments for that diagnosis were included in the same DT pair).

For a subset of diagnoses, procedural information was required to assign cases to an exact DT pair. These were cases in which either more than one procedure could be performed for a diagnosis, or medical or surgical treatment approaches could be followed. For example, the diagnosis of liver failure may fall into different DT pairs according to whether it is treated by liver transplantation, or medical therapy. While it was possible to do this for all diagnoses with imprecise diagnostic allocations in the mine hospital data set, because of the requirement for hand-matching of UK procedures to CPT-4 codes, this was only done for a limited subset<sup>8</sup> of imprecisely allocated diagnoses in the NHS data.

For an additional set of diagnoses, cases may have been allocated to a number of different DT pairs, but procedural information was insufficient to differentiate among competing options. For example, most malignancies could be allocated to a “treatable” or an “untreatable” category; however, neither diagnostic nor procedure codes adequately conveyed whether a given case was treatable. In these situations, cases were allocated in equal proportions to each of the competing diagnosis treatment pairs.

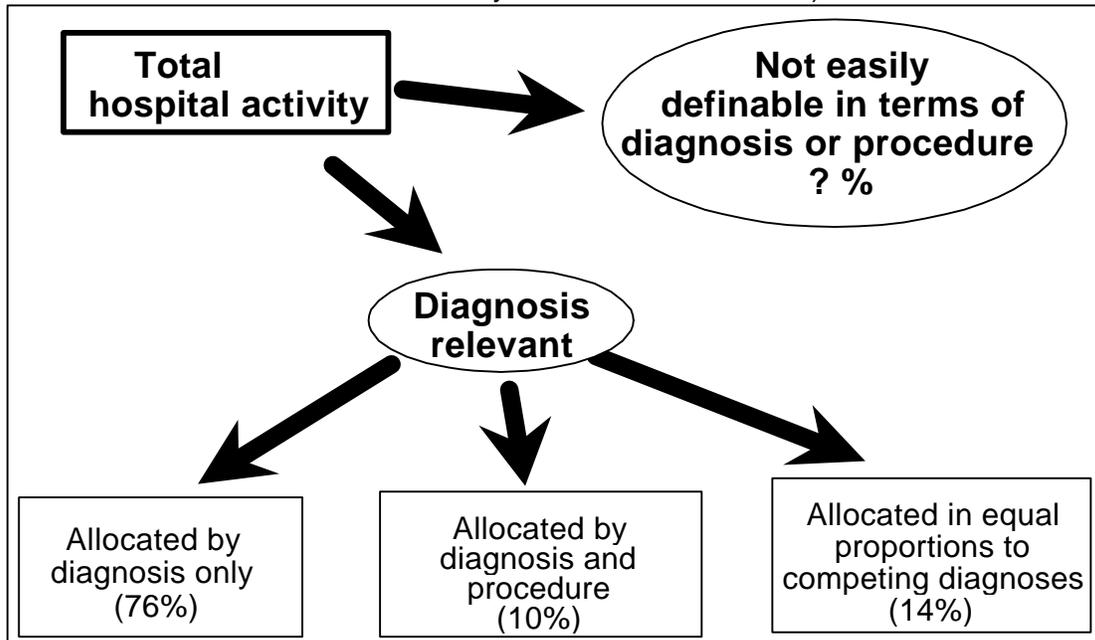
Finally, in one particular DT pair, the “comfort care for terminal illnesses” category, allocation could not be done using routinely coded information at all, and no cases were allocated to this category.

Figure 3.1 below summarizes the approaches used to allocate admissions to an Oregon diagnosis treatment pair for the UK NHS and mine hospital data. The percentages in each box reflect the proportion of total expenditure covered by each allocation approach for the mine hospitals, and thus give an idea of the precision of the overall allocation process. Eighty-six percent of costs incurred by the mine hospital were reasonably and reliably allocated. In the remaining 14 percent of cases, additional information not contained in our datasets prevented precise allocation. Because cases falling into the “comfort care for terminally ill” category could not be identified at all, these were mixed in with all of the cases allocated by diagnosis and/or procedure. We have no idea how many cases would usually fall into this category.

---

<sup>8</sup> Procedural information was used in addition to diagnoses for the 40 most common diagnoses with more than one DT pair option dependent on procedural information. In addition, manual matching was done for all organ transplant procedures because of the anticipated high cost of these cases. In total, 26 percent of imprecisely allocated diagnoses were reallocated using manual matching.

Figure 3.1  
 Methods of Allocating Hospital Admissions to Oregon DT Pairs  
 (Percentages refer to the proportion of total hospital costs  
 accounted for by each allocation method)



### Medical Scheme Data

Medical scheme data were allocated to DT pairs solely on the basis of procedural information. Only surgical or hospital-necessitating medical procedures were considered specific enough to be allocated to a DT pair.<sup>9</sup> Thus, non-surgical cases could not be assigned to a DT pair. Consequently, only 57 percent of all cases (52.5 percent of costs) from the combined medical schemes data could be allocated to DT pairs. Of those allocated, an additional 16 percent of cases (13 percent of costs) had procedure codes that occurred in more than one DT pair. These were allocated in equal proportions to competing DT pairs, and thus lacked precision. Only 40 percent of cases and costs from the medical schemes data could be precisely allocated to DT pairs.

Unlike the preceding two data sources, the medical schemes data do not give a comprehensive picture of utilization rates and costs but rather reflect need for treatment accurately where surgery is the only appropriate modality of hospital treatment. This would appear to include most areas of elective surgery and some areas of emergency surgery for which medical alternatives do not exist.

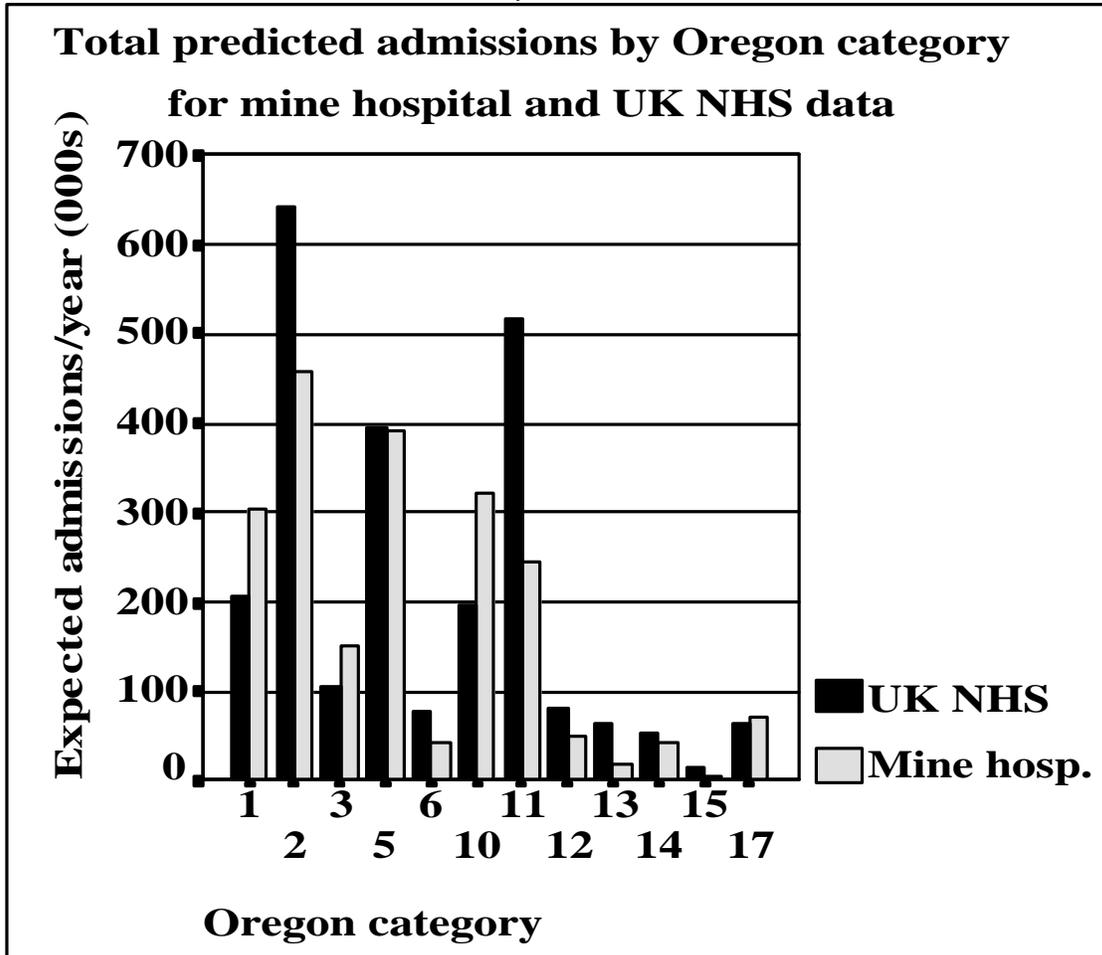
---

<sup>9</sup> That is, procedures such as insertion of an intravenous line were considered non-specific, and ignored for the purposes of the allocation exercise.

## Comparison of Results from Different Data Sources

The main aim of compiling these data is to yield best estimates of likely utilization and costs for various packages of insurance coverage for low-income formal sector workers and their dependents. In order to illustrate the features of the two treatment environments from which data were taken, however, this section compares utilization results between them. The purpose of these comparisons is to highlight discrepancies between data which may have been unexpected, and to illustrate the relative strengths and weaknesses of the different sources. Results are summarized using the original 17 Oregon priority categories. Figure 3.2 shows the total predicted number of admissions for each of the Oregon categories for the mine hospital and UK NHS data. As with all results that will be presented, utilization rates have been standardized to the target population of formally employed South Africans without medical scheme coverage and their dependents.

Figure 3.2  
Total Predicted Admissions by Oregon Category  
for Mine Hospital and UK NHS Data

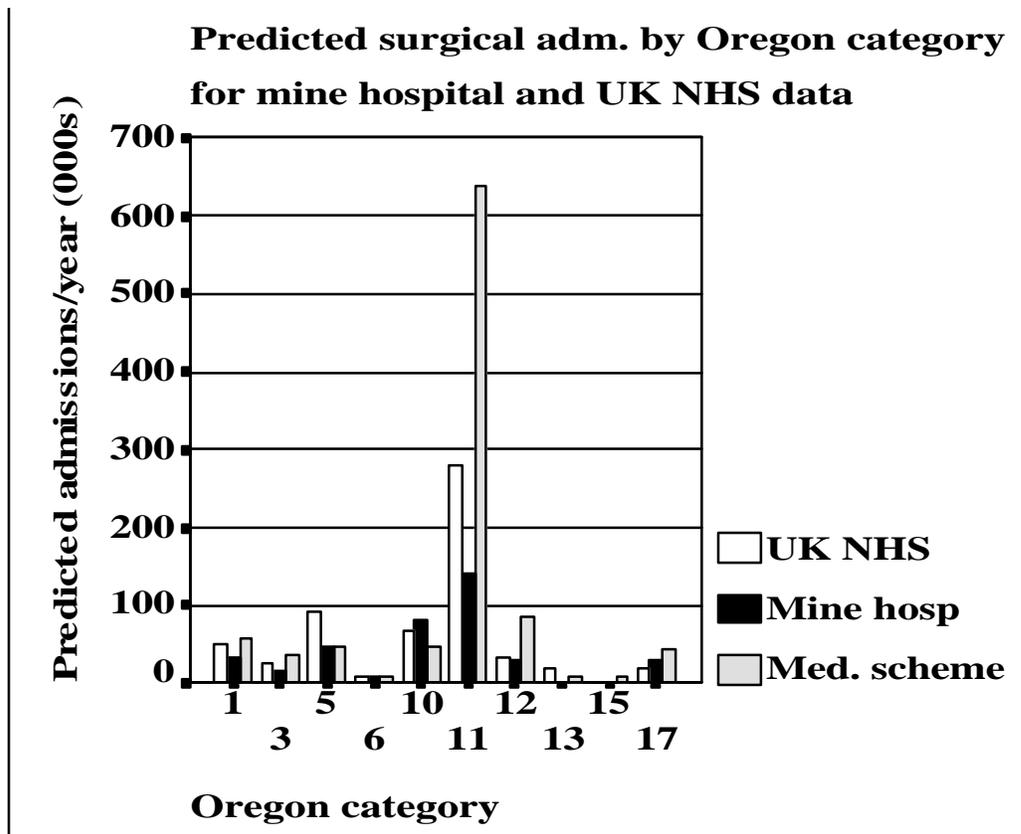


The main difference between the two data sources is the substantially higher proportion of acute conditions occurring in the mine hospital population (cat. 1, 3 and 10), and their proportionately lower use of elective surgical interventions (cat. 6, 11, 12 and 13). Admission rates for chronic but potentially fatal diseases (cat. 5) are relatively similar. This confirmed earlier suspicions that mine hospitals were preoccupied with dealing with emergencies and had relatively fewer resources for elective surgery. NHS admission rates for elective surgery are significantly

lower than they would be in an environment without waiting lists and other forms of rationing (Pope et al., 1991), so there is almost certainly some unmet demand for elective surgery in the mine hospital population. Somewhat surprisingly, there were also significantly lower numbers of admissions for obstetric events in the mine hospital data. This may be because of more extensive use of non-hospital delivery facilities, or because some women choose to deliver with the support of family members in different areas. Given overall higher fertility rates in South Africa, mine hospital admissions rates are thus likely to significantly underestimate demand for obstetric services.

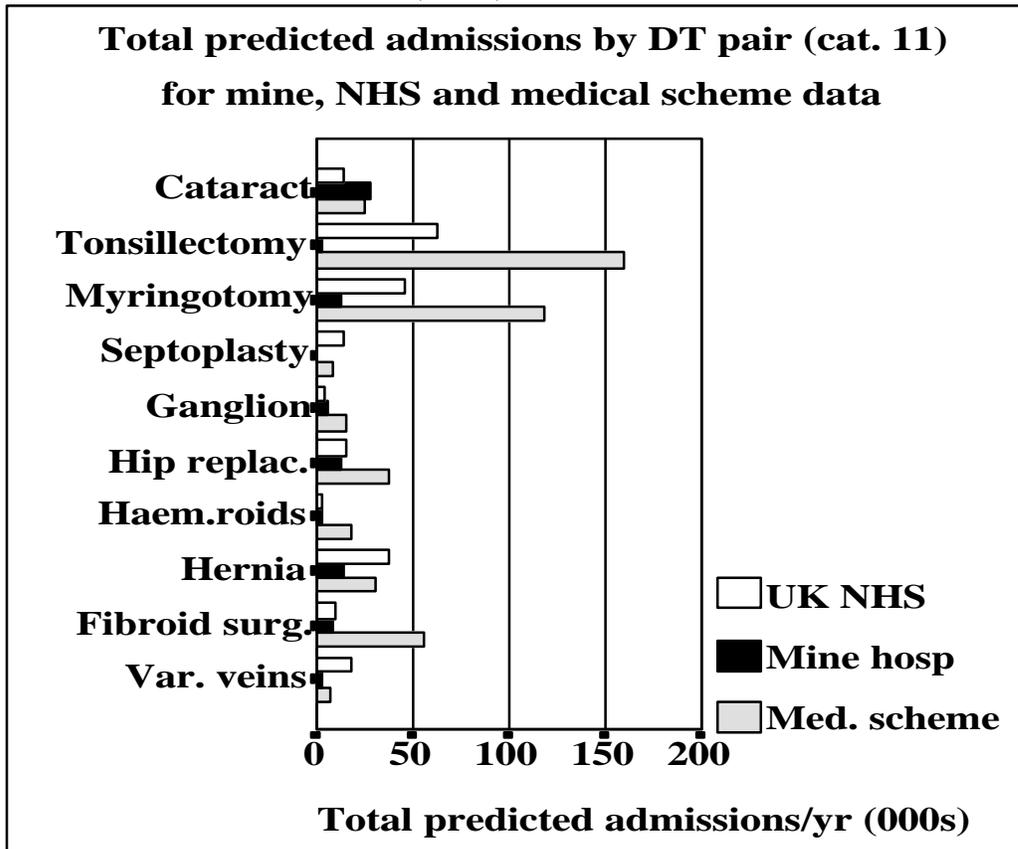
Medical scheme data were accurate only with regard to surgical procedures. Figure 3.3 shows admission rates for surgical interventions only in all three treatment settings.

Figure 3.3  
 Predicted Surgical Administration by Oregon Category  
 for Mine Hospital and UK NHS Data



The potential for enormous variation in the elective surgery rates (cat. 11) is well highlighted by Figure 3.3. Admission rates for this category in the South African Medical schemes sector are almost double those of NHS hospitals, and approximately four times those of mine hospitals. Figure 3.4 shows admission rates by DT pair for some of the common causes of admission in Oregon category 11.

Figure 3.4  
 Total Predicted Admissions by DT Pair (cat. 11)  
 for Mine, NHS, and Medical Scheme Data



**Key:**

- Cataract**—Cataract removal and lens replacement
- Tonsillectomy**—Tonsillectomy for chronic inflammation of tonsils
- Myringotomy**—Myringotomy for chronic suppurative otitis media
- Septoplasty**—Septoplasty for deviated nasal septum
- Ganglion**—Removal of ganglion of tendon sheath or bursa
- Hip replace.**—Hip replacement for chronic arthritis
- Hemorrhoids**—Hemorrhoidectomy for thrombosed or complicated hemorrhoids.
- Hernia**—Repair of uncomplicated hernia
- Fibroid surgery**—Myomectomy/hysterectomy for uterine fibroids
- Varicose veins**—Stripping/sclerotherapy for varices of lower limb

If the rates illustrated in Figure 3.4 remained constant, the lifetime risk of having a tonsillectomy in this population would be almost 40 percent. Medical schemes, up until recently, made no attempt to influence intervention rates, reimbursing providers on a fee-for-service basis, creating strong incentives for over-treatment. These rates thus represent a situation of virtually unconstrained demand with strong supplier inducement. Emergency surgical admission rates are fairly similar among the three environments.

### 3.5 Combining Data Sources

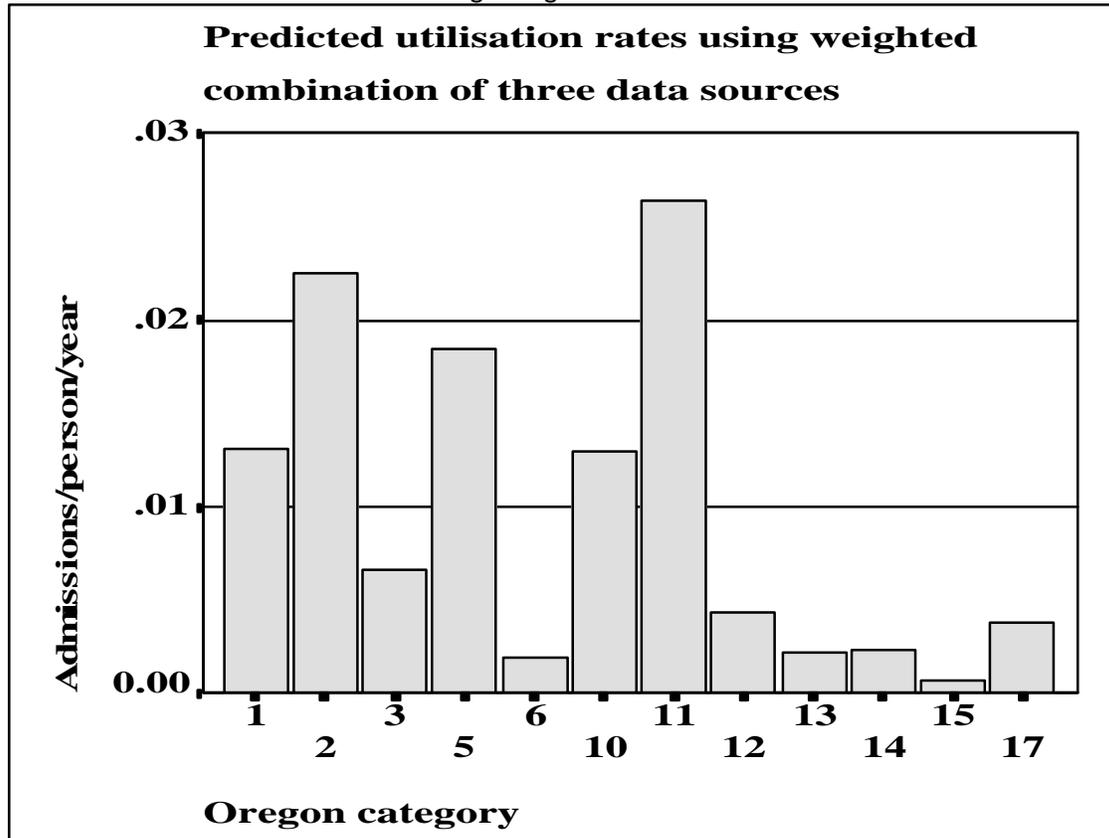
Differences among the data sources have been briefly highlighted above. This section describes how we have combined individual data sources to yield a hybrid utilization and cost data set that selectively uses elements from each of the sources. The hybrid data set was designed to represent the best possible estimates for the South African target population with an implicit decision rule to err in favor of higher rather than lower estimates. The hybrid data set should thus be viewed as representing the likely upper limit of utilization and cost levels for various packages of care for the target population. Data were combined by taking weighted averages of each source by Oregon category, and by whether a DT pair was surgical or not. The weights used to construct the averages are given in table 3.2. The essence of the weighting system was to favor the mine hospital data in the case of acute conditions, and the medical scheme data in the case of elective surgical ones. Rates for non-urgent medical conditions were constructed from NHS and mine data, where the mine data was favored for life-threatening conditions, and the NHS data for non life-threatening conditions.

Oregon category	Description	Medical/ surgical*	Data Sources		
			Mine Hospital	UK NHS	Medical Schemes
1	Acute fatal—full recovery	Med	0.66	0.33	0
		Surg	0.5	0.25	0.25
2	Maternity care		0.33	0.33	0.33
3	Acute fatal—partial recovery	Med	0.66	0.33	0
		Surg	0.5	0.25	0.25
5	Non-urgent fatal—treatment improves lifespan or quality of life	Med	0.66	0.33	0
		Surg	0.5	0.25	0.25
6	Fertility control	Surg	0.33	0.33	0.33
10	Acute non-fatal—treatment effective	Med	0.66	0.33	0
		Surg	0.5	0.25	0.25
11	Chronic non-fatal—one-off treatment improves quality of life	Med	0.33	0.66	0
		Surg	0.25	0.25	0.5
12	Acute non-fatal—treatment causes partial improvement	Med	0.33	0.66	0
		Surg	0.25	0.25	0.5
13	Chronic non-fatal—ongoing treatment improves quality of life	Med	0.33	0.66	0
		Surg	0.25	0.25	0.5
14	Acute non-fatal—treatment symptomatic only	Med	0.33	0.66	0
		Surg	0.25	0.25	0.5
15	Infertility services	Med	0.33	0.66	0
		Surg	0.25	0.25	0.5
17	Treatment for conditions with minimal symptoms	Med	0.33	0.66	0
		Surg	0.25	0.25	0.5

\* Where both medical and surgical interventions were contained within the same DT pair, the pair was classified as medical.

The utilization rates yielded by applying the above weighting algorithm to combine data sources are shown in Figure 3.5. The category accounting for the largest proportion of admissions is category 11, which contains mainly elective surgical interventions.

Figure 3.5  
 Predicted Utilization Rates Using Weighted Combination of Three Data Sources

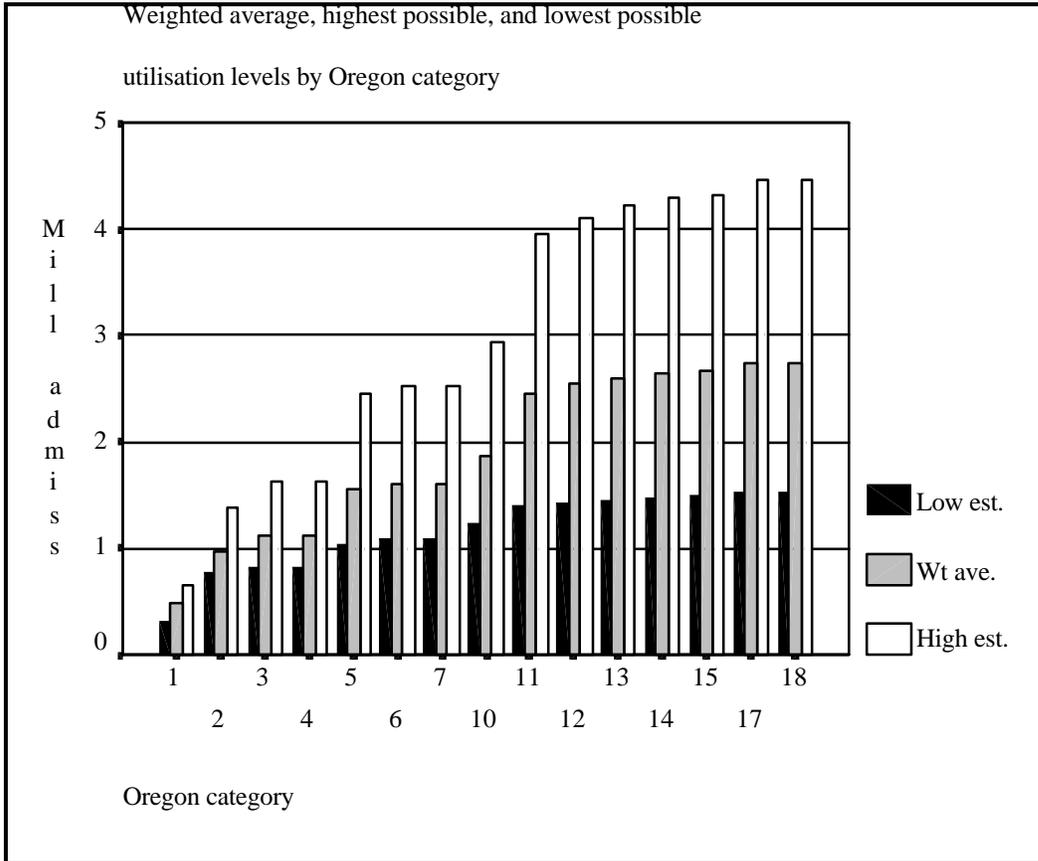


*Note:* Although our intention was to maintain category 7 (comfort care for terminal illness) within the analysis, it was not possible to allocate any cases to this category simply on the basis of diagnostic and procedural information. However, since virtually all of those cases requiring comfort care were allocated to higher priority categories on the basis of their diagnosis, these costs will still be incorporated within the package.

As a simple sensitivity analysis, featuring two additional combined utilization estimates, was produced. The first estimate took the lowest number of admissions from each of the three sources for each of the 598 Oregon categories, while the second took the highest observed number of admissions from each of the three data sources. Because of inconsistent methods of allocation to the “not specified” category, we assigned the weighted mean to this category in all cases. Figure 3.6 shows the results of this analysis. The total predicted admissions for the target population vary from a high of 4.5 million to a low of 1.6 million per year. Interestingly, highest priority categories 1-3 show proportionately less variation between high and low utilization estimates, suggesting that these might be true indicators of intrinsic population need. The more discretionary procedures, however, such as categories 11 through 17, show substantial variation between highest and lowest estimates (approximately threefold). This suggests that intervention rates for these procedures are much less a function of intrinsic human need and much more due to supply inducement factors. This

sensitivity analysis represents an extreme range of possible utilization rates, however. The low estimate is particularly misleading, especially for the smaller datasets, since it is biased downwards by the indivisibility of rare events.

Figure 3.6  
 Weighted Average, Highest Possible, and  
 Lowest Possible Utilization Levels by Oregon Category



---

## 4. Costed Packages

In this section we combine possible approaches to prioritizing categories of care (section 2) with hybrid utilization and cost estimates derived in section 3. Two approaches to defining the package are adopted. The first uses the 17 original Oregon priority categories, while the second applies the derived discretion, effectiveness and cost scores in varying weighted combinations.

---

### 4.1 Oregon Categories

The 17 Oregon categories provide a “pre-packaged” way in which to prioritize health care interventions, and incrementally add on to existing services delivered. We have used this approach to estimate the costs of a set of incremental packages, where interventions are added from highest to lowest priority category (i.e., from category 1 to category 17). The cumulative cost of the package is represented graphically in Figure 4.1. Some admissions and their associated costs could not be allocated to a category (labeled “?” on the x-axis), and these were included by default in the total package costs. Significant increments occur with the inclusion of chronic life-threatening conditions (cat. 5), and one-off treatments for non life-threatening chronic conditions (cat. 11).

A package offering care only for life-threatening acute emergencies and maternity care (categories 1-3) would thus cost around R275 per person per year. If care for chronic life threatening conditions were added, this would increase to R410. Hospital-based fertility control (i.e., sterilizations—category 6) make a negligible contribution to the package costs. The addition of treatment for non life-threatening acute conditions, such as closed fractures, menstrual bleeding disorders, etc. (cat. 10), would increase package costs to around R480 per person per year, while access to effective elective procedures for chronic conditions (cat. 11) would increase costs to around R590. We estimated relatively little demand in our target population for services in categories 12 to 17.

As was discussed earlier, the 17 Oregon categories take into account only the urgency and likely effectiveness of required treatment. Furthermore, they combine these two criteria in a fixed manner, so that, for example, an improvement in Quality of Life (QoL) for an acute condition is ranked higher than the same QoL gain for a chronic condition in the Oregon rankings. If we were to decide that urgency of treatment were unimportant in defining the package, then these two categories should be ranked equally. The following section attempts to explore whether reorienting the subcriteria of the Oregon categories, and adding an additional criterion, cost, produces substantially different packages. This also allows analysis of what the main priority determinants are within the original 17 Oregon categories.

---

### 4.2 Flexible Package Definition

An alternative to using the pre-ordered 17 Oregon categories is to use various combinations of the disaggregated effectiveness, discretion and cost scores developed in chapter 2. This approach allows inclusion/exclusion of DT pairs from the package using varying decision rules. Before examining ways of combining criteria, it is worthwhile to look at the degree of correlation between the effectiveness, discretion and cost rankings. This gives an impression of the extra information yielded by including each criterion in developing the package. Spearman rank

correlation coefficients between the three criteria, and the Oregon categories, for the 598 DT pairs are shown in table 4.1.

Figure 4.1  
Cumulative Cost of Incrementally Added Interventions

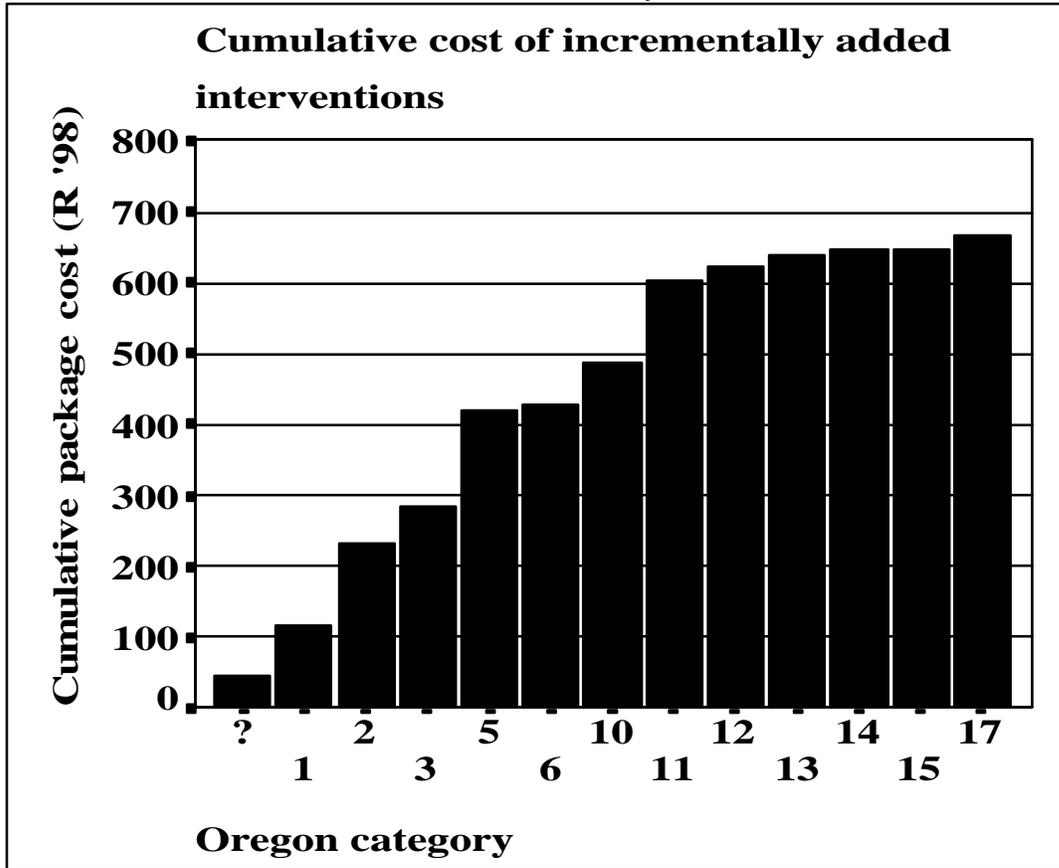


Table 4.1  
Spearman Rank Correlation Coefficients among Cost, Effectiveness, and Discretion Criteria and the Original Oregon Categories

	Cost	Discretion	Effectiveness
Cost	1	—	—
Discretion	-0.30	1	—
Effectiveness	0.14	0.52	1
Oregon categories	-0.26	0.94	0.66

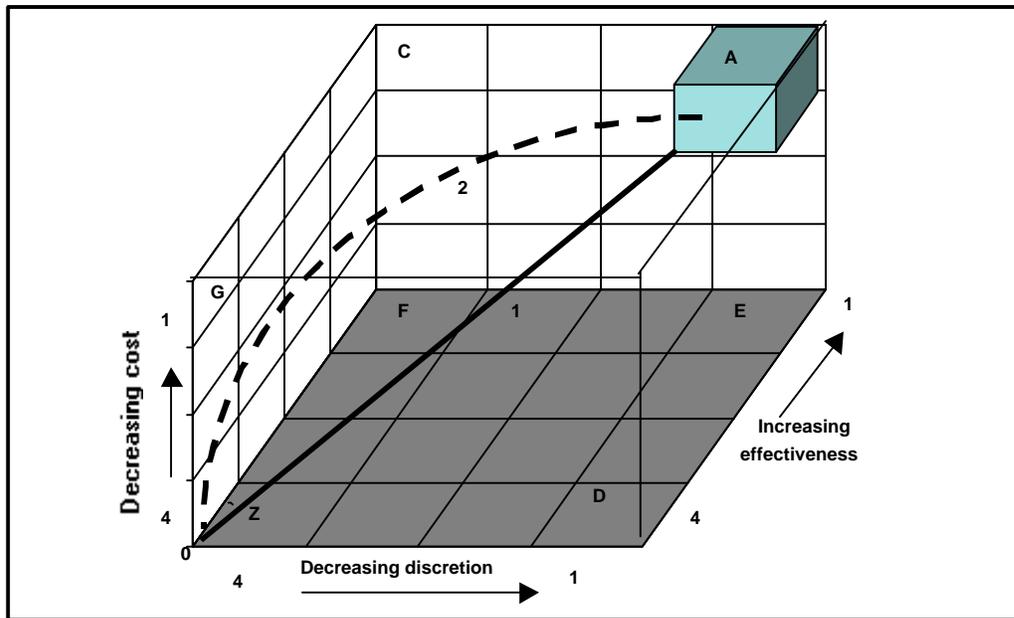
(In each case, the most favorable condition, i.e., low cost, low level of discretion, and high effectiveness, were given a score of 1, and the least favorable category a score of 4.)  
All correlation coefficients were statistically significant at the  $p < 0.01$  level.

The discretion and effectiveness scores showed the highest degree of correlation, but this was still only slightly greater than 0.5. This indicates that emergency conditions tended to be more amenable to effective treatment. While the correlation between cost and effectiveness was weak, the sign indicated that more effective treatment also tended to be of lower cost. On the other hand, less discretionary care (i.e., emergencies) had a higher cost than cold cases on average. These relationships persisted when cost was treated as a continuous, rather than a categorical variable,

although the relationship with effectiveness became non-significant at the 5 percent level. These results tell us that varying the weighting between effectiveness and discretion categories is unlikely to change the package nearly as much as changing the degree of emphasis put on costs. Finally, the discretion criterion is very closely correlated with the original Oregon categories, this suggests that the Oregon categories, in practice, reflect mainly the degree of urgency of required treatment, and to a weaker extent, the degree of effectiveness of treatment. None of the criteria are so highly correlated with any other as to render them redundant, however.

We have divided possible decision rules for combining criteria into arithmetic and non-arithmetic techniques. Arithmetic techniques would include taking an average or a weighted average favoring one or more of the criteria. A three-way priority matrix can be used to illustrate this approach to combination, and is shown in Figure 4.1. DT pairs falling into zone A in Figure 4.2 are effective, cheap, and doctors have little choice but to deliver immediate treatment. These will thus be included in all packages. Those in zone Z, on the other hand, are ineffective, costly, and there is no urgency in administering treatment. These interventions should thus be the first to be excluded from any package of care. DT pairs falling into intermediate zones may be included in, or excluded from the package depending on the weighting applied to each of the axes. If all axes are weighted equally, then the straight line 1 represents a line of constantly increasing priority from Z to A. Each plane perpendicular to line 1 represents points of equal priority. If, on the other hand, cost is considered a relatively more important criterion, then line 2 in the vertical plane above line 1 indicates constantly increasing priority.

Figure 4.2  
A Three-way Priority Matrix



The main problem with this approach is that it assumes that the rankings used have ratio meaningfulness (i.e., that an effectiveness score of 2 denotes half the effectiveness of a score of 1, and so on). Ratio scales are available for the cost variable, but not the effectiveness or discretion ones, and interpreting the four-point ranking system in this way would be misleading.

We have thus rejected this approach and favored non-arithmetic approaches to combining the criteria. These approaches do not attempt to summarize cost, effectiveness and discretion scores

into a single score. Instead they apply thresholds to one or more of the selection criteria. For example, we might include interventions on the basis of their best score over all three criteria (i.e., priority is determined by their highest ranking on the three axes) or their worst score over all three criteria, their worst score on their two best criteria, and so on. There is obviously a large number of possible ways to combine criteria. Table 4.2 shows the total costs per cell of the three-way matrix of criteria. The top left hand corner of the table represents more favorable candidates for inclusion in the package, and the bottom right hand corner interventions that are unlikely to be included, regardless of the criteria used.

Discretion Category	Effectiveness Category					
	Cost 0-6000	1	2	3	4	Totals
1	179	11	.	.	.	191
2	.	28	.	.	.	28
3	51	17	8	.	.	75
4	7	90	5	13	.	115
	Cost 6000-12000	1	2	3	4	Totals
1	35	7	1	.	.	43
2	.	43	.	.	.	43
3	9	2	1	.	.	12
4	.	24	3	1	.	28
	Cost 12000-24000	1	2	3	4	Totals
1	17	32	.	.	.	48
2	.	62	.	.	.	62
3	0.1	0.1	.	.	.	0.2
4	.	2.5	0.6	3	.	6
	Cost >24000	1	2	3	4	Totals
1	0.9	0.7	.	.	.	1.6
2	.	5	.	.	.	2
3	.	.	.	.	.	0
4	.	.	8.6	0.5	.	9.1
	Totals	298	326	26	17	666

Note: A score of 1 indicates a favorable ranking (i.e., low discretion, high effectiveness, and low cost).

DT pairs falling into the two least effective categories account for very little of total costs (<10 percent), and restricting the package according to effectiveness alone would thus seem to offer few savings. Similarly, high-cost interventions (>R12,000 per course of hospital treatment) account for less than 10 percent of total costs. This group includes all transplant cases, open-heart surgery cases, and treatments for many malignancies, renal failure, and other life-threatening chronic conditions. It should be pointed out, however, that few data were available on high-cost events from South Africa, since most such cases are referred from both mine and private hospitals to public hospitals, for which we have no data. The utilization rates and costs for these cases were thus drawn primarily from the UK NHS data. There is strong centralization of such services in the NHS, and such centralization is probably essential to exploit economies of scale for such services.

If many specialized units were each to provide care for a few such cases, costs would likely be much higher. The only criterion which has a reasonable proportion of total costs spread across all four categories is the discretion criterion. Just under a quarter of total package costs are incurred on treatments for non life-threatening conditions, where delaying treatment would have minimal permanent effect on outcome. From a purely empirical point of view, therefore, decisions regarding this criterion are likely to be most important in determining the composition of the essential package.

Figures 4.3 and 4.4 illustrate the application of two non-arithmetic approaches to combining criteria to define a core package of services. Figure 4.3 uses the same matrix as Figure 4.3 to illustrate the package created by selection of all DT pairs which do not have a ranking of 4 for any criterion. Figure 4.4 illustrates a package containing all DT pairs where the best ranking on any of the axes is 2 or less. Figures 4.3 and 4.4 illustrate that the services included in these two packages are quite different, although the number of included blocks are approximately the same (27 and 32 respectively).

Figure 4.3  
 Package Designed to Exclude all DT Pairs with a Score of 4 (worst) on Any of the Axes  
 (Filled blocks indicate services included in the package)

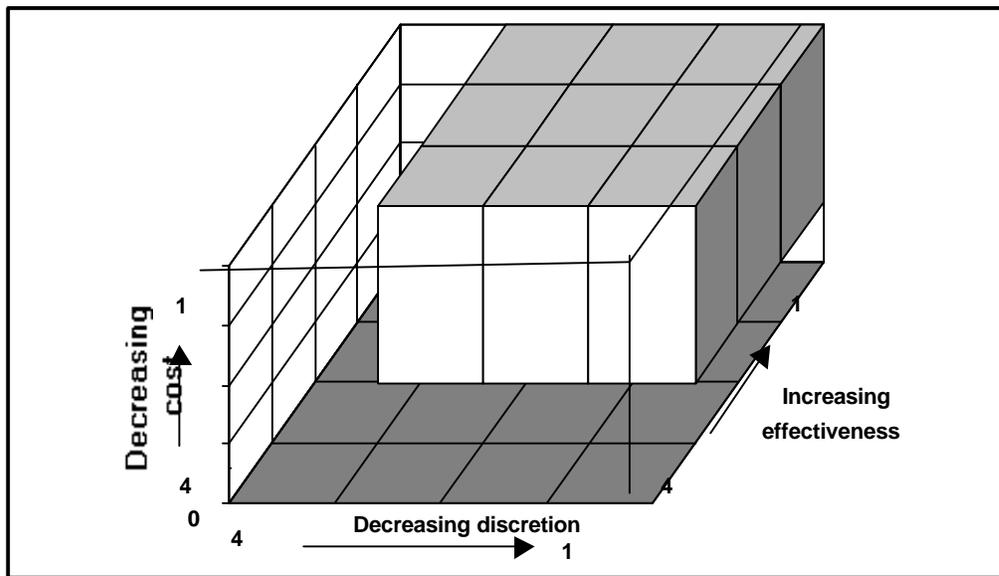
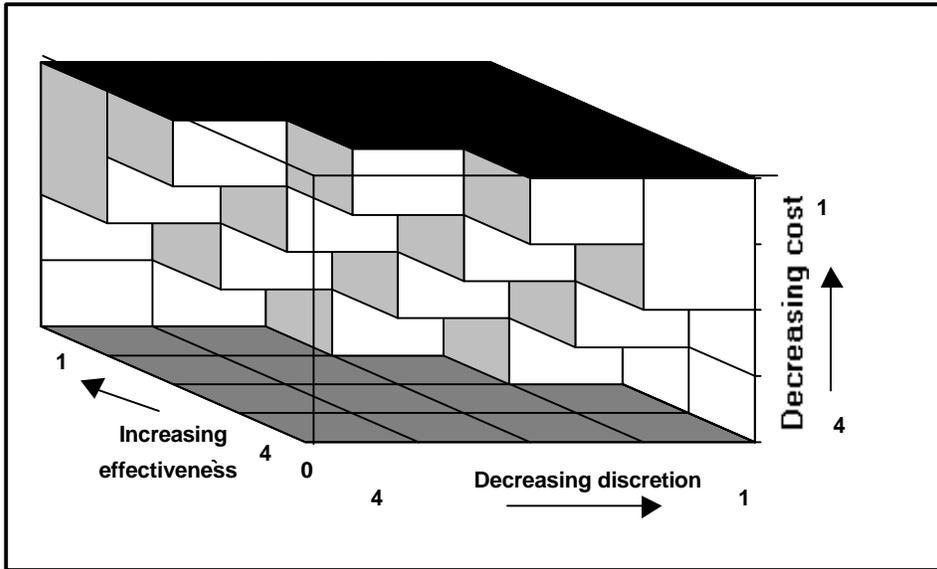


Figure 4.4  
 Package Designed to Exclude All DT Pairs without a Best Score of 2 on Any of the Axes  
 Filled Blocks Indicate Services Included in the Package



Of these two approaches, the one that comes closest to approximating the continuous approach of Figure 4.2 is a selection based on best criterion (Figure 4.4), rather than worst (Figure 4.3). In practice, however, the distribution of scores are uneven for each criterion across all DT pairs. Figure 4.5a shows the costs of a total package of care derived by selecting all DT pairs where the highest rank is 1, 2, 3, or 4, respectively. Figure 4.5b on the other hand, shows the costs of packages where the worst score on each of the axes is used to rank DT pairs.

Figure 4.5a.  
 Total Package Cost by Best Rank on  
 All Three Axes

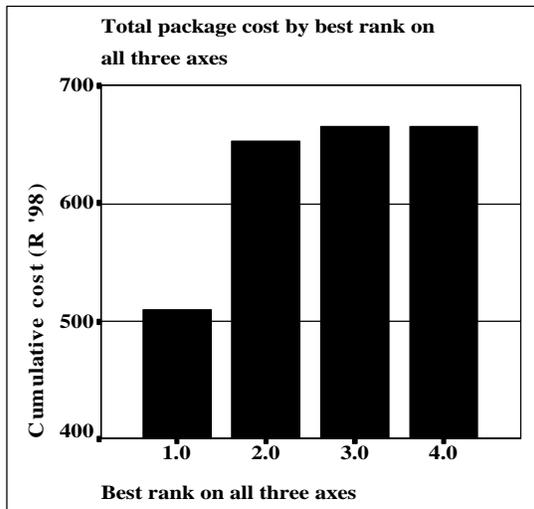
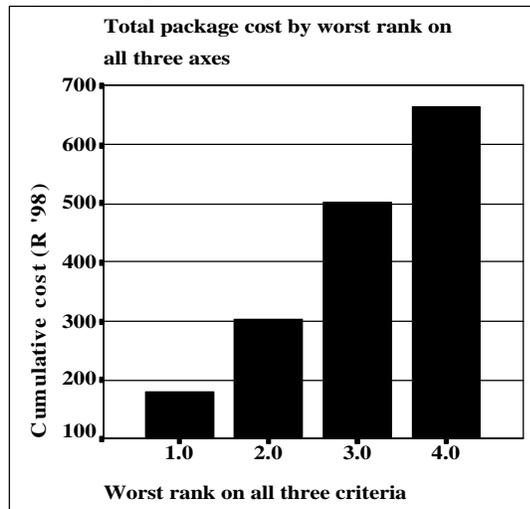


Figure 4.5b  
 Total Package Cost by Worst Rank on  
 All Three Axes



Ranking by worst scores yields a fairly even distribution of costs across all four combination categories. When ranking is done on the basis of best scores; however, more than 90 percent of costs fall into the top two categories. Thus, the degree of sensitivity obtainable from the combined ranking is considerably reduced. Using bivariate correlation coefficients, it is possible to determine

which of the individual criteria have the greatest effect on the combined rankings in Figures 4.5a and b. It turns out that the best rank combination method is influenced primarily by cost, whereas the worst rank approach is determined largely by the discretion criterion.

---

### 4.3 An Optimal Combination of Criteria

The discretion criterion appears to be able to divide the entirety of expected hospital costs into four roughly equally-sized priority groups. These priority groups are highly correlated with the original 17 Oregon categories. The consistency between the original Oregon categories and the discretion rankings suggests that use of either would yield similar results. Adding information on effectiveness or cost (specifically, exclusion of interventions that are very costly, or ineffective) does not fundamentally change the total cost of the package determined by the discretion criterion alone. This information may, however, improve the feasibility of implementing the package by removing interventions that are so costly as to threaten the viability of insurers, or of such dubious effectiveness as to threaten the well-being of enrollees. There are thus good reasons to include some cost and effectiveness criteria, even if they are unlikely to affect current practice. The criteria combination that fits this description most closely is illustrated in figure 4.3, the equivalent of excluding all DT pairs with a worst rank of 4. Figure 4.5b suggests that providing such a package to formal sector employees and their dependents would cost just over R500 per person per year. For the purposes of the rest of this study we will assume that this is the inpatient core package of choice.

What would such a package provide? Since it is not possible to list all the component DT pairs of such a package, we will attempt to characterize it by describing the most prominent exclusions from the package. Annex B identifies the most important DT pairs included and excluded from the worst rank < 4 package. The vast majority of excluded services are elective surgical interventions for chronic conditions, such as cataract surgery, back surgery, joint replacements for arthritis, etc. A few exclusions are slightly more controversial, for example, exclusion of elective abortions and sterilizations (on the basis of treatment being completely discretionary). In reality, such services will almost certainly need to be decided upon based on criteria other than the 3 used here, and their inclusion will be strongly, if not exclusively determined by political and social approval. They appear to add little to the total package costs as measured here, however.

The data that have been compiled for this exercise can be used to define and cost any number of different hospital benefit packages. We have used a “best available” set of data to define what we believe is a suitable, essential hospital inpatient package based on technical criteria. Perhaps more importantly, however, the data allow the estimation of costs of any number of different packages determined by more widely agreed criteria. For the purpose of further discussion regarding essential package feasibility, the “worst rank < 4” package will be regarded as the essential hospital inpatient benefit package.



---

## 5. Hospital Outpatient Services

South African public hospitals typically provide emergency ambulatory care (or casualty services) and specialist outpatient consultation facilities in addition to inpatient care. The NHI Committee Report indicates that such services should not be within the free primary health care package. In reality, however, the boundary between hospital outpatient and primary care services remains indistinct. Even within South Africa, there are very different arrangements for delivery of such services. Most ambulatory specialist services and investigations are provided outside of hospitals in the private sector, for example, but are delivered in hospital outpatient departments in the public sector. Furthermore, in areas where primary health care services are poor, public hospital outpatient departments also render a large proportion of primary consultation services. Mine hospitals operate a referral system from peripheral clinics for lower categories of employee, but allow primary care consultations in hospital outpatient departments for higher status employees and paying patients.

This section attempts to estimate likely costs for hospital-based ambulatory services in South Africa. Because of the range of different services that might be delivered in this setting, we have assumed a normative set of ambulatory services that should be provided by the package, rather than studying the cost of actual services delivered by hospitals to outpatients.

---

### 5.1 A Normative Package of Hospital Ambulatory Services

Unfortunately, none of the sources used to estimate inpatient hospital utilization and costs collect diagnostic, or meaningful procedural information for ambulatory treatment events. This meant that we could not allocate treatments to Oregon DT pairs and define the package accordingly. Consequently, a simpler approach was assumed in which resource use was allocated according to the nature of the provider of the service. It was thus implicitly assumed that all services rendered were appropriate for the presenting diagnosis. Table 5.1 shows how ambulatory treatment costs were divided.

We took “hospital outpatient equivalent” costs to be the sum of categories 2, 6, 7, and 8 (non-italicized text). This choice was based on the following reasoning:

- ▲ Ambulatory specialist consultations should occur only with a referral from the primary care level or as follow-up after an admission episode.
- ▲ Included services approximate closest the services offered by public hospital outpatient departments, assuming the development of an adequate public-sector primary health care system. Since one of the major objectives of the package is to replace public hospital care for those who can afford to pay, this is a relevant consideration.
- ▲ Included services could not feasibly be provided by primary health care services because of lack of skilled personnel (specialist level) or lack of equipment (laboratory and radiological tests) .

- ▲ Ambulatory drugs were excluded from the package. Most medicines prescribed for ambulatory use are either for acute minor ailments, or maintenance therapy of chronic conditions. The former would be prescribed entirely by primary care practitioners. With regard to the latter, we assume that the role of ambulatory specialist consultation is to direct therapy, rather than provide ongoing maintenance and monitoring, and hence drug costs would still be incurred mainly in primary care.

Service/cost category	Included services
1. DRUGS	<i>All out of hospital medications</i>
2. FACILITIES and nursing staff	Fixed facilities and nursing staff required for ambulatory treatment, excluding consultation rooms (i.e., minor procedure theater and staff, dialysis machines, etc.)
3. GPs	<i>All general medical practitioner consultations</i>
4. OTHER PRIMARY CARE	<i>Dental, optometry, homeopathic and other non-medical primary care excluding rehabilitation services.</i>
5. REHABILITATION	<i>Services provided by physicians, occupational and speech therapists, orthopaedic appliance manufacturers, and dieticians</i>
6. PATHOLOGY	All pathology services
7. RADIOLOGY	All radiology services (radiologist, radiographer, and equipment costs)
8. CLINICAL SPECIALISTS	All consultations and procedures by clinical specialists out of hospital.

## 5.2 Data Sources

The range of available data sources for costing chosen elements of ambulatory hospital based care was more limited than for inpatient care. No individual patient level data were available for UK NHS hospitals, and these were thus excluded at the outset. Ambulatory claims data (charges) were available for four of the six medical schemes studied (representing 76,000 person years), and costs were available for one of the three mine hospitals (representing 85,000 person years), each for 1995. Each source divided costs or charges up into the approximate categories defined in table 5.1. With regard to mine hospital outpatient visits; however, we were unable to distinguish among specialist salary costs and other staff and facility costs used for ambulatory patients. Furthermore, we could not distinguish between specialist and generalist consultations, and it was assumed that all hospital-based consultations were of a specialist nature.

Both medical scheme and mine hospital ambulatory specialist services utilization rates are probably overestimates given the assumption of required referral from primary care described in section 5.1. In the medical schemes sector, gynecologists, pediatricians dermatologists, and to a limited extent, other specialists are often consulted without referral. In the mine hospital studied, a subgroup of covered workers and their dependents (members of the Goldmed medical scheme) were allowed access to hospital outpatient consultations without prior referral from a mine primary

care clinic. The complete screening out of all non-referred patients is unlikely to be feasible from the outset of package implementation, however, because of the inadequacy of primary care facilities in many areas. Consequently, while the figures produced probably represent an overestimate of the costs of true referral outpatient care, they might still be realistic representations of what the package would be expected to deliver.

All costs and utilization rates were age-sex standardized to the same target population used for inpatient care. They are expressed in 1998 Rand terms, inflated using the consumer price index, and capital costs were added to mine hospital costs using the same approach used for inpatient care costs. Furthermore, a 10-percent insurance administrative charge has been added to costs. While attendance rates could be easily identified from mine hospital data, we experienced difficulty in identifying unique consultations in medical scheme data. For example, if, during a consultation, a specialist conducted a diagnostic procedure—such as a lung-function test—two treatment events would be recorded.

### 5.3 The Hospital Ambulatory Package

Estimated costs for the hospital ambulatory package are outlined in table 5.2. Medical scheme costs for this type of care are approximately twice those of mine hospitals. Outpatient laboratory costs are most noticeably higher in the medical schemes environment (more than four times those of the mine hospitals environment).

	<b>Laboratory costs</b>	<b>Radiology costs</b>	<b>Facility and staff costs</b>	<b>Total costs</b>
<b>Mine Hospital</b>				
Total costs for target population	437,643,844	574,158,928	2,782,026,221	3,793,828,993
Average cost/person/year	21.14	27.74	134.40	183.28
<b>Medical Schemes</b>				
Total costs for target population	1,910,249,096	1,563,028,242	4,767,654,192	8,240,931,529
Average cost/person/year	92.28	75.51	230.32	398.11

Utilization data, in terms of numbers of complete hospital outpatient consultations per person per year, were only available for mine hospitals because of the data recording format used by the medical schemes. Mine hospital users had a standardized attendance rate of 0.79 outpatient visits per person per year.

Because of problems finding units of service that are defined in the same way across data sets, we were unable to standardize medical scheme costs to those of mine hospitals as we did for inpatient costs. A feasible low-cost package of hospital outpatient care in a managed care environment was thus estimated to be at the mine hospital level, with the medical scheme figures representing likely costs should free choice of provider and an absence of referral requirements apply. The outpatient package costs used for the rest of this document are thus R183 per person per year.

It should be noted that these costs are higher than estimated existing expenditure on users of public sector outpatient services. These were estimated at R110 per person per year in 1997 terms<sup>10</sup> in one of the better resourced provinces (Gauteng), which works out to R145 per person per year using the standard costing method applied here.

---

## 5.4 Conceptual Issues Regarding Outpatient Services

It should be emphasized that the notion of an outpatient care package, regardless of provider setting studied, is much less well defined than that of an inpatient package for the following reasons:

- ▲ Outpatient hospital care is likely to substitute for, or be substituted for by primary care. Levels of demand for hospital outpatient services will thus be strongly determined by quantity and quality of primary care provided. For example, in South Africa, a simple case of hypertension may be managed by a primary health care nurse in a clinic, a general practitioner in his surgery, or a specialist physician in a hospital outpatient setting. The availability of the former two types of services will determine whether or not the hypertensive patient seeks care as a hospital outpatient.
- ▲ Need for hospital outpatient services are more difficult to define in terms of diagnosis alone. Routine care for many diabetics can be managed quite adequately at the primary care level. However, some diabetics will require referral to a specialist because of complications, or difficulty achieving optimal control, and an even smaller subset will require regular specialist review. While it is possible to draw up protocols for the appropriate referral of each of these groups of patients, it is far more difficult to specify insurance coverage in a way that provides hospital-based outpatient care only for those who need it.
- ▲ The potential for unchecked moral hazard is greater for ambulatory care than for hospital based care. Most hospital admissions are to facilitate treatment for a serious illness, or the performance of a significant surgical procedure. Need for these can be relatively easily monitored by simple pre-authorization procedures and bill review. Furthermore, because of the serious nature of most hospital inpatient treatments, patient demand would also be stemmed to some extent by the knowledge that inappropriate treatment could have significant adverse effects. In the decision to seek symptomatic relief for arthritis from a rheumatologist, rather than a primary health care nurse, however, the only real negative consideration in choosing the former is cost. If insurance removes this cost barrier, then there is little incentive to choose the latter. Furthermore, it is very costly and cumbersome for an insurer to introduce pre-authorization procedures for outpatient consultations. While requiring referral from a lower tier of the health services is one possible control on excess use of specialist outpatient services, primary care providers would have no disincentives to referring patients to a free specialist consultation service should the patient request this.

---

<sup>10</sup> Söderlund N. "Social Health Insurance feasibility research project—The likely costs of hospital care benefits to be covered by a Social Health Insurance fund." Unpublished report to the National Department of Health, May 1997.

Allowing alternative methods to control utilization of outpatient specialist services, such as the introduction of incentive systems for primary care providers not to refer to hospital specialists, or some form of pre-consultation screening at hospitals might be appropriate in the context of low-cost hospital insurance schemes. Co-payments might also be considered, although their potential negative impact on equitable access will need to be addressed.



---

## 6. Changes in Package Costs Over Time

---

### 6.1 Effect of Retired Members

The NHI Committee Report envisages that a recommended employer mandate would cover currently employed persons and their dependents. This intention is reflected in the target population used for this work, which consists almost exclusively of working age people and their children. Over time, however, these workers will enter retirement, and presumably be allowed to continue membership of the medical scheme or state health insurance fund to which they belonged when part of the workforce. In some cases, employers might guarantee to pay part or all of their employees post-retirement premium contributions. We know that expected health care costs increase significantly with old age. Unfortunately, accurate estimates of the likely cost increases due to old age in low-cost hospital settings are difficult to obtain since very few mine hospital users are past retirement age. It is possible to calculate the ratio of hospital costs by sex and age group for two of the medical scheme populations studied, and these are shown in figure 6.1. Those over 60 years of age require 2–3 times the population average in terms of health care resources. Consequently, we would expect the average costs of a mandatory core package to increase as its member population came to resemble the average age structure of the population over time. Furthermore, if a risk equalization mechanism (Söderlund and Khosa, 1997) were introduced to compensate insurance funds that take on higher proportions of the elderly, new working age core package enrollees would be required to pay into the fund to subsidize elderly existing members, and premiums would thus rise. If core package insurance brought an additional 10 million persons into the privately insured pool, expected average premium costs for those purchasing the core package would increase by 9.8 percent because of the older age profile of the already insured population.

---

### 6.2 The Impact of Aids and HIV

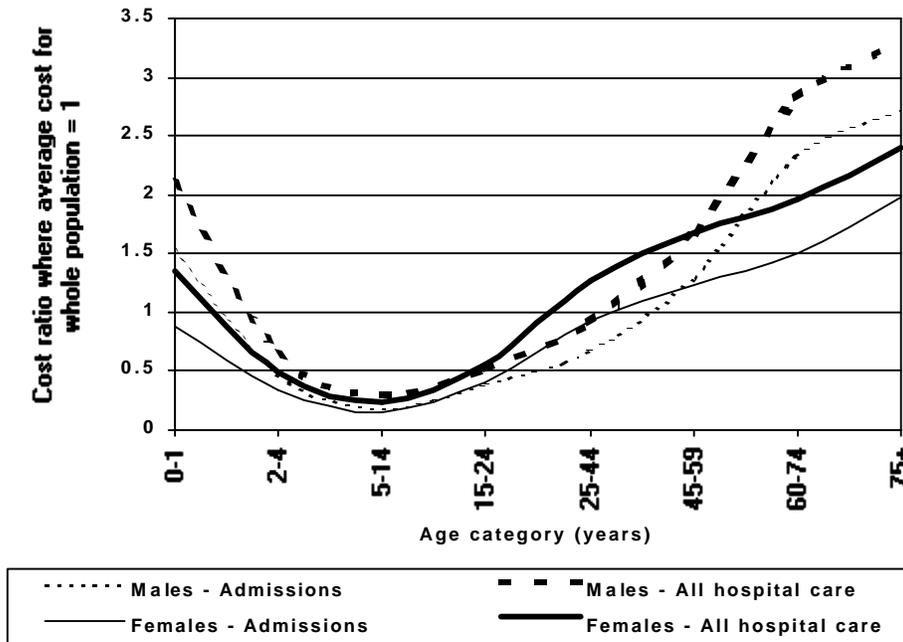
Of all the single diseases potentially afflicting South Africans, AIDS is almost certainly the most ominous. Current seroprevalence surveys indicate that between 10 and 17 percent of sexually active South Africans between the ages of 15 and 44 are infected with the virus (Department of Health, 1997b). Most of these will only become sick 3–10 years after their infection, and we could thus reasonably expect a massive increase in the AIDS-related burden on hospitals over the next 30 years or so. Because of the new nature of HIV/AIDS, there is considerable uncertainty both about the natural course of the disease and about the potential effectiveness of individual curative treatments and population-based prevention strategies. In this section we have taken cost data for HIV-related diseases from the mine hospital data set and published data from Baragwanath Hospital<sup>11</sup> (Karstaedt et al., 1996; Kinghorn et al., 1996), and combined these with epidemiologic simulation model predictions of the likely future prevalence of HIV/AIDS in South Africa. The model used was the Actuarial Association of South Africa (ASSA) Scenario 500 model, which

---

<sup>11</sup> Baragwanath hospital is located in Soweto, south of Johannesburg. It is the world's largest hospital in terms of beds (approximately 3,300).

was calibrated to antenatal clinic HIV serosurvey data from the period 1990 to 1996. A full description of the methods used and detailed results are given in Annex C.

Figure 6.1  
Ratio of Average Hospital Costs per Year between Age and Sex Groups

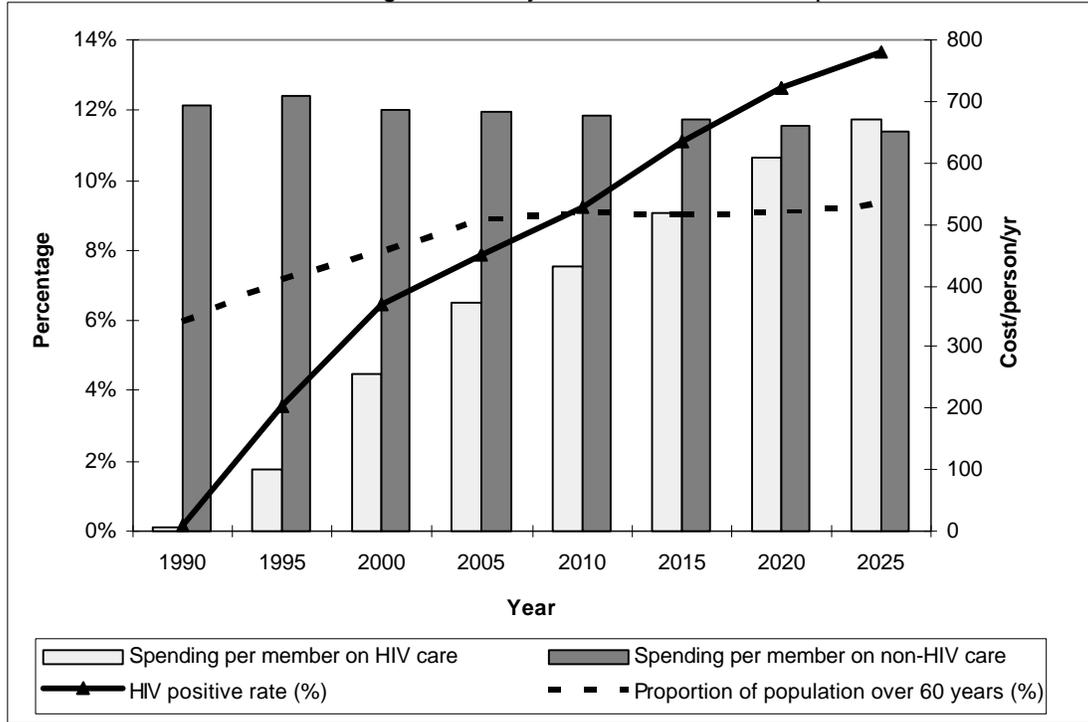


In summary, the model assumes a hypothetical insurance fund consisting of 50,000 persons. It consists of 50 percent black African and 50 percent non-African members in 1987, and assumes a 1-percent annual increase in the proportion of African members so that by 2025 the population mix is roughly representative of the country. The demographics of African and non-African groups are drawn from the medical scheme member subset of the 1995 October Household survey sample. The demographic mix of the model population is thus similar to that described in Figure 6.1 above, and includes retired persons. It is assumed that HIV costs are related to stage of HIV where stage was determined retrospectively by period until death. Only hospital inpatient and outpatient costs were included in the model. The model predicts an increase in HIV-related costs from around R100 per enrollee per year in 1995 to just under R700 per enrollee per year in 2025 in constant 1998 rands. This implies that the real cost of coverage will increase by 63 percent if current levels of expenditure on HIV-related diseases continue over time. It should be emphasized that these costs include only the treatment of intercurrent infections and malignancies in HIV-infected persons and do not include anti-retroviral therapy, which would almost double HIV-related costs even if used only for late-stage disease (W. Bannenberg, personal communication, 1997).

Figure 6.2 illustrates the potential impact of HIV on costs for the model population. The bars represent HIV- and non-HIV-related costs (on the right y-axis), while the lines represent HIV seroprevalence and the population percentage over 60 years of age (left y-axis). Some of the high costs of HIV appear to be offset at a late stage of the epidemic by a reduction in the number of people surviving to old age, who would otherwise require treatment for degenerative health problems. There is also a decreased fertility rate and costs associated with higher levels of fertility towards the later stages of the epidemic because death of women at young ages results in

diminished numbers of babies. Net health care costs continue to increase beyond 2025, however, indicating that these cost-reducing effects are insufficient to offset the costs incurred as a result of HIV.

Figure 6.2  
Costs of Treating HIV-related and Other Diseases, HIV Prevalence Rates, and Percentage of Elderly Persons in Model Population



The objective of this projection exercise is simply to emphasize the considerable uncertainty surrounding the future costs of HIV care. Given current prevention and treatment technology, therefore, the effect of HIV even under the relatively conservative scenario modeled here will probably be substantial. If technology changes—as is highly likely—cheaper or more effective treatments will become available for HIV, and the future will be more favorable than current projections indicate. It is likely that political and economic realities will prevent the degree of spending on HIV-related disease projected. The non-infected population will resist paying such a high premium for HIV-related disease if they perceive themselves to be at low risk, and this might result in poorer quality care for HIV, the ejection of HIV-infected individuals from community risk pools, or the collapse of private health insurance. The ability of government to prevent this eventuality will be severely restricted by the high costs involved and the fact that public hospitals will be overburdened by treating HIV-related diseases. In the short run, therefore, it is essential that any core benefit package takes into account both the potentially high HIV-related costs and the uncertainty surrounding estimates of these costs.



## 7. Affordability

We estimate that in 1998, a feasible low-cost package of essential inpatient and outpatient hospital care will cost around R690 per person per year given the average age and gender structure of the employed but uninsured population and dependents. This consists of approximately R510 for hospital care and R180 for ambulatory care. This is fairly meaningless without being placed within an affordability context, however. In the section which follows we estimate the likely impact of such a mandatory package on the aggregate national payroll. A more detailed analysis of affordability for individual households under different cross-subsidy scenarios is included in Annex D.

Income Category (per breadwinner per year)	Average Number of Dependents per Worker	Cumulative Number of Persons Covered—000s (workers plus dependents)	Cumulative % of Total Payroll*
0-1000	2.13	19384	10.6
1001-2000	2.38	19344	10.6
2001-5000	2.19	19187	10.5
5001-10000	2.51	17536	9.8
10001-20000	2.47	13470	8.1
20001-30000	2.31	7503	5.8
30001-50000	2.29	3731	4.1
50001-75000	2.22	1297	2.6
75001-100000	2.02	423	1.7
100001-200000	1.55	200	1.2
>200000	0.74	21	0.4

\* Gives cumulative proportion of total payroll spent on health care coverage assuming that all wealthier income categories are already covered.

Data on employee incomes, numbers of dependents and existing medical scheme coverage have been taken from the 1995 October Household Survey (OHS) and inflated to 1998 terms using the Consumer Price Index. Table 7.1 summarizes data extracted from the OHS. Approximately 71 percent of workers in the target population earn between R5,000 and R30,000 per year, with relatively small numbers of employees earning above this level who are not medical scheme members and relatively small numbers of employed persons earning less than R5,000 per year. The right-hand column of table 7.1 indicates the impact on total payroll costs of extending core package coverage to lower-income groups. This illustrates the impact of such coverage on total employment costs, rather than on household incomes, and assumes that coverage would be mandated first for higher income employees. If core package coverage were required for all persons earning above R30,000 per year, for example, payroll costs would be an additional 4.1 percent, and health care coverage would be provided to an additional 3.7 million people. If mandatory coverage applied to all of those with incomes above R20,000 per year, on the other

hand, payroll for included workers would increase by 5.8 percent, and 7.5 million persons would be included in insurance coverage. Including lower-income groups into core package coverage would seem at this stage to impose an inordinate economic burden on low-middle-income workers and their employers. Given the package cost estimates generated here, it would seem inadvisable to apply any employer mandate to those earning less than between R20,000 and R30,000 per annum. This would increase the insured population by between 4 and 8 million persons, but would leave a residual group of between 12 and 16 million low-income employees and their families reliant on tax-funded public hospital services. Including lower-income categories within the employer mandate would probably require either a downward revision in the size of the core benefit package, or a state subsidy to low-income groups. Many of these low-income employees would be in semi-formal occupations such as farm labor and domestic work, however, and would thus be difficult to capture within any mandatory coverage net.

---

## 8. Conclusions

The concept of an “essential package of hospital services” is a key component of the South African National Department of Health’s strategy to reform health care financing in South Africa. It would serve as both the package of benefits offered by any future state health insurer, as well as a minimum set of benefits that all private insurers would be forced to offer. A strong motivation behind the “package concept” appears to be a desire on the part of the state to ensure that all persons able to afford basic health care make a prepayment to cover such care, at least at the public hospital level. This in turn would alleviate free-riding and dumping problems in public hospitals, and allow them to concentrate the use of tax resources on the unemployed and indigent. It would also facilitate transfer of funds from hospitals to primary health care facilities. We concluded, therefore, that the objective of introducing a core package was to provide “minimum public insurance,” i.e., to force individuals to insure for care that the state, because of its position as *de facto* last resort insurer has no choice but to treat through its hospital network.

Cost effectiveness, public preference, and absolute affordability, are important considerations, but should not override this primary objective. This primary objective distinguishes the South African case from other prioritization exercises, such as the Oregon Experiment, which tried to determine ways of spending public funds most judiciously.

We attempted to translate this objective into a set of hospital interventions using a subset of 600 or so hospital diagnosis-treatment pairs designed by the Oregon Health Services Commission. The result was a package of hospital care which covered all life threatening conditions for which effective treatments existed, some urgent non-life-threatening conditions, maternity care, fertility control, and palliative care for the terminally ill. Non-life-threatening conditions for which treatment was not urgently required, as well as treatments of dubious effectiveness, were excluded from the hospital package, as were all medical, dental and paramedical primary care interventions. Finally, because of the “public good” nature of chronic psychiatric and infectious disease treatment, we left coverage of these out of the package, favoring funding directly from tax revenue for all residents.

Based on utilization data from South African and British sources, and costs in local mine hospitals, we estimated that the package should cost around R700 per insured person per year in 1998 Rands for both inpatient and hospital outpatient care. We attempted to simulate the potential impact of two future phenomena, population aging and HIV, on the costs of the core package. While the impact of the former was likely to be small, the latter will almost certainly have a significant impact on core package costs, even without offering high-cost anti-retroviral treatments. In the absence of significant advances in either the prevention or treatment of HIV, we estimated that it would be consuming around 50 percent of essential hospital package expenditures by the year 2025.

Finally, we attempted to assess affordability of the essential package for currently uncovered formal sector workers and their dependents. For workers earning less than around R20,000 per year, the economic burden imposed by the package was significant, and we recommend that these workers only be included in any employer mandate if a state subsidy pay for part of their contribution. A mandate applying to those earning R20,000 or more, and their dependents would expand insurance coverage by about 7.5 million persons.

An analysis of the likely costs of core package provision in public hospitals is missing from this report. The main reasons for this were a complete absence of individual patient level data for public hospitals, poor denominator data for user populations, and unreliable accounting data. An unpublished analysis of costs of existing levels of coverage in Gauteng<sup>12</sup> suggests that, using the same cost-standardization approach used for mine hospital data, approximately R549 is spent per potential user per year on hospital inpatient care. Some public hospitals provide services in excess of the minimum package, and it is almost certain that others fail to provide even the basic package. It is thus difficult to compare costs directly between the two sectors, except to say that public hospital costs for currently provided levels of care are lower than what would be expected from mine hospitals.

This introductory study intends to stimulate more widespread discussion around the construction of a package of essential hospital benefit package for South Africa. Two further processes are now required before the package could be incorporated into planned public or private health insurance legislation.

First, a process needs to be instigated whereby the package designed here can be adapted to South African conditions, both now, and over time. At the very minimum, this should consist of setting up a national technical working group to assess the applicability of the Oregon treatment categories and assign diagnosis-treatment pairs to each category. Over time, this group could consider applications to expand or contract the package, review the impact of emerging diseases such as HIV, and update affordability data according to the prevailing economic climate. It could also coordinate public input to the design of the package.

Secondly, the political feasibility of a core-package approach to employer mandate legislation needs to be tested. Virtually no political debate has arisen around the core package approach. Some stakeholders have complained that it was impossible to enter into this debate before a package was proposed. Hopefully this document helps to provide a baseline for discussion.

---

<sup>12</sup> Söderlund N, May 1997, *op cit*

---

# Annex A

---

## 50 Most Frequent Likely Causes for Hospital Admission, Described as OHSC Diagnosis Treatment Pairs—in Descending Order of Frequency

DIAGNOSIS: PREGNANCY

ICD-9 CODE: 620.7,621.1,622.5,640-677,751.8,760-763,766,768,V22-V24,V26-V28,V30-V3

TREATMENT: OBSTETRICAL CARE

CPT-4 CODE: 49215,57700,58520,59000,59012,59015,59020,59025,59030,59050-59051,5910

CATEGORY: 2

DIAGNOSIS: CHRONIC DISEASE OF TONSILS AND ADENOIDS

ICD-9 CODE: 474.0,474.1-474.2,474.9

TREATMENT: TONSILLECTOMY AND ADENOIDECTOMY

CPT-4 CODE: 42820-42836,42860,42870,90700-90713,90716,90718-90724,90726-90799,9090

CATEGORY: 11

DIAGNOSIS: PNEUMOCOCCAL PNEUMONIA, OTHER BACTERIAL PNEUMONIA,  
BRONCHOPNEUMONIA, I

ICD-9 CODE: 020.3-020.5,022.1,025,073.0,481-483,485-486,487.0,507,508.0

TREATMENT: MEDICAL THERAPY

CPT-4 CODE: 31645,33960-33961,90700-90713,90716,90718-90724,90726-90799,90900-9235

CATEGORY: 1

DIAGNOSIS: CHRONIC OTITIS MEDIA

ICD-9 CODE: 380.5,381.1-381.3,381.5-381.7,381.81,382.1-382.3,383.1,384.2

TREATMENT: PE TUBES/ADENOIDECTOMY/TYMPANOPLASTY, MEDICAL THERAPY

CPT-4 CODE: 42830-42831,42835-42836,69210,69220-69222,69310,69400-69410,69420-6942

CATEGORY: 11

DIAGNOSIS: HIV DISEASE (EXCLUDING OPPORTUNISTIC INFECTIONS OR MALIGNANCIES  
IN HIV

ICD-9 CODE: 042

TREATMENT: MEDICAL THERAPY

CPT-4 CODE: 90700-90713,90716,90718-90724,90726-90799,90900-92353,92358-92371,9250

CATEGORY: 5

DIAGNOSIS: CANCER OF BREAST, TREATABLE

ICD-9 CODE: 174-175,233.0,238.3,239.3

TREATMENT: MEDICAL AND SURGICAL TREATMENT, WHICH INCLUDES CHEMOTHERAPY  
AND RADIAT

CPT-4 CODE: 11401-11402,11623,13132,13300,17100,17999,19110,19120,19125-19126,1916

CATEGORY: 5

DIAGNOSIS: OTHER GASTROENTERITIS AND COLITIS

ICD-9 CODE: 558

TREATMENT: MEDICAL THERAPY

CPT-4 CODE: 90700-90713,90716,90718-90724,90726-90799,90900-92353,92358-92371,9250

CATEGORY: 3

DIAGNOSIS: SKIN, NAIL AND HAIR INFECTIONS, CELLULITIS AND ABSCESSSES NOS

ICD-9 CODE: 054.6,527.3,566,597.0,607.2,608.4,611.0,611.2,611.8,680-682,684,686.8,

TREATMENT: MEDICAL AND SURGICAL TREATMENT

CPT-4 CODE: 10060-10061,10120-10121,10140,10180,11040-11044,11730-11732,11740,1175

CATEGORY: 10

DIAGNOSIS: UTERINE LEIOMYOMA

ICD-9 CODE: 218-219,621.0,621.2

TREATMENT: HYSTERECTOMY OR MYOMECTOMY

CPT-4 CODE: 56301-56304,56306-56309,56350,56352-56356,57240-57260,57410,57511,5782

CATEGORY: 11

DIAGNOSIS: FRACTURE OF JOINT, CLOSED (EXCEPT HIP)

ICD-9 CODE: 810.0,811.0,812.0,812.4,813.0,813.4,814.0,815.0,816.0,817.0,819.0,821.

TREATMENT: REDUCTION

CPT-4 CODE: 20690,20692-20694,20900,23500-23515,23570-23630,24530-24587,24650-2468

CATEGORY: 12

DIAGNOSIS: TUBERCULOSIS

ICD-9 CODE: 010-012,031.0,137.0,137.2-137.4,429.4

TREATMENT: DIAGNOSIS AND ACUTE MEDICAL THERAPY, TRANSFER TO MAINTENANCE THERAPY

CPT-4 CODE: 32662,32906,32960,33015,33020,33025,33030-33031,33050,90700-90713,9071

CATEGORY: 5

DIAGNOSIS: UNCOMPLICATED HERNIAS AGE 18 AND OVER

ICD-9 CODE: 550.9,553,629.1,728.84

TREATMENT: REPAIR

CPT-4 CODE: 32800,39502-39541,43330-43331,44050,44346,49250,49500-49611,51500,5554

CATEGORY: 11

DIAGNOSIS: RHEUMATOID ARTHRITIS, OSTEOARTHRITIS, AND ASEPTIC NECROSIS OF BONE

ICD-9 CODE: 713.5,714.0,714.3,715.1-715.3,715.9,716.1,733.4

TREATMENT: SURGERY, INCLUDING ARTHROPLASTY

CPT-4 CODE: 23470-23472,23800-23802,24102,24130,24160,24164,24360-24366,24800-2480

CATEGORY: 11

DIAGNOSIS: NEONATAL ANEMIA AND JAUNDICE

ICD-9 CODE: 277.4,772.0,772.3-772.4,773.0-773.2,773.4-773.5,774.0-774.4,774.6-774.

TREATMENT: MEDICAL THERAPY

CPT-4 CODE: 90700-90713,90716,90718-90724,90726-90799,90900-92353,92358-92371,9250

CATEGORY: 2

DIAGNOSIS: ASTHMA; PNEUMONIA DUE TO RESPIRATORY SYNCYTIAL VIRUS IN PERSONS UNDER ICD-9 CODE: 480.1,493

TREATMENT: MEDICAL THERAPY

CPT-4 CODE: 31600-31603,31820,31825,90700-90713,90716,90718-90724,90726-90799,9090

CATEGORY: 5

DIAGNOSIS: NEONATAL AND INFANT GIT ABNS AND DISORDERS NOS  
ICD-9 CODE: 564.8,750.5,751.0-751.5,751.7-751.9,756.7,770.1,777.1-777.4,777.8  
TREATMENT: MEDICAL AND SURGICAL THERAPY  
CPT-4 CODE: 32905-32906,43500-43510,43520,43620-43638,43640,43760,43800-43832,4384  
CATEGORY: 2

DIAGNOSIS: HYPERTENSION AND HYPERTENSIVE DISEASE  
ICD-9 CODE: 401-402,437.2,997.91  
TREATMENT: MEDICAL THERAPY  
CPT-4 CODE: 90700-90713,90716,90718-90724,90726-90799,90900-92353,92358-92371,9250  
CATEGORY: 5

DIAGNOSIS: TOP  
ICD-9 CODE: 620.7,621.1,635-639,655,779.6,V25.3  
TREATMENT: INDUCED ABORTION  
CPT-4 CODE: 58520,58611,59100,59200,59840-59841,59850-59852,59855-59857,90700-9071  
CATEGORY: 6

DIAGNOSIS: MENSTRUAL BLEEDING DISORDERS  
ICD-9 CODE: 621.7,626.2-626.6,626.8,627.0  
TREATMENT: MEDICAL AND SURGICAL TREATMENT  
CPT-4 CODE: 11975-11977,56308,56350,56356,57820,58120,58150,58152,58180,58260,9070  
CATEGORY: 10

DIAGNOSIS: SYMPTOMATIC IMPACTED TEETH  
ICD-9 CODE: 520.6,524.3-524.4  
TREATMENT: SURGERY  
CPT-4 CODE: 41899  
CATEGORY: 11

DIAGNOSIS: DISORDERS OF SPINE WITH NERVE DYSFUNCTION  
ICD-9 CODE: 344.6,721.1,721.4-721.6,721.91,722.0-722.2,722.7,723.0,723.2-723.4,724  
TREATMENT: LAMINECTOMY, MEDICAL THERAPY  
CPT-4 CODE: 20931,20938,22548,22554,22556,22558,22585,22851,22632,22808,55870,6228  
CATEGORY: 11

DIAGNOSIS: CATARACT  
ICD-9 CODE: 366.0-366.3,366.8,743.3,998.82,V43.1  
TREATMENT: EXTRACTION OF CATARACT, LENS IMPLANT  
CPT-4 CODE: 65770,66250,66682,66825,66830,66840,66850-66852,66920-66984,66986,9070  
CATEGORY: 11

DIAGNOSIS: PELVIC PAIN SYNDROME  
ICD-9 CODE: 614.1,614.6,625.0-625.2,625.4-625.5,625.8-625.9  
TREATMENT: MEDICAL AND SURGICAL TREATMENT  
CPT-4 CODE: 56303-56304,56306-56309,56351-56352,56355,58150,58260-58285,58400,5841  
CATEGORY: 13

DIAGNOSIS: NON-SUPERFICIAL OPEN WOUNDS, NON-LIFE THREATENING  
ICD-9 CODE: 870.0-870.1,872.0-872.1,872.62-872.69,872.7-872.9,873.0-873.5,873.7-87  
TREATMENT: REPAIR  
CPT-4 CODE: 11043,11730,11750,12001-13300,15000-15400,15570-15576,15580-15625,1565  
CATEGORY: 10

DIAGNOSIS: PHIMOSIS  
ICD-9 CODE: 605  
TREATMENT: SURGICAL TREATMENT  
CPT-4 CODE: 54152,54161  
CATEGORY: 17

DIAGNOSIS: DEFORMITIES OF FOOT  
ICD-9 CODE: 355.5,355.6,718.07,718.17,718.27,718.37,718.47,718.57,718.87,727.1,732  
TREATMENT: FASCIOTOMY/INCISION/REPAIR/ARTHRODESIS  
CPT-4 CODE: 20920,20922,20924,27690-27692,28008,28010,28035,28050-28072,28086-2809  
CATEGORY: 11

DIAGNOSIS: VIOLENT INJURY, PHYSICAL AND SEXUAL ABUSE INCLUDING RAPE, NOS  
ICD-9 CODE: 959.9,994.2-994.3,995.5,995.81,V61.21,V71.5  
TREATMENT: MEDICAL THERAPY  
CPT-4 CODE: 90700-90713,90716,90718-90724,90726-90799,90900-92353,92358-92371,9250  
CATEGORY: 1

DIAGNOSIS: ACUTE PELVIC INFLAMMATORY DISEASE  
ICD-9 CODE: 614.0,614.2-614.5,614.7-614.9,615  
TREATMENT: MEDICAL AND SURGICAL TREATMENT  
CPT-4 CODE: 11043,57010,58150,58805,58820-58822,58925,90700-90713,90716,90718-9072  
CATEGORY: 1

DIAGNOSIS: INTERNAL DERANGEMENT OF KNEE AND LIGAMENTOUS DISRUPTIONS OF  
THE KNEE,  
ICD-9 CODE: 717.0-717.4,717.6-717.7,717.81-717.84,836.0-836.1,844.0-844.2  
TREATMENT: REPAIR, MEDICAL THERAPY  
CPT-4 CODE: 27332-27335,27340,27350,27380-27386,27430,27650-27654,29871-29889,2740  
CATEGORY: 12

DIAGNOSIS: PRIAPISM, ORCHITIS, EPIDIDYMITIS, SEMINAL VESICULITIS, FOREIGN BODY  
IN  
ICD-9 CODE: 595,598,599.0,601.0,604,607.3,608.0,608.83,939.0,939.3,939.9  
TREATMENT: MEDICAL THERAPY, REMOVAL OF FOREIGN BODY, DILATION  
CPT-4 CODE: 51700,52260,52265,52275-52276,52283,53040,53600-53621,53640,53660-5367  
CATEGORY: 10

DIAGNOSIS: OTHER NONFATAL VIRAL INFECTIONS, EXCLUDING PNEUMONIA DUE TO  
RESPIRATOR  
ICD-9 CODE: 051-052,053.0-053.1,053.7-053.9,055,056.79,056.9,057,072,074,078.0,078  
TREATMENT: MEDICAL THERAPY  
CPT-4 CODE: 90700-90713,90716,90718-90724,90726-90799,90900-92353,92358-92371,9250  
CATEGORY: 14

DIAGNOSIS: GENERALIZED CONVULSIVE OR PARTIAL EPILEPSY WITHOUT MENTION OF  
IMPAIRMENT  
ICD-9 CODE: 345.1,345.5  
TREATMENT: SINGLE FOCAL SURGERY  
CPT-4 CODE: 61533-61536,61720,61735,61760,61850-61888  
CATEGORY: 11

DIAGNOSIS: DYSPLASIA OF CERVIX AND CERVICAL CARCINOMA IN SITU, CERVICAL  
CONDYLOMA

ICD-9 CODE: 078.1,233.1,622.0-622.2,623.0-623.1,623.7,795.0

TREATMENT: MEDICAL AND SURGICAL TREATMENT

CPT-4 CODE: 11623,52240,56515,56501,57061-57065,57150,57180,57400,57460,57505,5751

CATEGORY: 5

DIAGNOSIS: ENTERIC INFECTIONS AND OTHER BACTERIAL FOOD POISONING

ICD-9 CODE: 003.0,003.8-003.9,005.0,005.2-005.9,008.0-008.4,008.6-008.8,009

TREATMENT: MEDICAL THERAPY

CPT-4 CODE: 90700-90713,90716,90718-90724,90726-90799,90900-92353,92358-92371,9250

CATEGORY: 14

DIAGNOSIS: REGIONAL ENTERITIS, IDIOPATHIC PROCTOCOLITIS

ICD-9 CODE: 008.5,555,556,557.1,569.41,569.81

TREATMENT: MEDICAL AND SURGICAL TREATMENT

CPT-4 CODE: 44110,44121,44139-44160,44345,44625,44650,45112-45113,45123,45307-4530

CATEGORY: 5

DIAGNOSIS: THROMBOSED AND COMPLICATED HEMORRHOIDS

ICD-9 CODE: 455.1-455.2,455.4-455.5,455.7-455.8

TREATMENT: HEMORRHOIDECTOMY, INCISION

CPT-4 CODE: 10140,45320,45334,45339,46083,46220-46221,46250-46262,46320,46500,4660

CATEGORY: 11

DIAGNOSIS: BENIGN NEOPLASMS OF SKIN

ICD-9 CODE: 210,214,216,221,222.1,222.4,228.01,228.1,229,686.1

TREATMENT: MEDICAL THERAPY, WHICH INCLUDES RADIATION THERAPY, SURGERY

CPT-4 CODE: 10060-10061,10120-10160,11000-11446,11600-11646,12031-12032,13100-1315

CATEGORY: 17

DIAGNOSIS: BENIGN NEOPLASM BONE & ARTICULAR CARTILAGE INCLUDING OSTEIOD  
OSTEOMAS;

ICD-9 CODE: 213,215,225.3-225.4,526.0-526.1,526.81,610,719.2,733.2

TREATMENT: EXCISION, RADIATION THERAPY

CPT-4 CODE: 10060-10061,11050,11400-11446,13131,17100-17200,19125-19126,19290-1929

CATEGORY: 11

DIAGNOSIS: SEVERE RHINITIS, CHRONIC SINUSITIS, NASAL POLYPS,

ICD-9 CODE: 471,472.0,473,478.1,993.1

TREATMENT: MEDICAL AND SURGICAL TREATMENT

CPT-4 CODE: 30000-30020,30110-31230,31237-31240,31254-31256,31267,31276,31287-3129

CATEGORY: 11

DIAGNOSIS: GANGLION OF TENDON OR JOINT

ICD-9 CODE: 727.4

TREATMENT: EXCISION

CPT-4 CODE: 10140,10160,20600,20605,20610,25111-25112,28090,90700-90713,90716,9071

CATEGORY: 11

DIAGNOSIS: SEBORRHEIC KERATOSIS, DYSCHROMIA, AND VASCULAR DISORDERS, SCAR CONDITION

ICD-9 CODE: 278.1,702.1-702.8,709.1-709.3,709.8-709.9

TREATMENT: MEDICAL THERAPY, SURGERY

CPT-4 CODE: 11000,11050,11420,15781-15783,15810-15811,15831-15839,15876-15879,1700

CATEGORY: 17

DIAGNOSIS: ACUTE BACTERIAL BRONCHITIS

ICD-9 CODE: 466

TREATMENT: MEDICAL THERAPY

CPT-4 CODE: 31600-31603,31820,31825,90700-90713,90716,90718-90724,90726-90799,9090

CATEGORY: 1

DIAGNOSIS: NEUROLOGICAL DYSFUNCTION due to CHRONIC NEURO-DEGENERATIVE CONDITION

ICD-9 CODE: 046,049,062-063,090.40,094.0-094.2,137.1,138,139.0,139.8,191-192,225,2

TREATMENT: MEDICAL THERAPY

CPT-4 CODE: 21084,31611,70370-70371,90700-90713,90716,90718-90724,90726-90799,9090

CATEGORY: 13

DIAGNOSIS: MALARIA AND RELAPSING FEVER

ICD-9 CODE: 084,086.1-086.5,087

TREATMENT: MEDICAL THERAPY

CPT-4 CODE: 90700-90713,90716,90718-90724,90726-90799,90900-92353,92358-92371,9250

CATEGORY: 1

DIAGNOSIS: PERIPHERAL ENTHESOPATHIES

ICD-9 CODE: 726.12,726.3-726.9,728.81

TREATMENT: SURGICAL TREATMENT

CPT-4 CODE: 20550,20600-20610,21032,24105,24350-24352,24354,24356,25447,26035-2606

CATEGORY: 11

DIAGNOSIS: NONINFLAMMATORY DISORDERS AND BENIGN NEOPLASMS OF OVARY, FALLOPIAN TUB

ICD-9 CODE: 220,221.0,620.0-620.1,620.4,620.8

TREATMENT: SALPINGECTOMY, OOPHORECTOMY, HYSTERECTOMY

CPT-4 CODE: 56307-56308,56352-56356,58140-58150,58260-58263,58700-58720,58925,5894

CATEGORY: 11

DIAGNOSIS: CERVICAL VERTEBRAL DISLOCATIONS/FRACTURES, OPEN OR CLOSED; OTHER VERTE

ICD-9 CODE: 337.0,718.88,805.0-805.1,805.3,805.5,805.7,806,839.0-839.1,839.3,839.5

TREATMENT: REPAIR/RECONSTRUCTION, MEDICAL THERAPY

CPT-4 CODE: 20690,20692-20694,20900,20930-20938,22548,22100-22116,22305-22328,2250

CATEGORY: 3

DIAGNOSIS: UTERINE PROLAPSE; CYSTOCELE

ICD-9 CODE: 618

TREATMENT: SURGICAL REPAIR

CPT-4 CODE: 45560,52270,52285,53000,53010,56308,57120,57160,57220,57230,57240-5728

CATEGORY: 11

DIAGNOSIS: BURN, PARTIAL THICKNESS WITHOUT VITAL SITE, 10-30% OF BODY SURFACE  
ICD-9 CODE: 941.26-941.27,941.36-941.37,942.20-942.24,942.29-942.34,942.39,943.2-9  
TREATMENT: FREE SKIN GRAFT, MEDICAL THERAPY  
CPT-4 CODE: 11000,11040-11041,11960-11971,14020,14040-14041,15000-15121,15200,1522  
CATEGORY: 3

DIAGNOSIS: VARICOSE VEINS OF LOWER EXTREMITIES  
ICD-9 CODE: 454,459  
TREATMENT: STRIPPING/SCLEROTHERAPY  
CPT-4 CODE: 36468-36471,37700,37720-37735,37760,37780-37799,90700-90713,90716,9071  
CATEGORY: 11



# Annex B

**Table A-B-1**  
**Twenty Most Important (in terms of contribution to total cost)**  
**Included DT Pairs (in decreasing order of importance)**

Diag: pregnancy
Proc: obstetric care
Diag: not specified/non-specific/not elsewhere classified*
Proc: not specified/non-specific/not elsewhere classified
Diag: pneumococcal pneumonia, other bacterial pneumonia, bronchopneumonia.
Proc: medical therapy
Diag: tuberculosis
Proc: diagnosis and acute medical therapy, transfer to maintenance therapy
Diag: skin, nail and hair infections, cellulitis and abscesses nos
Proc: medical and surgical treatment
Diag: other gastroenteritis and colitis
Proc: medical therapy
Diag: HIV disease
Proc: medical therapy
Diag: cancer of breast, treatable
Proc: medical and surgical treatment, which includes chemotherapy and radiation therapy
Diag: non-superficial open wounds, non-life threatening
Proc: repair
Diag: menstrual bleeding disorders
Proc: medical and surgical treatment
Diag: hypertension and hypertensive disease
Proc: medical therapy
Diagnosis: burn, partial thickness without vital site
Procedure: free skin graft, medical therapy
Diagnosis: priapism, orchitis, epididymitis, seminal vesiculitis, foreign body in urethra, urethral stricture
Procedure: medical therapy, removal of foreign body, dilation
Diagnosis: asthma; pneumonia due to respiratory syncytial virus in persons under age 3.
Procedure: medical therapy
Diagnosis: fracture of shaft of bone, closed
Procedure: reduction and fixation
Diagnosis: fracture of joint, closed (except hip)
Procedure: reduction and fixation

**Table A-B-1**  
**Twenty Most Important (in terms of contribution to total cost)**  
**Included DT Pairs (in decreasing order of importance)**

Diagnosis: neonatal and infant git abns and disorders nos

Procedure: medical and surgical therapy

Diagnosis: cardiomyopathy, hypertrophic muscle, ischaemic, other degenerative cardiac disease causing failure

Procedure: medical and surgical treatment

Diagnosis: low birth weight baby

Procedure: medical therapy

Diagnosis: septicemia, systemic bacterial infections

Procedure: medical therapy

\*Hospital-based interventions which could not be allocated to an Oregon DT pair, either because of insufficient information, or because the Oregon pairs did not account for these interventions, were included in the package by default.

**Table A-B-2  
Twenty Most Important (in terms of contribution to total cost)  
Excluded DT Pairs (in decreasing order of importance)**

<b>Diagnosis treatment pair</b>	<b>Basis for exclusion</b>
Diagnosis: rheumatoid arthritis, osteoarthritis, aseptic necrosis Procedure: surgery, including arthroplasty	DISCRETE
Diagnosis: chronic disorders of spine with nerve dysfunction Procedure: laminectomy, other surgery, medical therapy	DISCRETE
Diagnosis: chronic disease of tonsils and adenoids Procedure: tonsillectomy and adenoidectomy	DISCRETE
Diagnosis: neurological dysfunction due to chronic neuro-degenerative condition Procedure: medical therapy	DISCRETE + COST
Diagnosis: uncomplicated hernias age 18 and over Procedure: repair	DISCRETE
Diagnosis: cataract Procedure: extraction of cataract, lens implant	DISCRETE
Diagnosis: chronic otitis media Procedure: pe tubes/adenoidectomy/tympanoplasty, medical therapy	DISCRETE
Diagnosis: benign neoplasm bone, articular cartilage and connective tissue Procedure: excision, radiation therapy	DISCRETE
Diagnosis: uterine leiomyoma Procedure: hysterectomy or myomectomy	DISCRETE
Diagnosis: termination of pregnancy Procedure: induced abortion	DISCRETE
Diagnosis: varicose veins of lower extremities Procedure: stripping/sclerotherapy	DISCRETE
Diagnosis: hyperplasia of prostate Procedure: transurethral resection, medical therapy	DISCRETE
Diagnosis: deformities of foot Procedure: fasciotomy/incision/repair/arthrodesis	DISCRETE
Diagnosis: tmj disorders Procedure: tmj surgery	DISCRETE
Diagnosis: cancer of various sites with distant metastases where treatment will not improve survival Procedure: curative medical and surgical treatment	DISCRETE + EFFECTIV
Diagnosis: gallstones without mention of acute cholecystitis Procedure: medical therapy, cholecystectomy	DISCRETE + EFFECTIV
Diagnosis: pelvic pain syndrome Procedure: medical and surgical treatment	DISCRETE

**Table A-B-2  
Twenty Most Important (in terms of contribution to total cost)  
Excluded DT Pairs (in decreasing order of importance)**

Diagnosis treatment pair	Basis for exclusion
Diagnosis: severe rhinitis, chronic sinusitis, nasal polyps, Procedure: medical and surgical treatment	DISCRETE
Diagnosis: noninflammatory disorders & benign neoplasms of ovary, fallopian tube Procedure: salpingectomy, oophorectomy, hysterectomy	DISCRETE
Diagnosis: esophagitis Procedure: fundoplasty, other surgical treatment	DISCRETE
<b>Key:</b> DISCRETE—High level of discretion (score = 4) COST—High cost (score = 4) EFFECTIV—In-effective treatment (score=4)	

---

# Annex C

---

## The Impact of HIV on Core Package Costs

The following section details the methods that were used to estimate the impact of HIV/AIDS on a typical insured South African population. Estimates were generated for a model medical scheme, the characteristics of which are detailed below.

---

## Data Sources and Analysis

### HIV seroprevalence

HIV seroprevalence estimates were generated using the Actuarial Society of South Africa (ASSA Scenario 500) model (Actuarial Society of South Africa, 1995). This applies a standard Markov process to a defined starting population, making assumptions about proportions of the population falling into different risk groups, infection risks, the degree of mixing between risk groups, and a large number of other variables including survival, fertility, perinatal infection rates, gender infectivity ratios, etc. (see below for details). Details regarding the model construction and operation may be found on the ASSA Internet site ([www.assa.co.za](http://www.assa.co.za)). Estimates were generated separately for black African and non-black African populations in South Africa because of documented differences in HIV prevalence between these populations (Department of Health, 1997b). Demographic breakdown data on each of these populations were taken from the 1995 October Household survey, and refer to current African and non-African members of medical schemes. These data were used to replace the starting population in the original ASSA model, (which referred only to the African population) after calibration of the model. The estimated rates for the black African population were calibrated with national antenatal seroprevalence surveys from 1990 to 1996 in order to optimize the risk-group assumptions in the model. For both the African and non-African populations, projections were made from 1990 to 2025 in five year intervals. Extending the model beyond 2025 seemed less than useful since almost all of the underlying assumptions regarding costs, infection rates, risk behavior, and survival are likely to have changed by then.

### ASSA model assumptions

The assumptions made regarding the projection of HIV seroprevalence rates using the ASSA model are described in table A-C-1.

<b>Table A-C-1 ASSA Model Input Assumptions</b>	
<b>Assumptions applied to both African and non-African populations</b>	<b>Value</b>
Median term to death of HIV+ (years)	10
Proportion of Perinatal Infect	0.25
Perinatal HIV mortality rate	0.3
Proportion of Male Births	0.52
Rel Male->Fem infectivity	2

Infections transmitted between groups per year:				
	Sex workers	STD patients	At risk	Zero risk
Sex workers	1	0.05	0.01	0
Previous STD	0.05	0.04	0.02	0
All others at risk	0.01	0.02	0.02	0
Zero risk group	0	0	0	0

Numbers of persons falling into risk categories within sexually active age group:		
	Black African	Non-black African
Sex workers	5%	0.5%
Previous STD	37%	3%
All others at risk	39%	10%
Zero risk group	19%	86.5%

Note : Risk group categories determined iteratively by calibrating against actual antenatal serosurvey data up to 1996.

To simplify the calibration process, it was assumed that the differences between African and non-African population in terms of epidemic progression were due entirely to differences in the proportions of high-risk categories in each. This is almost certainly an oversimplification, but no data were available on the true determinants of differences in population seroprevalence rates. African population data were calibrated to antenatal survey data from 1990 to 1996. Non-African seroprevalence rates were assumed to be one tenth of African ones in 1996 (National Aids Review, 1997), and risk group proportions were altered to produce seroprevalence figures at this level. We assumed that the mix of African/non-African persons in the model medical scheme was 1:1 throughout the study period. In reality, we would expect the proportion of African members to increase significantly over the next 20 years or so. This would have the effect of increasing total HIV costs because of predicted higher prevalence rates in this population.

## Costs

Cost data were taken from the mine hospitals studied, and from published data from Baragwanath hospital (Karstaedt et al., 1996; Kinghorn et al., 1996). UK NHS hospitals treated very few HIV/AIDS cases over the study period, and it was felt that the level of resource allocation to AIDS care in the UK would be inappropriately high for a country with far higher prevalence rates. Medical schemes did not record diagnoses, and often had strict limits on the degree of coverage for AIDS care, and thus could not be used in these analyses. A very simple approach was taken to

estimating costs of hospital care for HIV infected persons based on their estimated time till death. Stage 4 (roughly equivalent to WHO stage 4 disease (World Health Organization, 1990)) was assumed to include all those in their last year of life. Stage 3 contained all residual infected persons who had had at least one previous admission for HIV-related reasons, but were not within one year of death. It was further assumed that 90 percent of stage 3 patients would die within three years. It was assumed that stages 1 and 2 did not require any hospital admissions for HIV-related disease. The staging used is admittedly crude and is used here because it corresponded roughly with that used by the costing exercise undertaken at Baragwanath Hospital (Karstaedt et al., 1996; Kinghorn et al., 1996), rather than for its correspondence with established modern clinical staging approaches.

Cost data from the Baragwanath study were calculated according to clinical stage, and could thus be used in the model after adjustment to 1998 prices. Patients receiving treatment at mine hospitals were allocated retrospectively to stages according to their proximity to death. All patients within one year of death were assumed to be stage 4 cases. Those who had been admitted to hospital for an HIV-related disease at least once, but did not die within the next year, were assumed to be in stage 3 (we assumed that these could not be distinguished). Since we only had data on admitted cases, no information on stage 1 and 2 cases could be extracted, and Baragwanath Hospital figures were assumed for mine hospitals as well.

All costs were expressed in constant 1998 Rands, together with an additional 10 percent allocation for capital costs, and a 10 percent administrative charge, as applied in the core package costing exercise.

## Combining HIV seroprevalence and cost data

Projected HIV seroprevalence and mortality rates from the ASSA model were applied to the standard population used here, and estimated numbers of persons in each stage of HIV disease derived according to their time till death. That is, current and future mortality rates were used to predict proportions in stages 4 and 3 of the disease at any point in time. The remainder of HIV-infected persons at any point in time were assumed to be in stage 1 and 2.

It was assumed that costs per person per year could be broken up into a non-HIV related cost and an HIV-related cost. For uninfected persons, costs per year were simply the core package costs minus any HIV-related costs included within the core package,<sup>13</sup> age–sex-standardized to the demographic profile of the model population at that point in time. For HIV infected persons, costs were assumed to be their age-sex specific non-HIV costs plus their costs of HIV care according to stage of disease (these were not age sex standardized as they didn’t exhibit particular age-sex related patterns). The total costs of the population at any point in time were thus calculated as :

$$C^{\text{Total}} = \sum_{i=1-4} C^{\text{H}}_i N^{\text{H}}_i + \sum_{j=1-16} C^{\text{N}}_j N_j \quad (\text{Figure A-C-1})$$

Where :

$C^{\text{Total}}$  = Total costs for population per year.

---

<sup>13</sup> The HIV related component of the mine hospital core package was assumed to be all tuberculosis and other mycobacterial infections, viral infections, pneumonia, fungal infections, skin and hematological malignancies, and dementia in HIV positive persons. The average cost of these conditions was R138 per person per year in 1995 using mine hospital data. This implies that non-HIV costs of the core package amounted to around R550 per person per year.

$C_i^H$  = Cost/person/year in HIV disease stage  $I$   
 $N_i^H$  = Number of persons in HIV disease stage  $I$  in year concerned  
 $C_j^N$  = Cost /person/year of core package care excluding HIV costs for age-sex group  $j$   
 $N_j$  = Total number of persons in age-sex category  $j$ .

And the average costs per enrollee as :

$$AC = C^{\text{total}} / \sum_{j=1-16} N_j \quad (\text{Figure A-C-2})$$

where AC =average premium cost per enrollee per year.

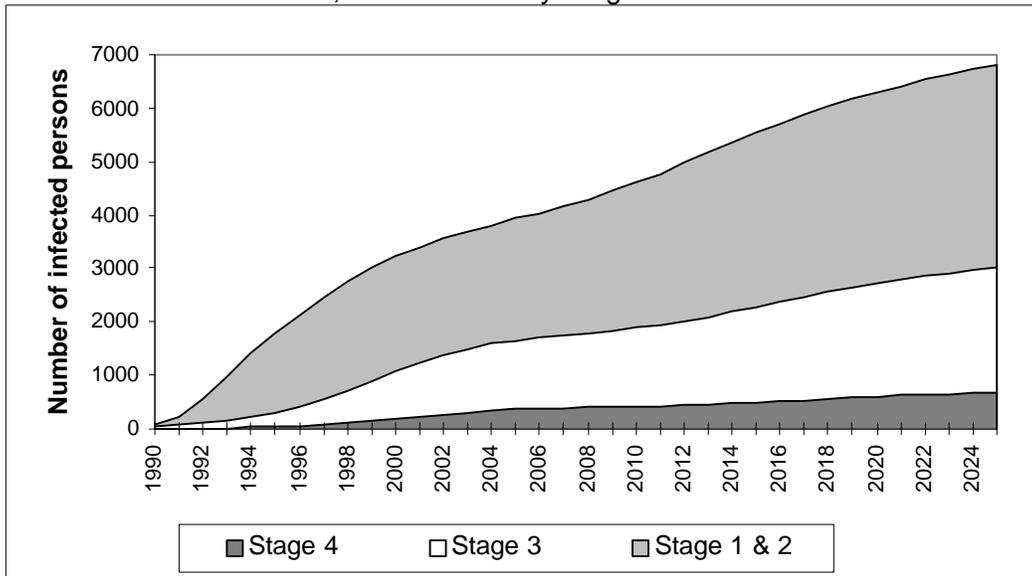
This makes the assumption that none of the costs of non-HIV disease treatment disappear when people are infected with HIV. In reality, there may be the potential for reducing some non-HIV treatment costs, for example, if a patient is attending for a routine HIV appointment, they might use this to obtain an assessment of a recently sustained injury, so avoiding the cost of a second outpatient appointment. This effect would tend to overestimate the costs of HIV-related care. On the other hand, many common infections, such as common upper respiratory tract infections, which are not peculiarly attributable to HIV, have a higher incidence in HIV-infected persons, and from this perspective, our method would produce low estimates of the costs of care due to HIV. The net effect, we believe, is thus likely to be zero.

## Results

The model assumes that the impact of HIV disease on insurance premium costs will be mediated through two phenomena. The first is the increasing cost of HIV care itself. This in turn is a function of increasing total numbers of infected persons, and, at an early stage of the epidemic, increasing proportions of persons with advanced disease. The second potential impact on costs is via the demographic impact of the HIV epidemic. As infected persons die, the age and gender profiles of schemes might be expected to change. Since non-HIV- related costs increase significantly with old age, as fewer people reach old age, we would expect these costs to diminish. The model examines the extent to which the latter phenomenon is able to offset the former.

Figure A-C-1 shows the estimated levels of infection by stage of disease as defined from our data set in terms of presence or absence of hospitalizations and estimated time till death. Most hospitalization costs are incurred by those in WHO stages 3 and 4 of the disease, not those in stages 1 and 2 who have mild or no symptoms of disease (World Health Organization, 1990). Estimated costs by stage are shown in table A-C-2.

Figure A-C-1  
 Numbers of HIV-infected Persons in Model Population  
 of 50,000 Members by Stage of Disease



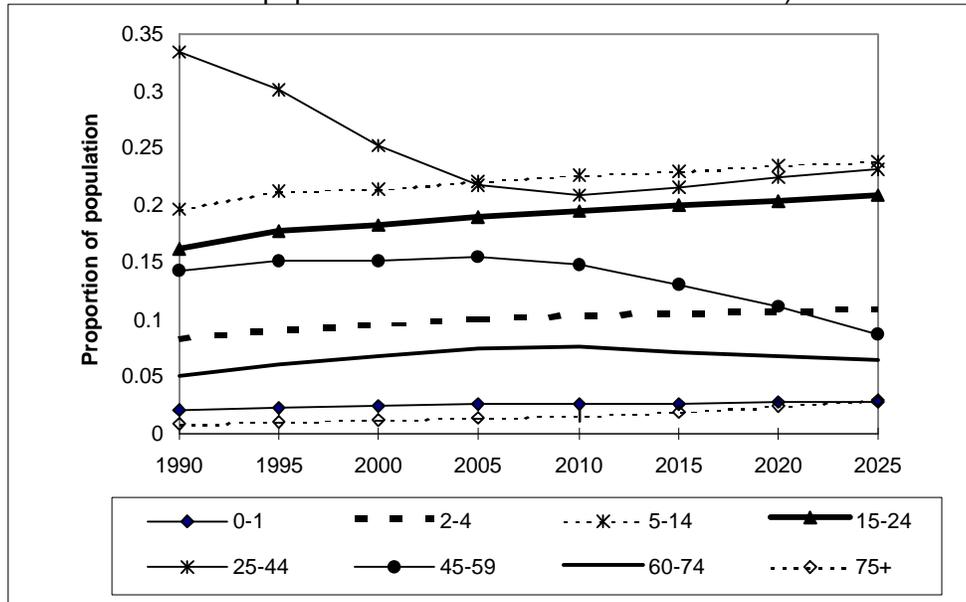
**Table A-C-2**  
**Cost Estimates by Stage of Disease (average of mine hospital and Baragwanath Hospital Data Expressed in 1998 Rands)**

Stage of disease	Outpatient	Inpatient	Total
Stage 4	1,236	1,4361	15,597
Stage 3	938	4,819	5,757
Stage 1 and 2	546	924	1,471

Total HIV costs are thus heavily dependent on the numbers of people with stage 4 disease. The proportion with stage 4 disease increases from an estimate of 1.3 percent in 1990 to around 9 percent in 2004, and from then onwards remains fairly constant between 8.5 and 10 percent until 2025. Since death mirrors the proportions with stage 4 disease, a similar picture is seen with mortality rates, and this has a consequent effect on the demographic profile of the model population. Figure A-C-2 illustrates the change in demographic profile.

Figure A-C-2

The Impact of HIV Infection on Insured Population Demographics by 5-year Interval  
 (The legend refers to age categories whose proportional contributions to the total population are shown on the vertical axis)



Clearly, HIV has the most dramatic effect on the 25–44 year old group in the initial part of the epidemic, and on the 45–59 year age group in the later stage of the epidemic. There is relatively little impact on the over 60 year age group up until 2025. These data suggest that any decrease in costs due to demographic effects are unlikely to occur before 2025.

Figure A-C-3

HIV and non-HIV-related Spending per Enrollee per Year for Model Population

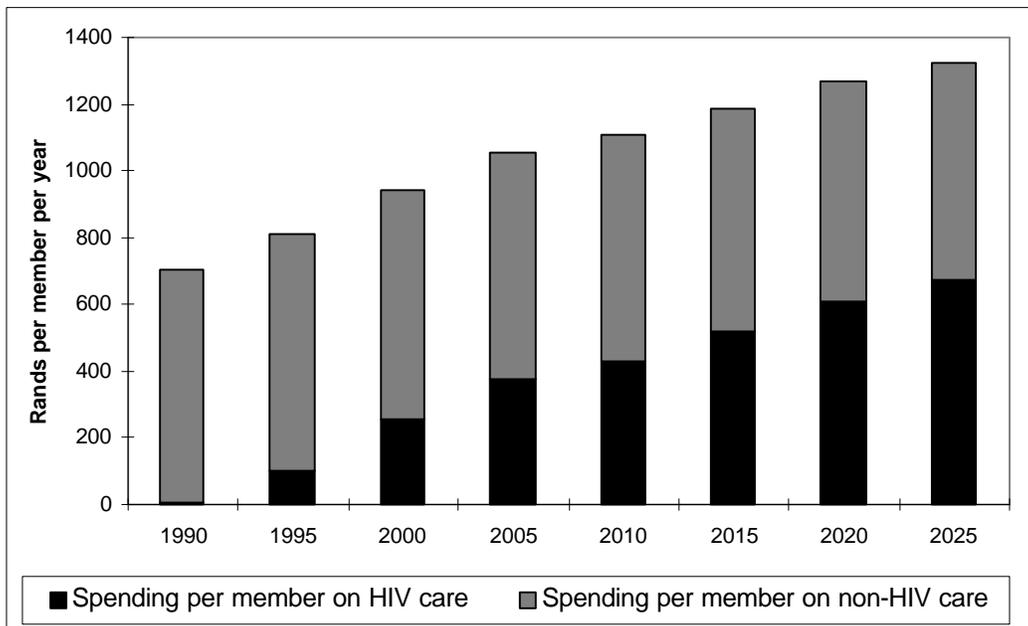
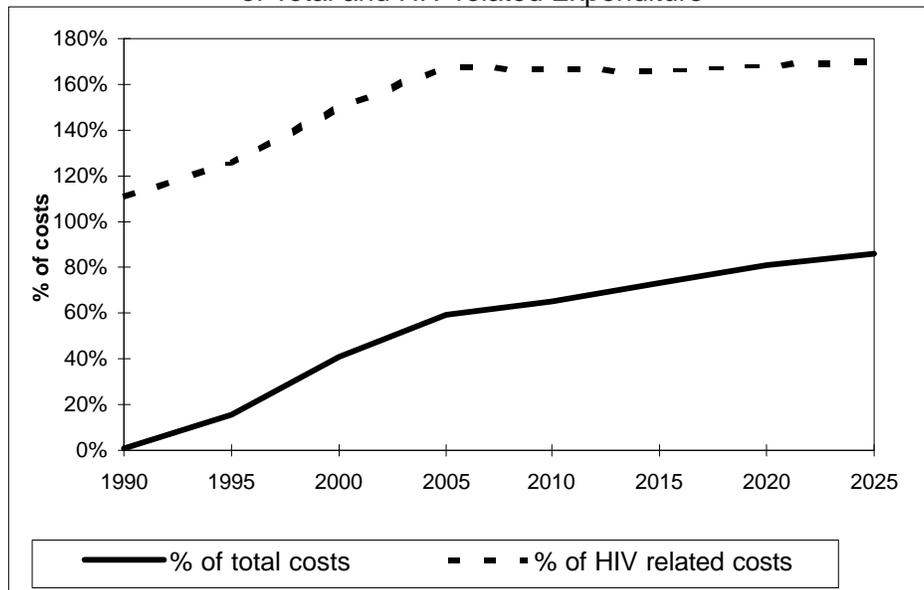


Figure A-C-3 shows how costs per member per year are likely to change as a result of HIV. All costs are given in constant 1998 Rands. There is a dramatic increase in HIV-related spending in this population, and by 2025, approximately half of hospital spending is estimated to go to care of HIV related disease. Over this period there is a 6 percent decrease in the costs of non-HIV-related care due to demographic changes, but this does little to offset the high HIV-related costs.

In both treatment institutions providing cost data, care consisted mainly of treatment of infections and palliative care. Neither had a policy of providing anti-retroviral therapy, which would have considerably increased package costs. Bannenberg has estimated costs of currently advocated triple anti-retroviral (ARV) therapy at R40,000 per year for South Africa (unpublished data, 1997), excluding the costs of additional monitoring required for the safe use of these drugs. If this regime were offered only to those in stage 4, additional costs as a proportion of HIV-related costs and total premium costs year are shown in Figure A-C-4.

Figure A-C-4  
 Costs of Triple Anti-retroviral Therapy for Stage 4 HIV Disease as a Proportion  
 of Total and HIV-related Expenditure



It was assumed that ARV therapy would be effective in averting one third of the hospital treatment costs otherwise incurred by stage 4 patients. At all points in time, the cost of ARV treatment for stage 4 patients alone is more than the total cost of treatment for all HIV-related disease in patients at all stages. At the later stages of the epidemic, ARV treatment for stage 4 patients alone consumes 80 percent of the total health care resources available to this population. Clearly, unless standard ARV treatment regimes become substantially cheaper (probably by a factor of at least 5), their inclusion in any core package will be impossible.



---

# Annex D

---

## Premium Scenarios for Core Hospital Package Provision and Their Impact on Affordability

Affordability issues are centrally linked to how premiums for core package coverage would be charged. In essence, the level of premium charged to each worker depends on the degree of subsidy (if any) in three areas:

- ▲ From workers with few dependents to workers with many dependents
- ▲ From high-income to low-income members
- ▲ From low-risk to high-risk members

Such subsidies may operate within an employer (it is currently common, for example, for employers to charge higher rates for medical aid membership to higher-income employees), by regulation of the premiums which funds set, or via the general taxation system. In summary, there are numerous approaches to premium setting for both private and public health insurance. They are important in that they will determine the balance between public and private health insurance membership, the severity of problems such as adverse selection, and the administrative feasibility of future health care financing arrangements. Complete analysis also requires consideration of taxation issues, post-retirement coverage and potential double coverage where there are two or more employed members of a household. These issues are not discussed further in this document, and indeed, should constitute a full monograph on their own. This annex explores affordability issues using three simple scenarios. In all scenarios we assume that the provider is a state insurer with a large member pool, wherein the types of cross-subsidies described below might be possible. Private insurance, especially in the open enrolment market is unlikely to be able to effect income or family cross-subsidies to any great degree, although these could be feasible within large group schemes.

### Scenario 1

All workers are charged premiums equal to the average cost of coverage for themselves and their dependents. That is, only subsidy 3 operates.

### Scenario 2

Premiums are set as a proportion of a worker's income, regardless of the number of dependents, or costs of care. That is, subsidies 1, 2, and 3 all operate.

### Scenario 3

Premiums are charged equal to the average cost of family (rather than individual) cover, but selected low-income groups are targeted with a subsidy to cover part of their costs. Subsidies 1,2 and

3 thus operate, although 2 is only effective for very low-income groups, and does not apply across the income range.

In each scenario, premiums are expressed as a proportion of total payroll costs, even though these costs would probably be shared approximately equally between employers and employees. Data on employee incomes, numbers of dependents and existing medical scheme coverage have been taken from the 1995 OHS and inflated to 1998 terms using the Consumer Price Index. Table 7.1 summarizes these data extracted from the OHS. Approximately 71 percent of workers in the target population earn between R5,000 and R30,000 per year, with relatively small numbers of employees earning above this level who are not medical scheme members, and relatively small numbers of employed persons earning less than R5,000 per year.

### **Scenario 1**

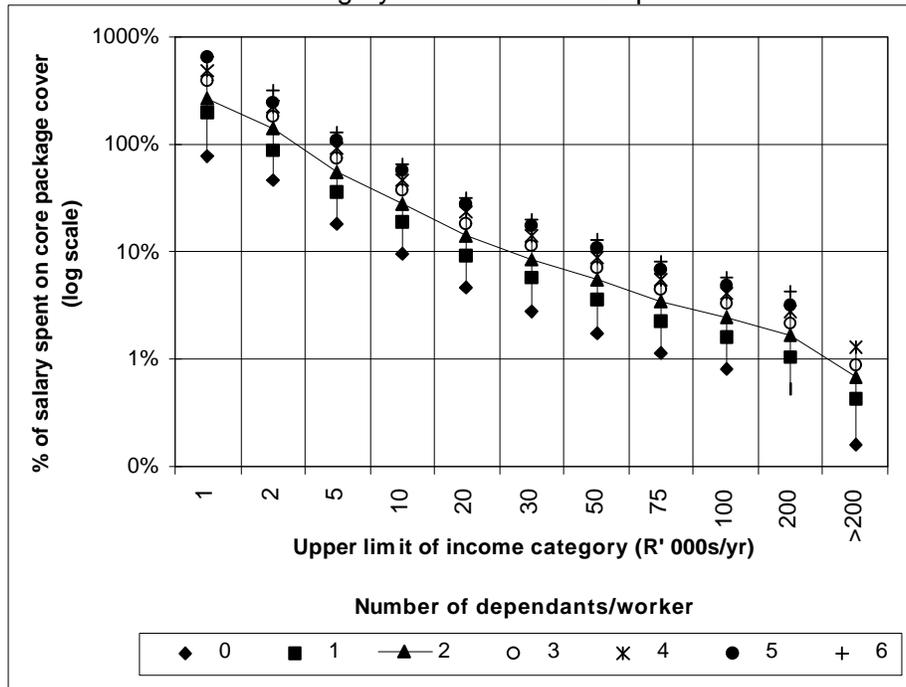
Figure A-D-1 shows the proportion of payroll taken by basic package coverage for formal employees and their dependents at different income levels. For workers in the lowest-income category (R0-1000) with dependents, the package costs would exceed total income. If we take 10 percent of income as a threshold above which premiums would be unaffordable, then the wage earner would need to be earning in excess of R50,000 per year to afford the package if they had 6 dependents, but only R20,000 per year if they had one dependent. It is clear that this approach to funding could lead to an unreasonable burden on workers supporting large families, and their employers. If the costs of dependents were met jointly by all contributors, on the other hand, all workers earning more than around R25,000 per year could afford the package. In the absence of subsidies from small to large families, membership of core-package coverage for dependents would almost certainly have to be optional. Scenario 1 is closest to the type of coverage that would be offered by medical schemes under the new regulatory environment envisaged by the National Department of Health (van der Linde, 1997; Söderlund and van den Heever, 1997). It is highly unlikely that the open-enrolment medical scheme sector could sell policies that required significant income or family size based cross-subsidies.

### **Scenario 2**

Scenario 2 assumes that premiums are set as a proportion of income, rather than at average cost, so that total premium revenue equals total costs for all enrollees. Under this scenario, all three types of cross-subsidy operate. The degree of income cross-subsidization is crucially dependent on:

- ▲ The extent to which low-income workers are enrolled in the scheme
- ▲ Whether or not contributions of high income members are capped at a certain absolute level of contribution. Under this type of arrangement, the fund would have to trade off the potential gains (in terms of higher revenue per person for high wage earners) against the desire not to drive these members into another fund which did not require income-based cross subsidies.

Figure A-D-1  
 Percentage of Individual Remuneration Spent on Core Package Coverage by  
 Income Category and Number of Dependents

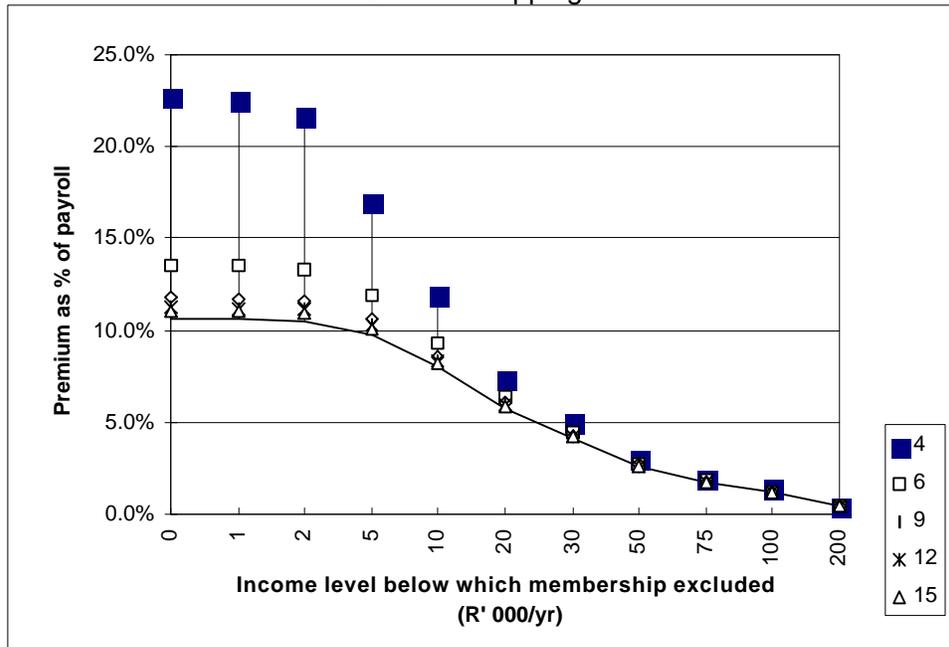


Note : The average number of dependents per worker for most income categories is approximately 2. The line drawn through the 2 dependents character thus represents spending on core package coverage by workers in each age category should premiums be unrelated to family size.

Figure A-D-2 indicates premium levels under scenario 2 where premiums are simply a set proportion of income (line), and where the contribution level is capped at a certain multiple of package costs per person (shown by unjoined markers 4, 6, 9, 12, and 15. The numbers represent the multiple of core package costs at which premium levels are capped. 4 indicates, for example, that premiums are capped at  $4 \times R690 = R2,760$ ). The X-axis shows the level of income below which the employer mandate does not apply. Since all enrollees pay the same percent of income, the percent figure on the y-axis refers to all premiums. Excluding low-income groups from mandatory coverage reduces the total cross-subsidy required from wealthier enrollees, and gives them a stronger incentive to stay within the fund.

Under the proportional contribution scenario, including income categories below R5,000 per annum leads to premiums in excess of 10 percent of income virtually regardless of whether caps are applied or not. While the premium in the uncapped scenario, where there are no exclusions from membership, is just above 10 percent, it should be remembered that for someone earning R100,000 per annum this equates to approximately R10,000 per year—i.e., the approximate cost of private medical scheme membership, which would almost certainly be preferred over the core hospital package alone. Retaining the higher-income members of such a proportional contribution fund is thus unlikely to be possible unless the lowest-income groups are excluded from membership.

Figure A-D-2  
 Premiums as Percentage of Income by Minimum Income Level Included in the Fund and  
 Level of Capping of Contributions



### Scenario 3

Scenario 3 is a modification of the family size pooled version of scenario 1 wherein all workers pay the same premium, regardless of income or family size, but low-income workers receive a targeted subsidy of R300 per enrolled member. Since premium contributions are tax deductible, higher income groups paying higher marginal tax rates effectively receive a subsidy for their medical scheme membership already. A positive subsidy for low-income groups might thus be seen as a fairer approach. Figure A-D-3 shows the proportion of total payroll that is required for core package coverage depending on the highest-income category receiving the subsidy. On the far left of the graph, all income groups, even those earning >R200,000 per annum receive the subsidy.

Figure A-D-3  
Percent of Payroll Required for Core Package Coverage According to Highest Income Category Receiving Subsidy

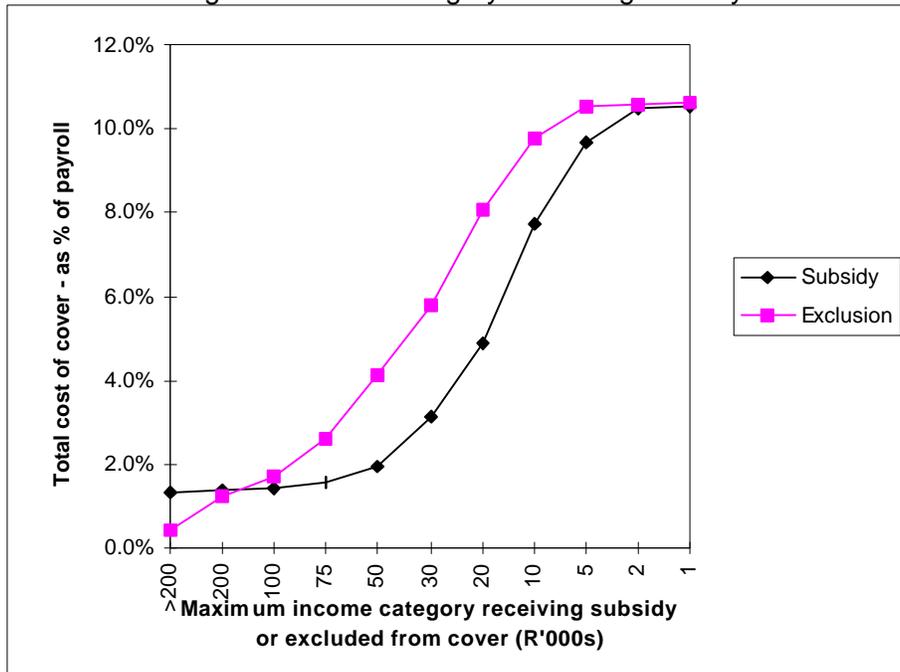


Table A-D-1 summarizes the effects of subsidies to different subgroups of the employed population.

Table A-D-1 Effect of Flat R300 Subsidy per Enrollee on Overall Costs of Mandatory Coverage and on Low-income Groups				
Income level below which subsidy received (R'000s/year)				
	30	20	10	5
Total cost of subsidy @ bill)	4.69	3.56	1.77	0.55
Total contribution towards core package coverage @ bill)	3.92	6.16	9.73	12.16
Percentage of income paid for core package coverage by lower-income categories:				
0-1000	165%	165%	165%	165%
1001-2000	84%	84%	84%	84%
2001-5000	33%	33%	33%	33%
5001-10000	19%	19%	19%	33%
10001-20000	9%	9%	16%	16%
20001-30000	5%	9%	9%	9%

Even with this relatively high level of subsidy, using our previously applied affordability threshold, those earning less than R10,000 per month are unlikely to be able to afford core package cover. Those in the R20,000 to R30,000 income category will be able to afford core package coverage without the subsidy.

In summary, all three scenarios indicate that including those with average incomes of less than around R20,000/annum would be likely to place a significant burden on workers, either through a significant drop in household income, or by decreasing their employment security because of the high cost transferred onto employers. Shifting this cost of subsidizing very low-income workers onto middle income workers might simply drive them into the private medical scheme environment, where income cross-subsidies are not required. Three feasible options seem to exist to extend affordable coverage for the core hospital package to low-income employees:

- ▲ Employers mandate cross-subsidies from high income workers to low-income workers within company medical schemes. The loss to high-income employees is partially offset by tax advantages of this type of arrangement.
- ▲ Government provides a tax-funded subsidy to low-income workers.
- ▲ The employer mandate applies only to workers themselves, with optional membership for dependents being allowed for low-income groups.

---

# Annex E

---

## Bibliography

- Bobadilla, J.L., Frenk, J., Cowley, P., Zurita, B., Querol, J., Villareal, E. and Lozano, R. *The Universal Package of Essential Health Services*. 1996, FUNSALUD, Mexico DF.
- Brewster, A.C., Karlin, B.G., Hyde, L.A., Jacobs, C.M., Bradbury, R.C. and Chae, Y.M. "MEDISGROUPS: A Clinically-based Approach to Classifying Hospital Patients at Admission." *Inquiry*. 22 (1985): 377-387.
- Casas, M. "Issues for Comparability of DRG Statistics in Europe. Results from EURODRG." *Health Policy*. 17 (1991): 121-132.
- Committee of Inquiry into a National Health Insurance System. *Restructuring the National Health System for Universal Primary Health Care*. Department of Health, Pretoria, 1995.
- Cooper, M.H. "Core Services and the New Zealand Health Reforms." *BMJ*. 51 (1995): 799-807.
- Daviaud, E. and Cabral, J. "The Core Package of PHC Services." In: *Promoting Equity through District Health Systems—Celebrating Ten Years of Health Policy Research and Analysis*. Centre for Health Policy, University of the Witwatersrand, Johannesburg, 1997, pp.17-26.
- Department of Health. *Hospital Episodes Statistics. Finished Consultant Episodes by Diagnosis, Operation and Specialty*. England: Financial year 1994-95. Department of Health, London, 1996.
- \_\_\_\_\_. *A Social Health Insurance Scheme for South Africa: Policy Document*. Department of Health, Pretoria, 1997a.
- \_\_\_\_\_. *Health Trends in South Africa—1995/6*. Department of Health, Pretoria, 1997b.
- Donaldson, C. and Gerard, K. *Economics of Health Care Financing—the Visible Hand*. Macmillan, London, 1993.
- Fetter, R.B., Shin, Y., Freeman, J.L., Averill, R.F. and Thompson, J.D. "Case mix definition by Diagnosis-related Groups." *Med.Care* 18 (supp) (1980): 1-53.
- Fisher, E.S., Welch, H.G. and Wennberg, J.E. "Prioritizing Oregon's Hospital Resources. An Example based on Variations in Discretionary Medical Utilization [see comments]." *JAMA* 267 (1992): 1925-1931.

- Gonnella, J.S., Hornbrook, M.C. and Louis, D.Z. "Staging of Disease—a Case-mix Measurement." *JAMA* 251 (1984): 637-644.
- Ham, C. "Priority Setting in Health Care: Learning from International Experience." *Health Policy* 42 (1997): 49-66.
- Hindle, D., Pilla, J. and Scuteri, J. "Where are DRGs Going?" *Aust. Health Rev.* 14 (1991): 301-313.
- Karstaedt, A.S., Lee, T.C.M., Kinghorn, A.W.A. and Schneider, H. "Care of HIV-infected Adults at Baragwanath Hospital, Soweto." *Part II Management and Costs of Inpatients. S.Afr.Med.J.* 86 (1996): 1490-1493.
- Khosa, S.P., Söderlund, N. and Peprah, E.O. *An Essential Package of Hospital Services : a Review of International Experience with Reference to South Africa.* Centre for Health Policy, University of the Witwatersrand, Johannesburg, 1997.
- Kinghorn, A.W.A., Lee, T.C.M., Karstaedt, A.S., Khuonane, B. and Schneider, H. "Care of HIV-infected Adults at Baragwanath Hospital, Soweto." *Part I Management and Costs of Outpatient Care. S.Afr.Med.J.* 86 (1996): 1484-1489.
- Kitzhaber, J.A. "Prioritizing Health Services in an Era of Limits: the Oregon Experience." *BMJ.* 307 (1993): 373-377.
- Klevit, H.D., Bates, A.C., Castanares, T., Kirk, E.P., Sipes-Metzler, P.R. and Wopat, R. "Prioritization of Health Services. A Progress Report by the Oregon Health Services Commission." *Arch.Intern.Med.* 151 (1991): 912-917.
- Knaus, W.A., Draper, E.A., Wagner, D.P. and Zimmerman, J.P. "An Evaluation of Outcomes from Intensive Care in Major Medical Centers." *Ann.Intern.Med.* 104 (1986): 410-418.
- McGuire, T.E. "DRGs: the State of the Art, circa 1990." *Health Policy.* 17 (1991): 97-119.
- McIntyre, D. "Financing and Expenditure." In Harrison, D. and Nielson, M. (Eds.), *South African Health Review 1995.* Health Systems Trust & Kaiser Foundation, Durban, 1995, pp.89-102.
- McPherson, K., Strong, P.M., Epstein, A. and Jones, L. "Regional Variations in the Use of Common Surgical Procedures: Within and Between England and Wales, Canada and the United States of America." *Soc.Sci.Med.* 15 (1981): 273-288.
- Monitor Company., Health Partners International., Centre for Health Policy. and NALEDI. *Cost Recovery and Contracting Out in the Public Hospital System.* Volume 4, Module 3. Monitor Company, Johannesburg, 1996.
- NERA. *Financing Health Care with Particular Reference to Medicines—Volume 19—The Health Care System in South Africa.* NERA, New York, 1996.
- National Casemix Office. *Healthcare Resource Groups: Version 2 Definitions Manual.* Information Management Group, NHS Executive, Winchester, 1994.
- Office of Population Censuses and Surveys. *Tabular List of the Classification of Surgical Operations and Procedures: Fourth Revision.* HMSO, London, 1990.

- Oregon Health Services Commission. Prioritization of Health Services—a Report to the Governor and Legislature.* Oregon Health Services Commission, Salem, Oregon, 1991.
- Pope, C.J., Roberts, J.A. and Black, N.A. “Dissecting a Waiting List.” *Health Serv.Manage.Res.* 4 (1991): 112-119.
- Propper, C., Wilson, D. and Söderlund, N. “The Effects of Regulation and Competition in the NHS Internal Market: the Case of GP Fund-holder Prices.” University of Bristol, Department of Economics Discussion paper (1997)
- Söderlund, N. “Product Definition for Healthcare Contracting: an Overview of Approaches to Measuring Hospital Output with Reference to the UK Internal Market.” *J.Epidemiol. Community Health* 48 (1994): 224-231.
- Söderlund, N., Raftery, J., Milne, R. and Gray, A. “The Construction of Resource-weights for Healthcare Resource Groups—a Comparison of Alternative Data Sources and Methodological Approaches.” National Casemix Office, Winchester, 1996.
- Söderlund, N. “The Essential Health Care Package—A Review of Possible Objectives and Resulting Entitlements.” *Health Policy* (forthcoming) (1998)
- Söderlund, N. and Khosa, S.P. “The Potential Role of Risk Equalization Mechanisms in Health Insurance: the Case of South Africa.” *Health Policy Plan.* 12 (1997): 341-353.
- Söderlund, N. and van den Heever, A. “The Regulation of the Medical Schemes Act—Origins of the Proposed Reforms.” *SAMJ.* 87 (1997): 983-984.
- Tatchell, M. “Measuring the Hospital Output: a Review of the Service Mix and Case Mix Approaches.” *Soc.Sci.Med.* 17 (1983): 871-883.
- Towse, A. *Financing Health Care in the UK: a Discussion of NERA’s Prototype Model to Replace the NHS.* Office of Health Economics, London, 1995.
- van den Heever, A. *Sources of Finance Project.* Health Systems Trust, Durban, 1998 (forthcoming).
- van der Linde, I. “Medical Aid Proposals.” *SAMJ.* 87 (1997): 397-402.
- Vladeck, B.C. and Kramer, P.S. “Case Mix Measures: DRGs and Alternatives.” *Annu.Rev.Public Health* 9 (1988): 333-359.
- World Bank: World Development Report 1993—Investing in Health.* Oxford University Press, New York, 1993.
- World Health Organization. Acquired Immune Deficiency Syndrome (AIDS)—Interim Proposal for a WHO Staging System for HIV Infection and Disease. *WHO Weekly Epidemiological Record* 65 (1990): 221-224.