

Cost analysis of the basic package, resource utilisation and financing of health services at Halley Stott Health Centre and Umbumbulu Clinic in KwaZulu-Natal

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Objectives. A cost analysis study compared the package of health services, costs, resource utilisation (drugs and staff) and financing mechanisms at Halley Stott Health Centre and Umbumbulu Clinic with those of other primary care providers in KwaZulu-Natal. Options identified were used to improve efficiency, resource allocations and financing of health services in KwaZulu-Natal.

Design/outcome measures. The direct accounting method was used to calculate unit costs for the following cost centres — paediatrics and adult curative consultations, antenatal/postnatal care, family planning, the under-5s clinic and the mobile services. Staff efficiency was assessed using the Centre for Health Policy method based on workload estimates, while the International Network for the Rational Use of Drugs indicators were used to assess the efficiency of drug usage.

Results. There was considerable variation in the package of services provided at all the health facilities; the average costs ranged from R5.94 to R134.76 and the unit costs ranged from R29.30 to R161.92 for curative care. The bulk of the resources (64 - 73%) were spent on personnel costs, providing mainly curative care. Under-utilisation of antenatal care, the under-5s clinic and paediatric consultations were reflected in reduced time utilisation and lower levels of staff efficiency, while family planning services were over-utilised, which reflected a relative staff shortage. The components of health services provided at the two health facilities exceeded those recommended by the World Bank.

Conclusions. Cost analysis has the potential to quantify staff and drug efficiency, facilitate resource allocation and improve health service efficiency. Defining the package of

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health services for each province contributes to the development of the nationally agreed basic package of health services, and enables managers and policy-makers to choose different options rationally, control costs, shift resources and achieve equity.

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Information on the costs of health services and the efficiency of resource utilisation within the public sector in South Africa is essential to provide cost-effective and efficient health services; such costing methodologies could assist provincial and district health administrations in planning district health services. Cost recovery, lack of a nationally agreed definition of a basic package of primary health care (PHC) services and the role of user fees are some of the challenges facing the health sector in South Africa and internationally.¹

Given the current high expenditure of 8.5% of its gross domestic product on health, of which nearly 60% is spent in the private sector,² and the competition for resources within the public sector, there is a need to increase the efficiency of existing health services to ensure that maximum output is achieved with minimal resources. The current debates regarding the basic package of services in South Africa centre on the issue of allocative efficiency and coverage. The World Bank³ advocates those programmes which have minimal costs and which would produce the maximum health benefits, quantified by disability-adjusted life-years (DALYs).

Economic evaluation of health services is one of the objective tools to achieve efficiency and equity in health and to find alternatives for financing and resource allocation such as the proposal for a national health insurance (NHI) system.²⁻⁴ Few economic evaluations of the health sector in South Africa have been undertaken. Studies conducted at Alexandra Health Centre and Diepkloof Clinic in Transvaal were essentially costing studies providing information on the costs of clinic-based care delivered by a non-governmental organisation (NGO) and the public sector respectively, using the direct accounting method of costing.^{5,6} The New Hanover study in KwaZulu-Natal⁷ (costing the services of general practitioners (GPs) in the area) and the 'need norms' study (costing clinic services provided by the public, NGOs and the private sector) also used the same methodology.⁸ The Phoenix PHC Centre costing study used a modified version of the direct accounting method.⁹

Cost analysis studies involve an examination of expenditures to determine how resources have been spent, including an analysis of revenue sources and the distribution of these sources.¹⁰ Such studies help to identify areas where inefficiencies occur and ways in which expenses can be reduced, areas where further analysis is needed and where increased funds are justified. They are also used as a basis for most economic evaluation techniques, such as cost minimisation, cost effectiveness, cost utility and cost/benefit analysis.^{11,12} These latter analyses also include epidemiological and other outcome measures and are more complex to undertake.

This study describes a cost analysis of Halley Stott Health Centre (HSHC) and Umbumbulu Clinic (UC) in KwaZulu-

Natal, and compares it with the costs of other health centres. The newly built HSHC is run by an NGO, the Valley Trust Socio-Medical Project, and subsidised by the provincial health department. UC is a well-established rural health clinic in southern Durban serving a population of 22 000 people. The demographic and epidemiological profiles of the catchment populations served by both clinics are similar. Although both health facilities are called 'clinics' and run as such, they are classified as health centres by the health authorities.

The aims of this study were to determine the cost of providing a package of services, of resource usage and efficiency and the financing mechanisms for health services within HSHC and UC. The reason for costing these clinics was because this information had been requested by the clinic management for the formulation of district health plans.

Methods

The following definitions were used:

Cost centres are services whose costs were calculated. These included paediatric curative, adult curative, antenatal and postnatal care, family planning, the under-5s clinic and the mobile services. The under-5s clinic cost centre included growth monitoring, nutritional advice and immunisations. Other services such as health education and AIDS prevention were incorporated into the abovementioned cost centres where these activities occurred.

Outputs were the number of units of service, e.g. immunisations, operations, performed or work done by the health services, which is routinely available within the health services (consultations, patient visits).

Outcomes are the health effects of, or the results produced by, the health services, such as cure rates, recovery and rehabilitation. Outcome data require follow-up of patients in the health facility, community or workplace, and are more difficult to obtain.

Cost-effective strategies aim to achieve an objective or outcome at the lowest cost, or by means of the strategy that achieves the objectives/outcome to a greater extent than other strategies that cost the same.

Cost-efficiency refers to attainment of the maximum output at the minimum cost, while maintaining adequate quality of care.

Allocative efficiency refers to the allocation of resources within the health sector to the areas and people in greatest need (capacity to benefit) to maximise the health benefits (improvement in health status). It also refers to the allocation of resources to health care as compared with investments in other sectors, such as agriculture, education and employment.

This was a cost analysis study that used the direct accounting method. This method was developed and previously described by the United Nations Children's Fund (UNICEF) by some groups in South Africa,^{6,11} including the KwaZulu-Natal Workgroup in the Osindisweni district.¹² Data from these two clinics were compared with costing and health services data from the World Bank and the KwaZulu-Natal Workgroup.^{1,12}

The package of health services provided by the HSHC and the UC were identified through direct communication

with the matron/sister-in-charge and middle managers, by site visits and a review of reports. Six components of the total package of health services were identified by the clinic managers as cost centres, viz. antenatal/postnatal care, adult curative consultations, paediatric consultations, under-5s clinic, family planning and the mobile services. Dental services and the nutrition unit at the HSHC were not costed.

Four steps were followed to determine the utilisation and distribution of resources in the six cost centres: (i) identification of the resources used (inputs); (ii) estimation of the quantity of each resource consumed; (iii) assigning monetary values to each unit of input and calculating the total cost of each input; and (iv) allocation of costs to the various cost centres. The unit cost of providing the different components of the package of health services was established by defining the service outputs from the clinic records, and calculating the unit cost of each cost centre by dividing the total costs per cost centre by the service output for that cost centre.

The traditional approach to assessing productivity and staffing needs (using time and motion studies) based on norms, institutionalised by the Public Service Commission, through a series of codes,¹³ has been criticised for being too generous for developing countries — there may not be sufficient resources and they have therefore not been used in this study.

A quantitative method to assess staff adequacy and efficiency developed by the Centre for Health Policy (CHP) was used to determine the workload estimates and has been described previously.¹⁴ It compared the number of staff ideally required to carry out the functions within the various cost centres to the actual staff complement in these centres. The Department of National Health norms¹⁵ was used as a basis to establish the average consultation time for each activity, e.g. an adult curative visit. Only the adequacy and the efficiency of professional nurses were calculated for HSHC as they constituted, as a group, the largest proportion of personnel expenditure in the clinic. The CHP methodology sets criteria whereby each clinic can compare its actual situation with a hypothetical ideal. UC was not assessed in respect of adequacy and efficiency of staff utilisation.

Assessing the efficiency of drug usage

The following International Network for the Rational Use of Drugs (INRUD) indicators for the assessment of efficiency of drug use and quality of care were used: (i) number of drugs prescribed per case per outpatient visit; (ii) proportion of outpatients receiving antibiotics; (iii) proportion of outpatients receiving injections; and (iv) cost per case for drugs per outpatient visit.¹⁶ These indicators were applied to a systematic random sample of 100 patient records, selected over a 12-month period.

Equal numbers of children and adults were selected and the sample represented patients seen by all the professional nurses who undertook clinical consultations.

The various sources of financing were identified from the income and expenditure statements of the clinics for each of the resources used (inputs), and the percentage contribution of each source to the total cost was calculated. The user fees collected for the year were calculated as a percentage of the total cost of providing the services.

Data analysis was undertaken using the Quattro-Pro computer programme. Authorisation was granted by the relevant health authorities. Most of the data were not linked to patients and therefore did not require patient consent.

Results

The package of service. The package of services offered by HSHC and UC were compared with the basic packages of services recommended by the KwaZulu-Natal Workgroup¹² and the World Bank' (Table I). HSHC and UC provided 14 and 11 components, respectively, of the 19 components of the basic package recommended by the KwaZulu-Natal Workgroup, and offered in excess of those components recommended by the World Bank. The World Bank's recommended package contains some components that were not suggested by the KwaZulu-Natal Workgroup, such as school health services, and vector, tobacco and alcohol control.

Table I. Comparisons of health services: HSHC and UC against the World Bank and the KwaZulu-Natal (KZN) Workgroup¹²

Basic package of service	World Bank	UC	HSHC	KZN Workgroup
Public health				
Immunisation	+	+	+	+
School health	+	-	-	-
Tobacco and alcohol control	+	-	-	-
Health education	+	+	+	+
Vector control	+	-	-	-
AIDS prevention	+	-	+	+
Growth monitoring	-	+	+	+
Clinical				
Maternity — 24 hrs	+	-	-	+
Antenatal care	+	+	+	+
Family planning	+	+	+	+
STD treatment	+	+	+	+
Minor ailment treatment	+	+	+	+
Basic emergency	+	+	+	+
TB treatment	+	+	+	+
Postnatal care	-	+	+	+
Dental services	-	-	+	+
Chronic disease treatment	-	+	+	+
Casualty	-	-	-	+
Cancer screening	-	-	-	+
Home visits	-	-	-	+
Support services				
X-ray	-	-	+	+
Laboratory	-	-	-	+

+ = provided/suggested; - = not provided/not suggested.

Resource utilisation and distribution across cost centres. More than two-thirds of the resources of both clinics were consumed by salaries of health personnel (Table II). The mobile services had a much higher personnel expenditure (73%) than the fixed facilities. Drug expenditure was highest at the HSHC fixed facility (18%), while the 'other' expenditure was higher at UC.

Table II. Distribution of financial resources by inputs

Inputs	HSHC		UC
	Fixed	Mobile	
Personnel	65%	73%	64%
Drugs and immunisation	18%	16%	12%
Others	17%	11%	24%
Total cost	R1 429 495 (74%)	R501 738 (26%)	R777 403 (100%)

* Other costs such as telephones, rent, medical gas, utilities, surgical sundries, transport.

The distribution of resources among the different components of the basic package of service for the two clinics shows that HSHC disbursed 65% of its resources on curative care (both adult and paediatric consultations) and 35% on preventive care, while the resources at UC were spread equally between curative and preventive care (Table III).

Costs of the package of services — unit costs. The service outputs and total costs for each cost centre — used for the calculation of the unit costs — were compared with the unit costs at different clinics (Tables III and IV). (The detailed calculations of the unit cost for the services are contained in appendices, which are available from the authors.) A comparison of the facilities within KwaZulu-Natal shows that HSHC has the highest overall average cost and the highest cost for family planning and antenatal care; Tongaat Clinic has the highest cost for curative consultations; UC has the highest cost for the under 5-year clinic (Table IV). The unit cost for the mobile service based at HSHC was R10.98. Vaalmed has the highest overall average costs and the highest unit costs for consultations and family planning. The unit cost for antenatal care (ANC)/postnatal care (PNC) for HSHC is slightly higher than for Vaalmed. Agincourt has a higher unit cost than the KwaZulu-Natal facilities for most of the components of the package except for ANC/PNC services. The use of the injectable contraceptive, Depo-Provera, which is cheaper than oral contraceptives, lowered the unit costs for family planning at UC. The unit cost of the under-5 years clinic at UC was twice that of HSHC, because professional staff rendered this service once a week, compared with a daily service run by a lower category of staff at HSHC.

Table IV. Unit cost comparisons of the package of health services for several primary care providers (R)

Primary care providers	Average cost	Curative consultation	Family planning	ANC/PNC	Under 5s
HSHC	27.68	29.30*	21.90	63.88	10.07
UC	5.94	25.15*	12.95	47.84	23.37
Inanda A†	22.51	11.80	14.40	47.70	16.15
Tongaat‡	22.28	34.87	20.62	25.33	8.31
Alexandra‡	40.00	43.53	19.01	33.33	N/A
Agincourt¶	46.37	49.24	47.83	42.10	42.35
Vaalmed§	134.76	161.92	63.37	63.37	18.31

All unit costs reflect recurrent costs only.

ANC/PNC = antenatal/postnatal care.

* Aggregate figures for the unit costs of the paediatric and the adult curative consultation cost centres.

† Public sector urban health centres in the Osindisweni Health District in KwaZulu-Natal — 1993/1994 financial year.

‡ Urban NGO health centre in Gauteng. Costs based on 1993 expenditure.

¶ Public sector rural health centre in the former Gazankulu homeland. Costs based on 1992/1993 expenditure.

§ Private sector — urban health maintenance organisation in Gauteng. Costs based on 1992/1993 expenditure.

Adequacy and efficiency of resource utilisation

Staff utilisation at HSHC. The assessment of staff utilisation in terms of adequacy and efficiency at HSHC indicates an excess of one professional nurse (Table V).

Efficiency of drug utilisation. The average number of drugs that each patient received is higher at UC (Table VI), while HSHC had a higher proportion of patients receiving antibiotics and injections and a higher average cost of prescriptions.

Table V. Professional staff adequacy and efficiency at HSHC

Services	Staff required	Existing staff	Excess (+) shortage (-)	Time utilised (%)
Paediatric consultation	1.3	1.5	+0.2	87
Adult consultation	5	5	0	100
FP				
1st visit	0.7	0.7	0	100
Repeat visit	1.3	1	-0.3	130
ANC/PNC	1	2	1	50
< 5 yrs cons.	1	1.3	+0.3	77
Total	10.3	11.5	+1.2	90

FP = family planning.

ANC/PNC = antenatal/postnatal care.

< 5 yrs cons. = < 5 years' consultation.

Table III. Distribution of costs (R) and service outputs (visits) of the package of services for HSHC (fixed) and UC: March 1993 - February 1994

Cost centres	HSHC		UC	
	Cost (%)	Service outputs (%)	Cost (%)	Service outputs (%)
Paediatric consultations	168 708 (12%)	6 154 (12%)	141 589 (18%)	6 120 (20%)
Adult consultations	759 675 (53%)	24 356 (47%)	252 945 (32%)	9 311 (31%)
Family planning	159 399 (11%)	7 276 (14%)	84 896 (11%)	6 555 (22%)
ANC/PNC	240 131 (17%)	3 759 (7%)	217 805 (28%)	4 553 (15%)
< 5 years	101 582 (7%)	10 083 (20%)	80 168 (11%)	3 429 (12%)
Total	1 429 495 (100%)	51 628 (100%)	777 403 (100%)	29 968 (100%)

Table VI. Efficiency of drug usage in HSHC and UC

INRUD indicators	HSHC	UC
Average No. of drugs per patient	2.1	2.5
Patients receiving antibiotics (%)	42	25
Patients receiving injections (%)	7	4
Average cost of drug/patient (R)	3.47	3.32

INRUD = International Network for the Rational Use of Drugs.

Sources of financing. The KwaZulu-Natal Provincial Health Department funds most of the services offered by HSHC (71.8%). The family planning services and the drug costs of STD patients are funded by the ex-Department of National Health (approximately 17.7%). The clinic records, however, did not allow for the disaggregation of the drug costs for STD cases from the total drug costs. The percentage contribution by the National Health Department is therefore an underestimate, while that of the Provincial Health Department is an overestimate. The services at UC are financed centrally by the ex-KwaZulu Department of Health (92.8%). User fees as a mechanism of financing for both the clinics constitute a significant proportion — 10.5% for HSHC, 7.2% for UC.

Discussion

Defining the package of health services. The package of services offered by these two health facilities is in excess of the minimum package of clinical services recommended for middle-income countries by the World Bank and close to the KwaZulu-Natal Workgroup's suggested package. The World Bank's recommended package requires that these additional services be paid for either out-of-pocket or through additional insurance cover.

The definitions, levels of care, range and quality of services offered at health facilities in KwaZulu-Natal and nationally show such great diversity that it is difficult to compare or develop a nationally defined basic package. Similarly the frequency and internal arrangement of services have an impact on output measures and hence efficiency.

It has been difficult to compare the basic package with the services offered at Diepkloof Clinic because the latter did not document the full spectrum of services offered.⁶ In comparison with the services offered at Alexandra Health Centre,⁵ HSHC does not offer geriatric outreach, district postnatal and physiotherapy services, support services such as laboratory facilities and a 24-hour maternity service.

Distribution and utilisation of resources. The distribution of resources among different components of the basic package of service for HSHC is consistent with the findings of other studies,^{5,12,17} where health centres were spending more on curative than preventive care. No norms exist to guide the optimal distribution of resources between preventive and curative care. The proportion of resources consumed by personnel in both clinics is consistent with that at Alexandra Health Centre⁵ and in the Osindisweni health district,¹² although it was higher than in a rural district in Namibia.¹⁷ The mix of health personnel rendering services has a great influence on how the resources are distributed among the various inputs and subsequently on the cost and coverage of services, equity of resource distribution and the

training of health professionals. Qualified personnel, such as doctors, will increase the costs of the service, as is the case at HSHC. The doctors' salaries constituted only a small percentage — 1.6% and 6% — of the total personnel expenditure at UC and HSHC respectively, an appropriate level indicative of the utilisation of nurses at PHC level.

This study has shown that there is capacity within clinics to reallocate professional staff more equitably by shifting staff from the areas where they are not fully utilised to overburdened services, without increasing the numbers of existing staff. Another method to improve efficiency would be to use a lower category of health worker such as an enrolled nurse to perform some of the functions that are currently being undertaken by professional staff. Studies in Namibia¹⁷ and the Osindisweni health district¹² show a staff utilisation pattern similar to that of HSHC, where there was a shortage of staff for curative care and a relative excess of staff for preventive care. These observations need to be qualified by quality of care studies to ensure that a minimum standard of care is maintained.

Drug expenditure and utilisation of drugs. Drug expenditure in this study (12 - 18%) was lower than that in Osindisweni and Namibia, where between 12% and 27% of resources were spent on drugs, and in the private sector (30%).⁷

The higher average drug cost per patient for HSHC could be related to the higher percentage of patients receiving antibiotics and injections than at UC, the presence of a part-time doctor at HSHC, the significant numbers of chronic care patients and the use of brand name drugs instead of generic equivalents. The lower average number of drugs per patient prescribed at HSHC could indicate a more rational prescribing of drugs than at the UC.

The average drug costs per patient at Alexandra Health Centre ranged widely, from 60 c to R9.43,⁵ while those in the Namibian study ranged from R1 to R5¹⁷ and in the Osindisweni health district from R2 to R12.¹² The wide variation in the use (and overuse) of antibiotics and injections is similar to that in other developing countries. A number of mechanisms is required to ensure rational prescribing.

The cost of the package of health services. The package of health services at HSHC that met up to 75% of the suggested KwaZulu-Natal package cost approximately R1.9 million. The per capita expenditure for this package was R32 for approximately 60 000 people (assuming a 100% coverage). For UC, which provided 58% of the suggested KwaZulu-Natal package, the per capita expenditure for approximately 22 000 people (100% coverage) was approximately R35. A more sophisticated package of services offered by Alexandra Health Centre had a total cost of R6.64 million⁸ and a per capita expenditure of R33.20 for 200 000 people in 1993.

The World Bank's 1990 per capita expenditure for its recommended package for middle-income countries at health centre level translated into 1993 South African prices amounted to R76.70 (using a 10% annual inflation rate for \$17.47 and a 1993 rand/dollar exchange rate of R3.30 to a dollar) for 80% coverage of the population. This figure of \$17.47 was based on the difference between the cost of the total package of care at the health centre and the community hospital level (\$21.50) and the cost of the package of care specifically at the community hospital level

(\$4.03). At 1993 prices it would therefore cost R95.87 per capita to cover 100% of the population. It must be noted that the clinical package recommended by the World Bank was much less than the KwaZulu-Natal package but that this cost included some components, e.g. school health services, and the vector, alcohol and tobacco control programme, that were not suggested by the KwaZulu-Natal group. Meaningful comparisons can only be drawn once all these components are costed for HSHC and UC. There appears to be wide variation in the total cost of providing the various components of the different packages. The World Bank's package claims to reduce the burden of disease by 15% in middle-income countries. Adopting this package for the entire population would have cost approximately R4.3 billion for 1995 (adjusting for 10% per annum inflation from the 1993 per capita expenditure of R95.87 per capita for 100% coverage). The total cost of providing these services nationally and for KwaZulu-Natal's rural populations would have been approximately R2 billion (for 17.8 million people) and R371 million (for 3.2 million people), respectively, for 1995. If a more comprehensive package such as HSHC's is used then the total cost for the country's rural population would have been R694 million and for the rural population of KwaZulu-Natal approximately R124 million for 1995. However, it must be noted that these cost estimates based on HSHC's per capita expenditure exclude maternity care, which incurs substantial expenses.

The 'need norms' study extrapolated a total cost of R4.3 billion for two visits per capita in 1995 at all public sector sites (covering 80% of the population) for a package of services that Alexandra Health Centre provides.⁵ This might be the most realistic reflection of the cost estimates for providing a comprehensive package of service for the country. Comparison of the unit costs with those of other studies was not possible, as the base years differ.

The overall average costs of the four public sector clinics (HSHC, UC, Inanda A and Tongaat) were lower than that of the GP in a rural area.⁷ The GP's average cost amounted to approximately R30. However, the unit cost for the GP's curative consultation was R27.78 for cash-paying patients, which was lower than that of HSHC. The average cost for a medical aid curative consultation was R32.72 which excluded medicines. This difference was due to the increased time that the GP spends on medical aid patients. It would be necessary to examine the quality of care in both these sectors before the policy-makers choose between different service providers to increase coverage and address any inequity.

Strategies to reduce unit costs and increase efficiency include: (i) provision of only those services that attract a sufficiently large number of consultations/visits; (ii) organising of outreach programmes; (iii) extension of the range and the hours of operation of the services to reduce the unit costs and increase coverage; (iv) delegating of functions performed by higher staff categories to lower staff categories; (v) discontinuation of inefficient services and investment of these resources elsewhere; and (vi) provision of comprehensive services that are available daily, rather than weekly clinics for vertical programmes.

Sources of financing for the package of health services. User fees for HSHC comprised a relatively high percentage of revenue, compared with the KwaZulu-Natal provincial average of 1 - 5% for public sector facilities,¹⁸ and

the situation in other African countries.¹⁹ User fee policies need to be carefully structured to avoid their becoming a regressive financing source.²⁰ McIntyre has advocated 'free' services at the primary level and user fees at higher levels of care, particularly for insured patients,²⁰ as a useful policy measure to influence consumer behaviour and establish appropriate and rational referral patterns.

Conclusion

As soon as a standard package of services is defined at the provincial and national levels, the unit and total costs need to be established in all the provinces so that comparisons can be made to facilitate resource allocation, reduce inefficiencies, and enhance the management of facilities and the redeployment of staff.

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