Susan Cleary[i]
Wezile Chitha[i]
Siyabonga Jikwana[iii]
Okore A. Okorafor[i]
Andrew Boulle[ii]

5 financing

Abstract

This chapter focuses on estimating financial and human resource requirements for scaling up two key health programmes in South Africa: Primary Health Care (PHC) and Antiretroviral Treatment (ART). Estimates are compared with current conditional grants in the case of ART or current estimated expenditure levels in the case of PHC services. Results show that Conditional Grants are approximately sufficient to deliver ART to 50 000 patients by April 2005, but that budgetary constraints will be encountered if the programme meets the patient targets contained in the National Department of Health's 'Operational Plan for Comprehensive HIV and AIDS Care, Management and Treatment.' Results from costing comprehensive PHC services show that national and provincial departments should aim to increase per capita spending to just over R300 in order to provide rural and scarce skills allowances, increase community health workers and environmental health services, and meet target PHC utilisation rates.

i Health Economics Unit, School of Public Health & Family Medicine, University of Cape Town
ii Infectious Diseases Epidemiology Unit, School of Public Health & Family Medicine, University of Cape Town
iii National Department of Health

antiretroviral treatment and primary health care services

Introduction

As important as equity in the allocation of resources is the need to ensure that the funds allocated to health are sufficient to provide adequate levels of health care. A good estimate of the costs of providing health services is invaluable in guiding resource allocation to health, to ensure that the desired level of health service provision is achieved. This chapter focuses on the financial and human resource requirements for the delivery of two key public health sector programmes:

- Antiretroviral treatment for HIV+ people (ART)
- Comprehensive primary health care services (PHC)

Antiretroviral treatment roll-out

The national Department of Health (DoH) has set the target of having just over 1 million patients on ART by March 2009.[1] Based on primary cost and utilisation data, we have calculated the resources required to meet these patient targets over the March 2004 to March 2009 period. Estimates include the full costs of delivering ART, treating patients on ART for opportunistic infections and HIV-related illnesses at clinics or community health centres, and the costs of providing nutritional supplements. Although we acknowledge that patients on ART could require other services such as hospital care and tuberculosis treatment, these costs have been excluded from the current estimates. The results are compared to the current HIV and AIDS Conditional Grants over the Medium Term Expenditure Framework (MTEF) and estimates of clinical human resource needs are provided.

A variety of data have been used to calculate the costs of delivering ART including:

- The cost per comprehensive ART visit and the average utilisation of visits by patients on ART and immediately prior to commencing ART
- The costs of nutritional supplements and average utilisation of supplements
- The costs and utilisation of first and second-line antiretroviral drug regimens
- The costs and utilisation of laboratory testing
- The expected average life expectancy of a patient on ART and the anticipated duration of first and second-line antiretroviral regimens
- The numbers of patients entering care on an annual basis.

Each element will be discussed in detail below. Key assumptions that could not be derived from primary data (such as the uptake and cost of nutritional supplements and the overall rate of enrolment of patients) were based on estimates provided by the national DoH.

Unit cost per comprehensive ART visit

The cost per ART visit (excluding antiretroviral drugs and laboratory testing) was based on the average cost per visit at the three HIV clinics in Khayelitsha that are jointly run by the provincial administration of the Western Cape and Médecins sans Frontières.[2] These clinics commenced operation in April 2000 and started offering ART in May

2001. Because this is the longest running public sector ART programme, it provides an opportunity to learn about the expenditure likely to be required to deliver ART to patients in other public sector settings.

The following items have been included in the cost per visit:

- Overheads (e.g. utilities, office supplies)
- Non-clinical staff (e.g. clerical staff and cleaners)
- Clinical staff (doctors, nurses, counsellors, pharmacists)
- Prophylactic and curative medicines
- Capital (e.g. buildings and equipment).

Costing was undertaken using standard methods in 2002 prices. These were updated to 2003/04 prices and adjusted to reflect increases in salaries including the scarce skills allowance. The costs of dieticians and social workers were included at an estimated reasonable workload. Table 1 shows a detailed breakdown.

Average visit schedule of patients on ART

The annual number of visits by patients in the Khayelitsha programme was estimated from a group of 670 patients with a maximum of 30 months on treatment (median of 15). To fill in data gaps it was assumed that:

- Patients would have 4 clinic visits prior to commencing ART
- Patients would access clinic services at the same frequency as they did between months 12 and 18 during later periods on ART
- After failing ART, patients would access services at the same frequency as they did prior to the commencement of ART services.

Table 2 contains details.

Costs and utilisation of nutritional supplements

A month's supply of nutritional supplements costs R100 for adults and R31.90 for children. It was assumed that there would be a 55% uptake of supplements, of which 10% would be by children and the remainder by adults. These assumptions lead to an average weighted cost of R51.25 per month. It was assumed that patients would receive nutritional supplements on a monthly basis, coinciding with the appropriate clinic visit. See table 2.

Table 1: Unit cost per ART visit (R 2003/04 prices), excluding costs of ARV drugs and laboratory costs

Item	Unit Cost R	%
Human resources		
Doctor (Level 11)	37.88	
Doctor (Level 10)	10.79	
Sub-total doctors	48.66	30
Nurse (Level 8)	6.31	
Nurse (Level 7)	11.18	
Sub-total nurses	17.49	11
Counselling and adherence monitors	21.22	
Clinic management, logistics and administration staff	9.78	
Pharmacists and pharmacist assistants	1.35	
Clerical and data management staff	8.21	
Cleaners	1.63	
Social workers	5.37	
Dieticians / nutritionists	5.37	
Sub-total other human resources	52.94	33
Commodities and Products		
Medical and nutritional (e.g. condoms, medical consumables, multivitamins)	2.76	
Sub-total commodities and products	2.76	2
Medicines		
Curative Medicines	5.59	
Prophylactic Medicines	6.87	
Sub-total medicines	12.46	8
Planning and Administration		
Electricity, water, telecommunications	4.67	
Printing, stationery, maintenance, supplies	12.44	
Transport, Storage	1.62	
Sub-total planning and administration	18.73	12
Capital		
Infrastructure and equipment	7.33	
Sub-total capital	7.33	5
Total cost per comprehensive visit	160.37	**100**

Table 2: Average Clinic Visit schedule for ART and Nutrition

		ART Visit	Nutrition
Pre-treatment	As required	4.0	4.0
First-line first six months	Begin Rx	1.0	-
	1 week	1.0	-
	2 weeks	1.0	-
	1 month	1.0	1.0
	6 weeks	1.0	-
	2 months	1.0	1.0
	3 months	1.0	1.0
	4 months	1.0	1.0
	5 months	1.0	1.0
	6 months	1.0	1.0
	Intercurrent	3.1	-
Total for first 6 months including pre-treatment		**17.1**	**10.0**
		ART Visit	**Nutrition**
Annually thereafter	Scheduled	10.0	10.0
	Intercurrent	0.6	2.0
Total for 1 year		**10.6**	**12.0**
Second-line first six months	Scheduled	5.0	5.0
	Intercurrent	0.3	1.0
Total for 6 months		**5.3**	**6.0**
Annually thereafter	Scheduled	10.0	10.0
	Intercurrent	0.6	2.0
Total for 1 year		**10.6**	**12.0**
Failing	Scheduled	10.0	10.0
	Intercurrent	4.5	2.0
Total for 1 year		**14.5**	**12.0**

Costs and utilisation of first and second-line antiretroviral regimens

The national guidelines[1] specify that patients on first-line regimens will receive a nucleoside reverse transcriptase inhibitor (NRTI) backbone of 3TC and d4T with either efavirenz or nevirapine as the non-nucleoside reverse transcriptase inhibitor (NNRTI). However, d4T would be replaced by AZT for a small number of patients. Based on primary data, we assumed that 40% of patients would be on nevirapine (NVP) and 60% on efavirenz (EFV).[2] In the class of NRTIs, we assumed that 95% would receive d4T and the remaining patients would receive AZT. All patients are assumed to receive 3TC as the second NRTI. In the second-line regimen, it was assumed that 95% of patients would receive AZT with ddI and 5% would receive d4T with ddI. All patients were assumed to receive lopinavir / ritonavir as the protease inhibitor. Patients failing the second-line regimen were assumed not to receive ARVs. ARV costs are based on prices agreed in the recently concluded tender for the supply of ARVs. A markup of 15% was placed on all ARV prices to cover procurement, distribution and stock management and it was assumed that paediatric ARV costs were 1.35 times higher than adult costs. Table 3 contains a summary of the proportion on each ARV, as well as the average annual cost in each period.

Table 3: Utilisation and costs of ARVs (R 2003/04 prices)

Medicine Regimens							
Individual medicines in regimen							
First line				Second line			
First 6 months		Annually thereafter		First 6 months		Annually thereafter	
5%	AZT	5%	AZT	95%	AZT	95%	AZT
95%	d4T	95%	d4T	5%	d4T	5%	d4T
100%	3TC	100%	3TC	100%	ddI	100%	ddI
40%	NVP	40%	NVP	100%	LPV / RTV	100%	LPV / RTV
60%	EFV	60%	EFV				
Cost (annualised) including procurement & distribution							
2 830		2 830		7 297		7 297	

Costs of laboratory testing and testing schedules

In line with national guidelines,[1] one CD4 and one viral load test was included at baseline, and 6-monthly thereafter during the first-line regimen. Once patients were on second-line, 6-monthly CD4 count testing continued but no viral load testing was done. The overall usage of safety monitoring investigations was based on the requirements for each individual ARV.[3] Laboratory test costs for 2004 were obtained from the National Health Laboratory Services. Details of laboratory testing frequencies are contained in Table 4.

Table 4: Laboratory testing schedule averaged for all patients

	First line		Second line		Failing
	Initial 6 months	Annually thereafter	Initial 6 months	Annually thereafter	
FBC	0.3	0.1	4.8	1.9	0.0
Diff	0.2	0.1	4.8	1.9	0.0
Creatinine	0.0	0.0	0.0	0.0	0.0
ALT	3.9	1.3	0.0	0.0	0.0
Cholesterol & TG	0.0	0.0	2.0	2.0	0.0
Glucose	0.0	0.0	2.0	2.0	0.0
CD4	2.0	2.0	2.0	2.0	2.0
Viral load	2.0	2.0	0.0	0.0	0.0

Summary of service costs

Table 5 shows a summary of costs for clinic visits, ARVs and laboratory tests.

Table 5: Cost per patient of ARVs, laboratory testing, and clinical services (R 2003/04 prices)

Item		First-line initial 6 months	First-line annually thereafter	Second-line initial 6 months	Second-line annually thereafter	Failing treatment
ARVs	**Annual cost**	**Percentage of people on each ARV**				
AZT	930	5%	5%	95%	95%	-
3TC	426	100%	100%	-	-	-
d4T	259	95%	95%	5%	5%	-
ddI	1 693	-	-	100%	100%	-
NVP	499	40%	40%	-	-	-
EFV	2 572	60%	60%	-	-	-
LPV / RTV	3 755	-	-	100%	100%	-
	Sub-total	1 231	2 461	3 172	6 345	0
	15% markup	185	369	476	952	
	Total (R)	1 416	2 830	3 648	7 297	
Laboratory tests	**Unit cost**	**Average tests in period per person on treatment**				
FBC	34.95	0.3	0.1	4.8	1.9	-
Diff	22.16	0.3	0.1	4.8	1.9	-
Creatinine	16.45	-	-	-	-	-
ALT	25.40	2.4	0.8	-	-	-
Cholesterol & TG	48.23	-	-	2.0	2.0	-
Glucose	16.45	-	-	2.0	2.0	-
CD4	60.00	2.0	2.0	2.0	2.0	2.0
Viral load	300.00	2.0	2.0	-	-	-
	Total (R)	795	746	521	358	120
Consultations	**Visit cost**	**Number of visits in period**				
ART visit	160	17	11	5	11	15
Nutrition	51	10	12	6	12	12
	Total (R)	3 255	2 315	1 157	2 315	2 940
Total (R)		**5 466**	**5 891**	**5 326**	**9 970**	**3 060**

Expected average life expectancy and duration on first and second-line regimens

Because ART is a new intervention, the gain in life expectancy associated with taking these drugs is still unknown. As argued in the Joint Health and Treasury Task Team (JHTTT) costing,[4] underestimation of improved survival due to HAART will understate the number of patients on treatment and therefore the costs of care. The Cape Town ARV costing model (CT Model)[3] has been used to extrapolate the cost and utilisation data presented above. This is a computer spreadsheet model that calculates the costs of scaling up antiretroviral treatment, under the assumption that patients on ART would have a life expectancy of 6.5 years after initiation of ART. It should be borne in mind that this estimate is lower than estimates based on the extrapolation of primary data,[2,5] and thus assumes a lower rate of adherence and higher rates of drop out than have been found in pilot ART programmes in South Africa.

Number of patients entering care

A crucial uncertainty in calculating the costs of scaling up ART is the number of patients entering care. Recent evidence from the Anglo Gold programme indicates that only one quarter of HIV+ employees who are in need of ART have initiated care.[6] In other words, the achievement of a full scale up by 2009 in South Africa (SA) could be exceptionally ambitious. Despite this limitation, we have continued to use the targets contained in the Operational Plan because they remain the official policy of the national DoH.[1] Numbers of patients started on treatment as well as cumulative numbers are presented in Table 6. It was assumed that 10% of patients starting ART would be children.

Programme level costs

Although there is very little primary data on programme level costs to support the ART roll-out, it is important to include these costs as they can be substantial. We have assumed that expenditure on programme administration would amount to 5% of the ART service delivery costs (i.e. not including laboratory, nutritional supplements and ARV expenditure) and a further R12 million per annum would be spent on research.

Table 6: Numbers on ART

	2004	2005	2006	2007	2008
Adults starting ART during period	53 500	142 000	212 000	302 000	419 000
Children starting ART during period	5 944	15 778	23 556	33 556	46 556
Total patients starting ART	59 444	157 778	235 556	335 556	465 556
Adults on ART at end of period	47 714	169 764	343 018	580 908	901 180
Children on ART at end of period	5 301	18 863	38 113	64 546	100 132
Total patients on ART	53 015	188 627	381 131	645 454	1 001 312

Overall costs

Overall costs based on the numbers of patients estimated to enter the programme are presented in Table 7.

Table 7: Breakdown of service delivery and programme-level costs (R million, 2003/04 prices)

	Year					Grand Total	% Total
	2004/05	2005/06	2006/07	2007/08	2008/09		
Programme-level	**32.56**	**94.51**	**194.25**	**334.09**	**524.23**	**1 179.65**	**8**
Programme administration	8.35	28.08	54.24	90.02	138.14	318.83	2
Procurement and supply chain	12.21	54.43	128.02	232.07	374.09	800.82	5
Research	12.00	12.00	12.00	12.00	12.00	60.00	0.4
Antiretroviral programme	**293.20**	**1 078.97**	**2 239.29**	**3 844.47**	**6 014.86**	**13 470.79**	**92**
Doctors	46.23	149.45	278.81	454.91	691.17	1620.56	11
Nurses	16.62	53.72	100.21	163.51	248.42	582.48	4
Pharmacists	1.29	4.16	7.76	12.66	19.23	45.08	0.3
Social worker	5.10	16.50	30.79	50.23	76.32	178.95	1
Dietician / nutritionist	5.10	16.50	30.79	50.23	76.32	178.95	1
Clinic management / administration	9.29	30.03	56.03	91.42	138.90	325.68	2
Monitoring / data capturing	7.80	25.21	47.04	76.75	116.60	273.40	2
Counselling	20.15	65.15	121.55	198.32	301.31	706.49	5
Drugs	93.23	401.15	924.81	1663.59	2670.89	5753.67	39
Commodities and products	47.39	162.93	316.94	522.77	797.25	1847.28	13
Planning and administration	19.18	62.00	115.67	188.73	286.74	672.32	4.6
Infrastructure and equipment	6.96	22.52	42.01	68.54	104.13	244.15	2
Nutritional supplements	14.85	69.65	166.89	302.83	487.56	1041.77	7
Grand Total	**325.76**	**1 173.48**	**2 433.54**	**4 178.56**	**6 539.09**	**14 650.44**	

The full service-delivery costs of ART are estimated to be R293 million in 2004/05. Total costs rise rapidly to R1 173 million in 2005/06, and reach R6 539 million by 2008/09. The total cost over the five-year period (March 2004 until March 2009) is R15 billion. The annual service delivery cost per patient on ART ranges between R5 500 and R6 000 over the period.

Comparison of estimated costs to ART Conditional Grants and Operational Plan estimates

The results from Table 7 are compared to the ART Conditional Grants and to the estimates of costs calculated in the national DoH Operation Plan.[1]

Table 8: Comparison of ART costs to Conditional Grants and estimated costs in the Operational Plan (R million, 2003/04 prices)

	2004/05	2005/06	2006/07	2007/08	2008/09	Grand Total
Estimated service delivery costs of ART [1]	326	1 173	2 434	4 179	6 539	14 650
ART Conditional Grants [2]	330	600	1 000	1 000	1 000	3 930
Difference [1] – [2]	4	-573	-1 434	-3 179	-5 539	-10 720
Estimated costs service delivery costs in national DoH Operational Plan [3]	296	1 590	2 358	3 268	4 474	11 986
Difference [1] – [3]	30	-417	76	911	2 065	2 664

Table 8 shows that sufficient funds were available to start 53 000 patients on ART by March 2005. However it should be noted that only approximately 40 000 patients were actually enrolled by this time. In order to meet the Operational Plan's targets in subsequent years, considerable extra resources would be required. Once again, this discrepancy points to the need either to revise the patient targets in the roll-out, or to revise the conditional grants if evidence becomes available that targets are being met. The cost estimates presented in this chapter are also higher than those presented in the national DoH's Operational Plan.[1] The key difference relates to lower ARV prices assumed in the Operational Plan, which have not been achieved through the national tender process.

Human resource requirements

This section estimates the number of staff of different categories that are required to deliver ART services. The calculation was based on staff establishments in the three Khayelitsha HIV clinics in 2002 and is therefore representative of efficiency levels achieved during the third year of operation of the clinics. Although this does not capture diseconomies of scale encountered in the earliest periods (where staff to patient ratios are typically higher) it also does not capture economies of scale that could still be achieved. During 2002, there were 18 546 visits to the clinics, of which just over 16% were ART visits. By the end of 2002, approximately 290 patients were on ART. Because staff were involved in delivering ART and care for patients who were not on ART, the proportion of time spent on the ART programme was established by timing 150 clinical consultations and interviewing non-clinical staff. These data in combination with routine visit headcounts allowed us to estimate the full time equivalent (FTE) staffing requirements for ART, as shown in Table 9.

Table 9: ART staff requirements in Khayelitsha clinics, 2003

Category of staff	Total FTE	ART FTE
Doctor level 11	3	0.52
Doctor level 10	1	0.17
Nurse level 8	1	0.17
Nurse level 7	2	0.35
Counsellors and adherence monitors	6	1.40
Clinic management, logistics and administrative staff	3	0.50
Pharmacists and pharmacist assistants	3	0.02
Clerical and data management	2	0.43
Social worker	1	0.17
Dietician / nutritionist	1	0.17
ART Visits		3 095
Total HIV clinic visits		18 546

We have combined these data with assumptions of patients enrolling in ART services and the average per patient utilisation of services to estimate staffing requirements for the delivery of ART services as shown in Table 10.

Table 10: Staff requirements for ART care

Category of staff	2004/05	2005/06	2006/07	2007/08	2008/09
Doctor level 11	160	516	963	1 571	2 387
Doctor level 10	53	321	321	524	796
Nurse level 8	53	524	321	524	796
Nurse level 7	106	1 591	642	1 047	1 591
Counselling and adherence monitors	430	1 389	2592	4 229	6 426
Clinic management, logistics and admin	153	496	926	1 510	2 295
Pharmacists and pharmacists assistants	7	24	45	74	112
Monitoring data capturers	133	430	802	1 309	1 989
Social worker	51	165	309	503	765
Dietician / nutritionist	51	165	309	503	765

Limitations and uncertainties

Estimates of service utilisation and the unit cost per visit are based on the experience of 670 patients accessing ART in Khayelitsha. Although there are uncertainties regarding the generalisability of these data, the biggest uncertainty is the rate of enrolment of patients into the service. Further uncertainties relate to the likely uptake of nutritional supplements.

Primary Health Care Services

This section presents estimates of the costs of providing the package of primary health care (PHC) services in the public sector in SA.[7] These are compared with current expenditure on these services in order to determine the funding gap. The key approach to costing involved combining data from a wide range of primary health care cost analyses, district health expenditure reviews and other sources of cost data, with utilisation data and population estimates.

More formally, the objectives are to:

- Calculate the financial resource requirements for providing a comprehensive package of primary health care services
- Compare the resource requirements with current expenditure on primary health care services
- Estimate the gap between current expenditure and the requirements to fully provide the primary health care package
- Calculate expected resource requirements over the MTEF period using a number of scenarios.

Population data

The cost of providing the package is very dependent on the size of the population being served. Data from the 2001 census were used as the basis for population estimates. To estimate the population dependent on the public health sector, medical scheme members were removed using data from the 1999 October Household Survey and the proposed civil servants medical scheme.

Cost per primary health care visit

Cost data were obtained from 16 facility based cost analyses and 21 district health expenditure reviews (DHERs).[8-24] A total of 882 facilities have been included. Because these cost analyses covered a large number and wide variety of differing facilities, the estimates from these sources are likely to be representative of the current cost per PHC visit. Cost data were inflated to 2003/04 prices.

The unit cost at clinics and community health centres (CHCs) ranged between R37 and R130 with an average of R63. A number of adjustments have been made to this cost. Firstly, the cost of additional counselling staff, particularly for VCT programmes, was included. This was estimated to be an average of R0.77 per visit. Secondly, the cost per visit was

adjusted to allow for the inclusion of rural and scarce skills allowances. It was estimated that the unit cost per visit would be R65 in urban areas and R67 in rural areas once these allowances were included.

A number of DHERs presented information on the cost per outpatient department (OPD) visit at district hospitals. The unit cost per OPD visit was R232 on average and ranged between R123 and R278. After adjustments, the unit cost per OPD visit was estimated to be R239 in urban areas and R248 in rural areas.

Data from these DHERs indicated that 84% of PHC visits were to clinics and 16% were OPD visits. Based on this ratio, the average weighted cost per visit was R93 in urban areas and R96 in rural areas. The inclusion of OPD costs has resulted in the cost per visit being approximately 30% higher than if PHC visits only occurred at clinic level. This is in line with estimates made in the National Health Accounts project.[25] Table 11 provides details of the PHC cost per visit.

Additional elements of the PHC package

The unit cost data presented above do not cover all services that are now identified as important to include in the PHC package. In particular, the cost of environmental health services (EHS) and community health workers (CHWs) should be incorporated. A costing of environmental health services[26] has indicated a national average cost of R9.79 per capita (2003/04 prices) and that it would cost R11.99 per capita to reach the target of 1 environmental health professional per 15 000 people.

A normative costing of CHWs was done based on information from the October 2003 CHW Lekgothla and the national DoH's CHW Policy Framework. The cost of CHWs was based on an estimated average workload of 90 house -holds per CHW in rural areas and a workload of 125 households per CHW in urban areas. Costs include the proposed R1 000 monthly CHW stipend as well as an

Table 11: PHC cost per visit (R 2003/04)

	Average	High	Low
Clinic and CHC cost per visit			
Doctor unit cost per visit	8.34	16.96	4.88
Doctor unit cost including scarce skills allowance	9.59	19.50	5.61
Doctor unit cost including rural and scarce skills allowances	11.42	23.23	6.69
Overall unit cost	64.12	130.43	37.54
Overall unit cost including scarce skills allowance	65.37	132.97	38.27
Overall unit cost including rural and scarce skills allowances	67.20	136.70	39.35
OPD cost per visit			
Doctor unit cost per visit	41.90	50.14	22.30
Doctor unit cost including scarce skills allowance	48.19	57.66	25.65
Doctor unit cost including rural and scarce skills allowances	57.40	68.69	30.55
Overall unit cost	232.78	278.56	123.90
Overall unit cost including scarce skills allowance	239.07	286.08	127.25
Overall unit cost including rural and scarce skills allowance	248.28	297.11	132.15
Average weighted cost per PHC visit (clinics, CHCs & OPDs)			
Overall unit cost	91.11	154.14	51.36
Overall unit cost including scarce skills allowance	93.17	157.48	52.51
Overall unit cost including rural and scarce skills allowance	96.19	162.38	54.20

Table 12: Number of CHWs required in each province (phased-in programme)

	2005/06	2006/07	2007/08	2008/09	2009/10
Eastern Cape	3 035	6 063	9 119	12 166	15 192
Free State	1 040	2 063	3 091	4 107	5 109
Gauteng	3 377	6 887	10 654	14 619	18 769
KwaZulu-Natal	4 642	9 464	14 528	19 784	25 216
Limpopo	2 536	5 056	7 583	10 088	12 560
Mpumalanga	1 397	2 812	4 270	5 752	7 251
Northern Cape	303	592	878	1 155	1 421
North-West	1 610	3 220	4 854	6 492	8 124
Western Cape	1 711	3 483	5 388	7 392	9 487
National	**19 651**	**39 640**	**60 365**	**81 555**	**103 129**

overhead cost to cover the costs of NGOs providing supervision and support to CHWs. These overhead costs were estimated to be R893 per CHW per month based on payments in the Western Cape to NGOs supporting VCT and adherence counselling staff.[2] However, it could be anticipated that the level of support required for a VCT counsellor would be higher than required for other CHW categories. We therefore assumed an overhead cost of half of that incurred by the NGO coordinators in the Western Cape (i.e. R447 per month). In all of these calculations, it was assumed that the CHW programme would be phased in equally over the period under consideration, with one-fifth of the required CHWs being operational within 2005/06, two-fifths in 2006/07 and so forth to reach full programme functioning by 2009/10. Table 12 shows the number of CHWs required in each province in each of these years to meet this phasing in timetable.

A final adjustment made to the PHC package is to include HIV-related services. The costs of providing services to patients in ART programmes have been shown earlier. However these costs do not include the costs of treating HIV+ patients at the primary care level who are not receiving ARVs. These costs have been included in two ways. Firstly, the total costs of counselling for HIV (largely for VCT programme but also for other issues such as bereavement) have been estimated at contributing an average of R0.77[a] per visit. Secondly, the normative PHC utilisation targets have been adjusted to take account of the additional visits for people living with HIV. Based on the ASSA model, it is estimated that approximately 35% of those who are HIV+ are in WHO Stage 3 and 10% are in Stage 4 of HIV and AIDS. At current prevalence rates, this translates into 4.5% of the South African population being in these stages. Preliminary findings from ongoing research at the Health Economics Unit indicate a utilisation level of about 10 visits per year for these patients. This figure has been applied to the general population. We have further assumed that coverage levels are at 70% (comparing the current PHC utilisation rate of 2.5 with the 'ideal' rate of 3.5). This translates into an additional 0.3 visits per person per year (i.e. 10 visits x 4.5% of the population in need of such visits x 70% coverage).

PHC utilisation estimates

Current PHC utilisation is approximately 2.5 visits per capita, based on 2002/03 District Health Information System (DHIS) data. However, the target primary health care headcount is 3.85 visits per capita. This target was drawn from the detailed evaluation of PHC service needs undertaken in the 'Need Norms' study.[27] Table 13 provides an overview of the components of this target. The only adjustment to the 'Need Norms' estimate was to increase the service requirements for HIV+ patients. The model assumed that this target would only be reached in 2009/10, and an increase in utilisation was phased in assuming that one-fifth of the increase would be achieved in each of the 5 financial years under review.

a Personal communication: Emmanuelle Daviaud. This cost was based on assumption that the average counselling session would be 20 minutes and that approximately 8% of current visits would require a counselling session

Table 13: Normative PHC utilisation estimates

Type of service	Utilisation Rates (per capita)
Combined (preventive & curative) services <5	2.70
Combined services for 5-14	1.43
Chronic care for children under 15	0.41
Family planning	1.63
Antenatal care	3.48
Deliveries	0.75
Postnatal care	0.75
Termination of pregnancy	0.02
Other well-women services (ca cervix)	0.02
Adult acute curative care	1.06
Casualty care (both medical and surgical)	0.20
STDs	0.19
Tuberculosis care	0.09
Care for persons with AIDS (pre-ART)	0.32
Chronic curative	0.90
Mental health with low screening	0.28
Chronic psychiatric care	0.31
Average per capita utilisation per year	3.85

Source: 'Need Norms' study[27]

Estimating the cost of the PHC package

The various PHC components were calculated as follows:

- Cost of facility based PHC = (average unit cost per visit in urban areas * urban population dependent on public sector services * utilisation rate) plus (average unit cost per visit in rural areas * rural population dependent on public sector services * utilisation rate). These data indicated that the current expenditure on PHC is approximately R6.6 billion. This is consistent with the findings of the recent Intergovernmental Fiscal Review.
- Cost of EHS = EHS cost per capita * total population. This resulted in an estimate of R473 million for current spending on EHS.
- Cost of CHWs = (number of households in urban areas dependent on public sector / 125 * CHW Stipend and NGO overhead cost) + (number of households in rural areas dependent on public sector / 90 * CHW Stipend and NGO overhead cost). Currently CHW programmes are not very substantial in most provinces and expenditure is low.

Table 14 shows projected expenditure levels over the MTEF period in order to meet the normative utilisation, EHS and CHW targets.

Table 14: Per capita and total resource requirements for PHC services (R 2003/04 prices)

	2005/06	2006/07	2007/08	2008/09	2009/10
PHC per capita resource requirements					
PHC services provided only in clinics & CHCs [1]	184.08	201.80	219.51	237.20	254.89
PHC services provided in clinics & CHCs as well as district hospital OPDs [2]	262.90	288.21	313.49	338.75	364.00
CHW [3]	8.26	16.49	24.66	32.79	40.88
EHS [4]	10.23	10.67	11.11	11.55	11.99
Total [1] + [3] + [4]	202.57	228.96	255.28	281.54	307.76
Total [2] + [3] + [4]	281.39	315.37	349.26	383.09	416.87
PHC total resource requirement (R million)					
PHC services provided only in clinics & CHCs [1]	7 603.05	8 422.31	9 327.07	10 241.11	11 163.20
PHC services provided in clinics & CHCs as well as district hospital OPDs [2]	10 858.83	12 028.63	13 320.31	14 625.17	15 941.44
CHW [3]	341.13	688.12	1 047.91	1 415.76	1 790.27
EHS [4]	494.31	524.30	554.39	584.31	614.09
Total [1] + [3] + [4]	8 438.49	9 634.73	10 929.37	12 241.18	13 567.57
Total [2] + [3] + [4]	11 694.27	13 241.05	14 922.62	16 625.24	18 345.80

The following key conclusions can be made about **future resource requirements**:

- R11.2 billion would be required in 2009/10 in order to provide the full package of facility-based PHC services. This means that an additional R4.5 billion is required by the end of the five year period.
- The cost of providing PHC services at district hospital OPDs is considerably higher than at clinics and CHCs. Although we have calculated current expenditure for clinics and CHCs only, DHERs indicate that PHC services are also being delivered in district hospital OPDs. If this continues, a total of R15.9 billion (instead of R11.2 billion) would be required in 2009/10. It is recommended that departments actively pursue the provision of the majority of PHC services through clinics and CHCs in preference to district hospital OPDs. If such reorganisation does not occur, it is unlikely that a comprehensive, accessible PHC package will be available to all.
- Very limited additional resources are required to meet EHS requirements; about R141 million is required to take expenditure to R614 million in 2009/10 to meet the EHS targets.
- Considerable additional resources, of nearly R1.8 billion, are required to fully implement CHW programmes by 2009/10.
- A total of R13.6 billion would be required in 2009/10 in order to provide the full package of facility-based PHC services at an average of 3.85 visits per person per year, EHS and CHW programmes. This is equivalent to about R308 per capita.

Discussion and conclusion

This chapter has presented updated estimates of resource requirements to meet Antiretroviral Treatment targets based on primary cost and utilisation data. The costs of delivering ART to over 50 000 patients is R326 million in 2004/05, with rapid increases to over R6.5 billion by 2008/09. The full cost over the period of projection was just over R14.6 billion. Antiretroviral drugs were 39% and human resources were 27% of the total cost. A crucial uncertainty in calculating resource requirements for ART is whether the pace of the roll-out will be in line with patient targets. We have based our estimates on the patient targets contained in the

Operational Plan.[1] It is acknowledged that these targets are ambitious, and it is recommended that these estimates be adjusted once more data are available on the uptake of ART on the ground. Finally, it is recommended that between R5 500 and R6 000 per patient per annum could be used as a ballpark figure in planning services.

It is acknowledged that current PHC utilisation rates in South Africa are relatively low by middle income country standards. Until recently an average of 3.5 visits per person per year has been seen as the desirable target utilisation rate in the South African context.[27] A major deficiency in this estimate was the lack of consideration of the impact of the HIV epidemic. We have therefore increased the target utilisation rate to 3.85 visits per person per year in order to take into account the service requirements of those with HIV and AIDS who are not enrolled in an ART programme. It was assumed that visits would increase from their current levels to the target level of 3.85 visits over a five year period. Similarly, we assumed that the CHW programme would reach its targets within five years. In reality, it may be necessary to extend this scaling-up process over a longer period. Given the high cost of this programme, it might also be necessary to revisit the CHW to household ratios.

Despite these uncertainties, the current estimates provide a good basis for initiating discussions on likely future resource requirements. It is recommended that national and provincial health departments use a ballpark estimate of just over R300 per capita in planning for comprehensive PHC services.

It was also shown that by 2008/09, an additional 3 182 doctors and 2 387 nurses would be required to run ART programmes, based on staff establishment and efficiency levels in the third year of the Khayelitsha programme. Over the five-year period, the cost of these staff would be approximately R2 billion. Currently, there is a shortage of both doctors and nurses in the public sector and levels of production of these categories of staff will not be sufficient to satisfy the need. The success of both the ART and PHC programmes is heavily dependent on the availability of qualified doctors and nurses. Providing financial incentives in the form of rural and scarce skills allowances has had some success but has not been sufficient in filling all vacant posts in rural and urban areas. Other non-financial factors such as job satisfaction, housing and career opportunities influence the choice to work in any given area. If the health sector is determined to achieve full staffing of all health districts, these non-financial factors must be incorporated into the incentive package. Examples of non-financial incentives could be:

- Providing housing (or subsidised housing) for health personnel in rural areas
- Accelerating career progress of personnel working in rural areas
- Investing in developing infrastructure and social amenities in rural areas.

Whether these are feasible or not, the critical point to note is that incorporating any financial or non-financial incentive package will imply additional costs to the health sector and the government in general. All will involve increases in overall expenditure in the long-term.

The key policy implications for the South African Health System are that:

- Non-financial incentives need to be incorporated into any sustainable incentive package to attract and retain health personnel, especially in view of the increased burden on health services from HIV and AIDS.
- Lack of managerial capacity, common in rural areas suggests that similar (financial and non-financial) incentive packages should be structured for managers working in rural areas.
- The health sector must begin to factor the additional cost implications for funding strategies to alleviate identified human resource constraints into future health budgets.

The costing of health services requirements is a very useful exercise in estimating required costs for adequate provision of health services. However, the human resource constraints currently experienced in many areas within the health system have significant financial implications that need to be recognised.

References

1 National Department of Health. Operational Plan for Comprehensive HIV and AIDS Care, Management and Treatment for South Africa. Pretoria: National Department of Health; 2003.
URL: http://www.info.gov.za/issues/hiv/careplan.htm

2 Cleary S, Boulle A, McIntyre D and Coetzee D. Cost-effectiveness of Antiretroviral Treatment for HIV-positive adults in a South African township. Durban: Health Systems Trust; 2004 p 1-67.
URL: http://www.hst.org.za/publications/579

3 Boulle A, Johnson L, Cleary S and Abdullah F. The Cape Town (CT) Antiretroviral Costing Model. Version 2. Cape Town: University of Cape Town; 2004.

4 Full report of the joint Health and Treasury task team charged with examining treatment options to supplement comprehensive care for HIV/AIDS in the public health sector., Pretoria: National Department of Health, National Treasury; 2003.
URL: http://www.info.gov.za/otherdocs/2003/treatment.pdf

5 van Sighem A, et al. Mortality and progression to AIDS after starting highly active antiretroviral therapy. AIDS, 2003. 17: p. 2227-2236.

6 Kahn T. Low uptake of AIDS drugs at Anglo mines. Business Day; 2005.

7 National Department of Health. Financial resource requirements for a package of primary health care services in the South African public health sector. Cape Town and Pretoria: Health Economics Unit and National Department of Health; 2004.

8 Bouwer M. and Mndebele J. District health expenditure review uMzinyathi health district, G. Jager and K. Wimble, Editors. Unpublished Report: The Equity Project; 2003.

9 Chetty V and Nielson P. District health expenditure review Ugu health district, G. Jager and K. Wimble, Editors. Unpublished Report. The Equity Project; 2003.

10 Daviaud E. Eden PHC: a photographic picture 2001-2002. Unpublished Report: Health Systems Trust; 2003

11 Daviaud E. Boland PHC: a photographic picture 2001-2002. Unpublished Report :Health Systems Trust; 2003

12 Daviaud E. West-coast PHC: a photographic picture 2001-2002. Unpublished Report: Health Systems Trust; 2003

13 Daviaud E. Overberg PHC: a photographic picture 2001-2002. Unpublished Report: Health Systems Trust; 2003.

14 Daviaud E. Central Karoo PHC: a photographic picture 2001-2002. Unpublished Report: Health Systems Trust 2004

15 Kaufmann, K. and M. Shamase, District health expenditure review Zululand health district, Jager G and Wimble K, editors. Unpublished Report: The Equity Project; 2003

16 Maoela C and Immelman E. District health expenditure review uMkhanyakude health district, Jager G and Wimble K, editors. The Equity Project; 2003.

17 Matandela E. District health expenditure review Alfred Ndzo, Wimble K, editor. Unpublished Report: Health Systems Trust; 2004.

18 Matsheke T. A cost analysis of rural primary health care services in KwaZulu-Natal, in Health Economics Unit. Cape Town: University of Cape Town; 2004.

19 Molefakgotla P and Crisp G, District health expenditure review 1999/2000 Tuang health district North West Province, Engelbrecht B, editor. Unpublished Report: Health Systems Trust; 2000.

20 Osigwe R and Mlezana S. District health expenditure review O.R. Tambo, Wimble K, editor. Unpublished Report: Health Systems Trust; 2003.

21 Sinanovic E, et al. Primary health care contracting study: Public sector facilities report on methods and findings. Cape Town: Health Economics Unit; 2001.

22 Vaal East District Gauteng Province district health expenditure review. 1998/1999.

23 Tshwane district health expenditure review. 2001/2002, Gauteng Provincial Government.

24 DHER 2002/2003 for Thabo Mofutsanyana Health District. Unpublished Report: Valley Trust; 2003.

25 Thomas S, Mbatsha S, Muirhead D and Okorofor O. Primary health care financing and need across health districts in South Africa. Health Economics Unit and Centre for Health Policy; 2003.

26 Haynes R. Financing environmental health services in South Africa. Durban: Health Systems Trust; 2004.
URL: http://www.hst.org.za/uploads/files/ehs.pdf

27 Rispel L, Price M and Cabral J. Confronting Need and Affordability: Guidelines for Primary Health Care Services in South Africa. Johannesburg: Centre for Health Policy; 1996.