MANAGING THE HEALTH CARE MARKET IN DEVELOPING COUNTRIES: A CASE STUDY OF SELECTIVE CONTRACTING FOR HOSPITAL SERVICES IN SOUTH AFRICA

VOLUME II: APPENDICES

JONATHAN BROOMBERG

March 1997

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX 1: COST ANALYSIS METHODS

Table A1.1: Organisation of study hospitals into cost centres

	Contractor			Public			Private		
Cost Centres	**Matik.**	**Hewu**	**Shil.**	**Tints.**	**Letaba**	**Bisho**	**St Doms.**	**Piet.**	**Nels.**
Intermediate administrative									
Administration	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stores				✓	✓	✓	✓	✓	✓
Maintenance/ Housekeeping		✓	✓	✓	✓	✓	✓	✓	✓
Catering	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transport	✓	✓	✓	✓	✓	✓	✓	✓	✓
Laundry	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nursing administration/ housing	✓	✓	✓	✓	✓	✓	✓	✓	✓
Intermediate service									
Laboratory	✓	✓	✓	✓	✓	✓			
Pharmacy	✓	✓	✓	✓	✓	✓	✓	✓	✓
Radiology	✓	✓	✓	✓	✓	✓			
Rehabilitation	✓	✓	✓	✓	✓	✓			
Operating theatres	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mortuary	✓	✓	✓	✓	✓	✓	✓	✓	✓
Final Cost Centres									
Outpatients Department	✓	✓	✓	✓	✓	✓		✓	✓
Wards									
Female medical		✓		✓	✓	✓			
Male medical		✓		✓	✓	✓			
Female surgical		✓		✓	✓	✓			
Male surgical		✓		✓	✓	✓			
Male	✓							✓	
Female	✓							✓	
Adult medical			✓				✓		✓
Adult surgical			✓				✓		✓
ICU							✓	✓	✓
Short stay/Day ward						✓	✓		
Isolation				✓	✓				
Psychiatry				✓	✓				
Maternity	✓	✓	✓	✓	✓	✓	✓	✓	✓
Paediatrics	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nurse Training	✓	✓	✓	✓	✓	✓	✓		
Community Services	✓	✓	✓	✓	✓	✓			

Key: ✓: cost centre present

Table A1.2: Adjustments to expenditure reports

	Additional expenditure items included (sources)	Expenditure items excluded
Contractor Hospitals		
Matikwana	• Salaries of medical and paramedical staff employed by Gazankulu DoH (Gazankulu DoH) • Ambulance personnel and capital costs (Gazankulu DoH)[a] • Gazankulu DoH overhead for contract administration (Gazankulu DoH)[b] • Lifecare HO administrative overhead (Lifecare HO)[c] • Capital costs	Capital items, depreciation[e] (expected use of 1 year or longer, and/or value of R500 or more)
Hewu	• Salaries of medical staff employed by Ciskei DoH (Ciskei DoH)[d] • Ambulance personnel and capital costs (Ciskei DoH)[a] • Ciskei DoH overhead for contract administration (Ciskei DoH)[b] • Lifecare HO administrative overhead (Lifecare HO)[c] • Capital costs	Capital items, depreciation (expected use of 1 year or longer, and/or value of R500 or more)
Shiluvana	• Costs of all staff employed by Gazankulu DoH (Gazankulu DoH) • Gazankulu DoH overhead for contract administration (Gazankulu DoH)[b] • Gazankulu DoH personnel administration overhead[f] • Lifecare HO administrative overhead (Lifecare HO)[c] • Capital costs	Capital items, depreciation (expected use of 1 year or longer, and/or value of R500 or more)
Public Hospitals		
Tintswalo	• Staff costs of seconded medical/paramedical staff (Transvaal Provincial Administration) • Medical and surgical supplies (Central Pharmaceutical Services, Gazankulu DoH) • Maintenance, water and lights expenditure (Gazankulu Dept. of Works) • Telephone expenditure (Gazankulu Dept. of Interior) • Gazankulu DoH administrative overhead (Gazankulu DoH)[a] • Capital costs	Capital items (expected use of 1 year or longer, and/or value of R500 or more)
Letaba	• As Tintswalo	As Tintswalo
Bisho	• Staff costs of specialist staff employed at other hospitals, but doing sessional work at Bisho[g] • Medical and surgical supplies (Central Pharmaceutical Depot, Ciskei DoH) • Maintenance, water and lights expenditure (Ciskei Dept. of Works) • Ciskei DoH administrative overhead (Ciskei DoH)[a] • Capital costs	Capital items
Private Hospitals		
St Dominics	• Afrox HO administrative overhead[h] • Capital costs	Capital items
Pietersburg	• HospiPlan HO administrative overhead[i] • Capital costs	Bad debts, discounts allowed, capital items[j]
Nelspruit	• HospiPlan HO administrative overhead[i] • Capital costs	Bad debts, discounts allowed, capital items

Notes to Table A1.2:

a. Number of ambulance personnel and costs were obtained from Gazankulu DoH. Ambulance capital costs were calculated as for other vehicles in the study. Costs were distributed between community and hospital using the average split obtained from all contractor and public hospitals for which data were available, since no data were available for Matikwana.

b. Costs were estimated on the basis of the assumed proportion of senior administrative personnel staff time utilised in administration of the contract. These data were obtained in interviews with the relevant HO personnel.

c. Overhead cost allocation obtained from Lifecare HO and reflects actual amount charged to each hospital by the HO. This amount is calculated using a formula, which is based on percentage of total beds in the group accounted for by this hospital, and the relative intensity of resource use by the hospital.

d. Costs were calculated on the basis of the estimated proportion of time spent by these staff in hospital night duties or other hospital related activities; salary costs were obtained from Ciskei DoH.

e. Capital items represent items purchased during study year and reflected in expenditure reports. These costs were omitted to avoid double counting of capital costs due to the use of the replacement cost approach. Depreciation costs were omitted since the costs of capital were included in the estimates of replacement costs.

f. Since Shiluvana medical, paramedical and nursing staff were employed by Gazankulu DoH, a personnel administration overhead was allocated to the hospital in addition to the contract administration overhead. A proportion of the total HO personnel administration cost was allocated as the staff overhead cost, based on the percentage of total staff on the Gazankulu DoH payroll accounted for by the hospital staff employed by Gazankulu DoH.

g. The total administrative costs for hospital services (consisting of personnel administration and management and control expenditures) were calculated by exclusion of all non hospital services from the expenditure report for the Gazankulu DoH. The personnel administration share of expenditure was allocated to the hospital on the basis of the percentage of total staff employed by the DoH accounted for by the staff of the hospital. The management and control share of HO costs was allocated to the hospital on the basis of the share of total government expenditure on hospitals accounted for by the study hospital.

h. Obtained from Afrox HO; reflects actual overhead charged to the hospital by the HO.

i. Total HO expenditure obtained from HospiPlan. Allocated to each hospital on basis of share of total beds in the group accounted for by that hospital.

j. Expenditure reports for HospiPlan hospitals reflect several items as recurrent expenditure which are equivalent to capital expenditure as defined in the study. For example, the hospital buildings and equipment are leased by a holding company to the hospital. These items, and depreciation costs, were omitted in order to avoid double counting of capital costs. Items such as bad debts and discounts were also excluded, since they were not regarded as true production costs.

Table A1.3: Comparison of public sector estimates and historic costs in estimation of current building replacement costs

	Contractor		Private		
	Matik.	Shil.	St Doms.	Piet.	Nels.
Building replacement costs: Ratio of historic to public sector estimates	0.87	0.76	1.93	1.29	2.18
Equipment replacement costs: Ratio of historic to expert estimates	0.55	0.38	n/a[a]	0.54	0.64

Notes: a: not applicable, since historic costs not available for St Dominics.

Table A1.4: Allocation of staff costs to intermediate and final cost centres

Contractor Hospitals	
Matikwana	***Staff numbers and cost data:*** 4 monthly payroll registers (at three month intervals during the study year) from Lifecare HO analysed for staff complement and salary costs for all Lifecare staff. Staff complement corroborated by analysis of hospital staff establishment data, obtained from hospital, with staff establishment data being used where discrepancies noted. Estimated staff costs from payroll data adjusted to fit known total annual staff expenditure. Data on numbers and salary costs of medical, ambulance and clerical staff obtained by analysis of 4 monthly payroll registers from Gazankulu HO. ***Time use data:*** Nurses: Rotation schedules from 6 alternating months analysed to show number of nurses in each nursing category working in each section. Sample data adjusted to fit total nurses in each category employed in each section, which was obtained from staff establishment records. Medical staff: Data from interviews with medical superintendent, individual doctors and analysis of rotation schedules used to allocate proportions of time to different cost centres. Rehabilitation unit staff: Staff time allocated to outpatients department and to wards (excluding maternity ward) on basis of percentage of total in-patients accounted for by each section, assuming that 3 outpatient visits equivalent to 1 in-patient. Administrative, housekeeping and maintenance staff: Staff time allocated fully to place of work given in staff establishment.
Hewu	***Staff numbers and cost data:*** As for Matikwana. Data for medical staff doing night duties, and for ambulance personnel obtained from Ciskei HO. ***Time use data:*** As for Matikwana with following exceptions: details on night duties conducted by Ciskei medical staff obtained from interviews and analysis of rosters.
Shiluvana	***Staff numbers and cost data:*** As for Matikwana in respect of Lifecare staff. For all staff employed by Gazankulu, four monthly payroll registers (at three month intervals) analysed; staff complement corroborated by analysis of staff establishment data obtained from the hospital. Estimated Gazankulu staff costs from payroll data adjusted to fit total annual staff expenditure on staff from Gazankulu expenditure reports. Data on costs of medical staff seconded by TPA obtained directly from TPA HO. ***Time use data:*** As for Matikwana with following exceptions: twelve monthly nurse rotations analysed for allocation of nursing staff time; rehabilitation staff time allocated to outpatient and in-patient services on basis of 50% sample of treatment records, and in-patient time allocated to wards as for Matikwana.

Table A1.4: Allocation of staff costs to intermediate and final cost centres (contd.)

Public Hospitals	
Tintswalo	***Staff numbers and cost data:*** Total numbers of staff in each category obtained from six monthly payroll registers from alternating months. These data were compared with hospital staff establishment data, with staff establishment data being used where discrepancies noted. Estimates of salary costs obtained by analysis of two monthly payrolls for a 50% sample of all staff. Estimated salary costs then adjusted proportionately to fit known total salary costs from annual expenditure report. Costs of seconded medical and paramedical staff obtained directly from TPA HO. ***Time use data:*** Nurses: Rotation schedules from six alternating months analysed to obtain numbers of nurses in each category working in each section, including community services. Sample data adjusted to fit known total number of nurses in each category employed in each section, which was obtained from hospital staff establishment data. Medical staff: Data from interviews with medical superintendent, individual doctors and analysis of rotation schedules used to allocate proportions of time to different cost centres. Rehabilitation unit staff: Staff time allocated to outpatients department and to wards on basis of analysis of a 20% sample of treatment records. Administrative, housekeeping and maintenance staff: Staff time allocated fully to place of work given in staff establishment.
Letaba	***Staff numbers and cost data:*** As for Tintswalo, except that estimate of total staff costs obtained from 100% sample of all employees on two monthly payrolls. ***Time use data:*** As for Tintswalo with exception that rehabilitation staff time allocated to outpatients department and to wards (excluding maternity ward) on basis of percentage of total in-patients accounted for by each section, assuming that 3 outpatient visits equivalent to 1 in-patient.
Bisho	***Staff numbers and cost data:*** Numbers of staff in each category obtained by analysis of two sources of staff establishment data obtained from the hospital. As no payroll data was available, estimates of staff costs obtained by using midpoints of salary ranges for each category of staff, obtained from Ciskei DoH. Data for each category then adjusted proportionately to fit known total staff costs obtained from annual expenditure report. ***Time use data:*** As for Tintswalo, with following exceptions: some paramedical staff time allocated to community services, based on interview data with superintendent and staff involved; rehabilitation unit staff time allocated to outpatients department and to wards (excluding maternity ward) on basis of percentage of total in-patients accounted for by each section, assuming that 3 outpatient visits equivalent to 1 in-patient.

Table A1.4: Allocation of staff costs to intermediate and final cost centres (contd.)

Private Hospitals	
St Dominics	***Staff numbers and cost data:*** Data obtained from Afrox HO for twelve months of the study year, showing total staff cost, and place of work, for all employees. ***Time use data:*** Nurses: Rotation schedules from six alternating months analysed to obtain the number of nurses in each category working in each section. Sample data adjusted to fit total nurses in each category employed in each section, obtained from hospital staff establishment data. Administrative, housekeeping and maintenance staff: Staff time allocated fully to place of work given in staff establishment.
Pietersburg	***Staff numbers and cost data:*** Data obtained from HO for six alternating months, showing total staff costs, and place of work of all employees. Estimate of total staff cost adjusted to fit known total annual staff expenditure, obtained from expenditure report. ***Time use data:*** as for St Dominics
Nelspruit	As Pietersburg

Table A1.5: Margins of error in sample estimations of total staff costs (%)

	Contractor Hospitals			Public Hospitals			Private Hospitals		
	Matik.	Hewu	Shil.	Tiats.	Let.	Bisho	St Dom.	Piet.	Nels.
Margin of error	+3.7	+0.48	+2.7	+8.5	+9.9	-21.3	0	0	0

Notes: The margin of error reflects the percentage difference between the sample estimate of total annual staff costs and known total annual staff expenditure from the expenditure reports.
+ denotes sample estimate higher than known total
- denotes sample estimate lower than known total

Explanations for margins of error in estimations of total annual staff costs

Estimates of total annual staff costs based on data from sample payrolls may differ from actual total expenditures for several reasons. Sample data may not reflect changes in the staff establishment occurring during months outside the sample; similarly, sample data may not reflect all salary adjustments, including salary

increments and bonuses, occurring during the year, despite the fact that sample months were selected to take account of such adjustments at each hospital. The extent of sample variation will obviously depend on the number of payrolls analysed, as well as on the underlying patterns of staff turnover and on salary payment methods. In the private hospitals, the zero margins of error are due to the fact that payroll data for all 12 months of the year were analysed. The relatively low margins in the contractor hospitals reflect the relative stability of staff establishments as well as the inclusion within the sample of the months in which salary increments and bonuses are paid. The relatively higher margins of error at Tintswalo and Letaba public hospitals reflect the fact that bonuses are paid throughout the year (in the month of the employee's birthday), as well as the higher levels of instability in the staff establishment. The particularly high margin of error at Bisho hospital is primarily due to the fact that no individual salary data was available, so that midpoints of salary ranges for each category of employee were used to estimate staff costs. The factors pertaining at the other public hospitals may also have contributed to this margin of error.

Table A1.6: Allocation of medical and surgical supplies to cost centres

Contractor Hospitals	
Matikwana	Allocated directly to theatre and other final cost centres on basis of data obtained from hospital, showing value of medicines and surgical supplies consumed by each cost centre for each month of the study year, with proportionate adjustment to fit total annual total expenditure.
Hewu	Allocated directly to theatre and final cost centres as follows: data showing value of usage by theatre and other final cost centres for two months of the study year. This data used to estimate unit medicines costs for each cost centre, and these unit costs applied to annual output data for each cost centre to derive estimate of total annual expenditure. Estimates for each cost centre then adjusted proportionately to fit known total annual expenditure.
Shiluvana	As Matikwana
Public Hospitals	
Tintswalo	Allocated directly to theatre and final cost centres as follows: data showing value of usage by theatre and other final cost centres for three months of the year following the study year. This data used to allocate proportions of total medicines expenditure to community services, radiology and laboratory sections, and to calculate unit medicines costs for the months concerned for each cost centre. These unit costs then applied to annual output data for each cost centre to derive estimate of total annual expenditure for the study year. Estimates for each cost centre then adjusted proportionately to fit known total annual expenditure.
Letaba	As Tintswalo.
Bisho	Supplies dispensed to cost centres from ward stocks and from other storage sources in the hospital. Data available showing value of medicines usage by theatre and other final cost centres for each month of study year, from ward stock, but not from other storage areas. Since ward stocks account for over 70% of total medicines usage, remaining costs allocated to cost centres on basis of proportion of value of ward stock used by each cost centre. Estimated usage by each cost centre proportionately adjusted to fit known total annual expenditure.
Private Hospitals	
St Dominics	These items supplied to theatre and other cost centres from dispensary and from ward stock. Data available on total value of sales from ward stock for each cost centre, but only on total value of sales for whole hospital from dispensary. Sales figures converted to expenditure by use of average mark up obtained from total sales and expenditure data for medicines and surgical supplies, and costs of ward stock allocated directly to theatre and other final cost centres. 2% sample of patient records drawn to assess usage of dispensary stock by different cost centres, and sample proportions used to allocate total annual costs of dispensary stock to each cost centre.
Pietersburg	Data obtained from hospital information system on value of sales of medicines and surgical supplies utilised by 10% sample of patients in each cost centre and in theatres. These unit sales values applied to output data for each cost centre to give estimate of total value of sales for each cost centre and for hospital as a whole. The proportion attributable to each cost centre used to allocate known total expenditure to theatres and other cost centres.
Nelspruit	As Pietersburg

Table A1.7: Allocation of other recurrent costs to intermediate and final cost centres

Line item/s	Data and methods used for allocation
External administrative costs	Includes all overheads from corporate or government HOs. Allocated to Administration cost centre.
Internal administrative costs	Includes all office related expenditures (e.g. postage, telephones, stationary etc.). Allocated to Administration cost centre.
Transport costs	Includes all recurrent items relating to transport, aside from staff. All costs allocated to Transport cost centre with following exceptions: Tintswalo and Letaba: small percentage of costs identified as directly attributable to administration cost centre on basis of examination of log books. Remainder of costs allocated to Transport cost centre.
Catering costs	Includes items such as provisions and food, and cutlery/crockery replacement cost. In the case of Tintswalo, Nelspruit and Pietersburg, major catering item represents payment to an outside contractor. All items allocated to Catering cost centre.
Building running costs	Includes rates, utilities and insurance. Allocated to all cost centres on basis of percentage of floor space occupied, with following exceptions: Matikwana: these costs, together with other line items related to building and equipment maintenance, and relevant staff costs, allocated to a composite building running cost, which was then allocated on basis of percentage of floor space occupied by each cost centre. Tintswalo, Letaba and Bisho: a proportion of these costs allocated to a medical staff overhead, based on percentage of total floor space occupied by medical staff quarters. This overhead then allocated to cost centres on basis of percentage of total medical staff time accounted for by the cost centre.
Maintenance costs	Includes all items relating to building, furniture and equipment maintenance (including domestic services contract at Bisho, and equipment service contracts at St Dominics). Allocated to Housekeeping/Maintenance cost centre in all hospitals, except Matikwana (see Building running costs).
Consumables and supplies	Includes all items not identifiable as medical and surgical supplies, and as food. Allocated directly to Housekeeping/Maintenance section, with following exceptions: Tintswalo and Bisho: items were allocated directly to cost centres on basis of sample proportions obtained from analysis of data showing consumption by each cost centre for 6 months of study year.
Laundry services/supplies	Includes payments for outside cleaning/laundry services (Bisho), replacement of linen, laundry related supplies. Allocated in total to Laundry cost centre.
Medical gas and blood supplies	Allocated to Operating theatres.
Laboratory costs	Represents expenditure by public and contractor hospitals on tests performed by outside laboratories. Allocated in full to Laboratory cost centre except in the case of Matikwana, where these costs were allocated directly to final cost centres on the basis of utilisation data available.
Radiology supplies	Allocated directly to Radiology cost centre.
Miscellaneous items	Tintswalo and Letaba: appliances for handicapped - allocated to outpatients section; library books - allocated to nurse training; mortuary fees - allocated to mortuary. Bisho: security services, representing payment to outside contractor- allocated to Housekeeping/Maintenance cost centre; nutritional scheme and family planning - allocated to community services; examination and lecture fees - allocated to nurse training. Matikwana: doctor charges, representing payment for part-time specialist surgeon - allocated to theatre. Hewu: doctor charges, representing overtime payments to doctors - allocated to medical staff overhead. Nelspruit and Pietersburg: pharmacy fees, representing payment to outside contractor for running pharmacy services - allocated to pharmacy. St Dominics: security costs allocated to Housekeeping/Maintenance.

Table A1.8: Allocation of intermediate cost centre costs

Intermediate administrative centres	
Administration	Percentage of total staff complement working in each cost centre.
Stores	Stores overhead, consisting of all costs aside from supplies, allocated on basis of percentage of total value of supplies consumed by each cost centre. Applies only to Tintswalo, Letaba and Bisho. No separate stores cost centre identified at other hospitals.
Maintenance/ Housekeeping	Percentage of floor space occupied by cost centre. No allocation to community services in any hospitals due to absence of data on which to base allocation. No separate section identified for Matikwana.
Catering	Assumed that catering services used exclusively for in-patients and hospital staff. Allocated on basis of percentage of in-patient day equivalents, assuming that patients eat 3 meals per day with paediatric patients eating half rations, and staff one meal per day (1 staff member = 365/3 day equivalents). Tintswalo: data for 3 months showing percentage of meals consumed by medical staff, community and hospital in-patients and staff collectively. Sample proportions used to allocate catering costs to medical staff overhead and to community. Remainder allocated to hospital cost centres as for other hospitals.
Transport	Where hospital supports community services, allocation to community on basis of percentage of total distance driven by all vehicles accounted for by community services.[a] Hospital component of costs allocated to final cost centres only, on basis of percentage of total in-patients, with 3 outpatient visits equivalent to 1 in-patient.
Laundry	Costs allocated fully to hospital cost centres (theatre, wards, outpatient department and nurses' residence), on basis of percentage of in-patient day equivalents, calculated on assumption that ward and nurses' residence bed linen changed weekly (except ICU, where daily linen changes assumed), one operation equivalent to 3 bed linen changes, 3 outpatient visits equivalent to 1 in-patient day.
Nursing admin./ housing	Percentage of total nursing staff complement working in each cost centre.
Laboratory	Systematic sampling of all investigations conducted during study year analysed for type of investigation and ward of origin.[b] Sample proportions applied to known totals for each test, where available, or used to estimate totals where this data not available. For tests conducted by outside laboratories,[c] total outside laboratory expenditure line item allocated to final cost centres using estimated numbers of each test ordered, and appropriate prices. For tests conducted within the hospital laboratory, a relative weight for each type of test was obtained from the South African Institute for Medical Research (SAIMR)[d], and these weights used to estimate a total number of shadow units ordered by each section. Costs of the internal laboratory then allocated to final cost centres on basis of the percentage of total shadow units ordered by that centre.
Pharmacy	Pharmacy overhead, including all costs aside from medicines and surgical supplies, allocated to theatre and other final cost centres on basis of percentage of value of medicines and surgical supplies accounted for by each centre.[e]

Table A1.8: Allocation of intermediate cost centre costs (contd.)

Intermediate administrative centres	
Radiology	Systematic sampling of all X-ray investigations conducted during study year analysed for type of investigation and ward of origin.[f] Sample proportions applied to known totals for each test, where available, or used to estimate totals where this data not available. Relative weights for each investigation obtained from Representative Association of Medical Schemes Tariffs[g] for the study year (Republic of South Africa 1992), and these weights used to estimate total number of shadow units used by each section and by hospital as a whole. Total radiology costs allocated to final cost centres on basis of percentage of total units accounted for by each centre.
Rehabilitation	Tintswalo: allocation to community and cost centres on basis of proportion of total treatment activities obtained by analysis of 20% systematic sample of treatment logbooks for study year. Shiluvana: analysis of 100% sample of treatment records used to allocate proportions of costs to outpatients, community services, and in-patient collectively. Hospital proportion allocated to final cost centres (excluding maternity wards) on basis of percentage of in-patients, with 3 outpatient visits equivalent to 1 in-patient. Other hospitals: staff interview data used to allocate proportion of costs to community and to hospital. Hospital proportion allocated as for Shiluvana. No rehabilitation services provided at private hospitals.
Operating theatres	Systematic sample of entries in operating theatre registers, reflecting all operations carried out during the year, analysed for ward of origin of patient and duration of operation.[h] Sample data corrected to fit known total number of operations and subtotals (e.g. caesarean sections) where available. Corrected data used to estimate proportion of total theatre time accounted for by each ward, and this data used to allocate theatre costs to final cost centres.[i] Nelspruit and Pietersburg: 10% systematic sample of all cases in hospital information system analysed for ward of origin and for theatre charges. Sample estimates of theatre charges corrected to fit known annual total theatre charges for hospital, and corrected estimates used to allocate total theatre costs on basis of percentage of theatre charges accounted for by each ward.
Mortuary	Allocated to all final cost centres except OPD, maternity and psychiatry on basis of percentage of in-patients.

Notes: a. The data showing split between hospital and community services were obtained as follows: Tintswalo: annual report showing total distance and functions for all vehicles; Letaba, Bisho and Shiluvana: analysis of individual vehicle logbooks (2 months of study year, 6 alternating months, and 12 months of study year respectively). Matikwana and Hewu: costs of vehicles operated by Lifecare allocated exclusively to hospital services. Cost of government ambulances and staff allocated between hospital and community by analysis of logbooks for individual vehicles at each hospital.

b. A 10% sample of all tests conducted throughout the year was taken in all hospitals, except *Shiluvana*, where sample sizes ranged from 30% - 100%, and *Bisho*, where a 100% sample of all tests conducted during 6 alternating months was carried out.

c. Outside tests are conducted by laboratories of the South African Institute for Medical Research (SAIMR) in all cases except Bisho. At Bisho, outside tests are conducted by a laboratory at another government hospital, Cecilia Makewane Hospital. Since the costs of these tests are not charged to Bisho, and no unit costs were available from the hospital, the total cost of laboratory services at Bisho is underestimated, although the accuracy of allocation of estimated total costs to cost centres is not affected.

d. The SAIMR attaches a unit value to each test and uses a standard unit cost to calculate the cost of individual tests. The unit values were thus assumed to represent with reasonable accuracy the relative intensity of resource usage in the execution of individual tests.

e. While it is recognised that the percentage of total items dispensed to each cost centre would better reflect the proportionate use of pharmacy overhead costs than the percentage of total value consumed by that centre, such data were not available for any of the study hospitals.

f. *Tintswalo and Letaba:* A 10% sample of all investigations throughout the year was taken and applied to the known total number of chest X-rays, and used to estimate totals of all other investigations. *Other hospitals:* 20% sample of all investigations applied to known annual totals for each investigation.

g. These tariffs govern payments between private health insurance schemes and private health care providers. In the case of radiology, each investigation is assigned a unit value, and the cost per unit is adjusted annually. As in the case of laboratory investigations, the unit values were thus taken as reasonable proxies for relative resource use in carrying out different radiological procedures.

h. *Tintswalo, Letaba, Bisho and Shilwana:* A 20% sample of all operations conducted in the study year was taken. Equivalent figures for the other hospitals were: *Hewu:* 30%; *Matikwana:* 50% *St Dominics:* 100% sample of caesarean sections, 20% sample of all other operations.

i. Where theatre register reflected the ward of origin as OPD (since some patients are referred in for surgery via the OPD), these operations were re-allocated to all other non-maternity wards on the basis of their estimated proportions of total non-maternity theatre usage

Table A1.9: Sources and methods of output data collection

Matikwana	Total annual outpatient visits, operations, admissions and in-patient days for adult male and female wards, paediatrics and maternity wards were obtained from the hospital information system. A 30% systematic sample of adult ward admissions was categorised as medical or surgical, and analysed for LOS, and sample proportions were used to allocate adult admissions and days to medical and surgical categories. Numbers and identification of caesarean section and NVD obtained from maternity register. 100% of caesarean section cases analysed for LOS; NVD LOS derived from caesarean and maternity ward data. A 10% systematic sample of admissions registers for all wards analysed for age and sex.
Hewu	Total numbers of annual outpatient visits, operations and admissions for all wards, and total days for paediatrics ward, and for whole hospital, were obtained from the hospital information system. A 10% systematic sample of admissions to all wards (except paediatrics) was analysed for LOS. Analysis of caesarean section and normal deliveries, and age and sex data as for Matikwana.
Shiluvana	As Matikwana
Tintswalo	Data on total annual outpatient visits (separate data for general outpatient department and for specialist outpatient clinics), operations, admissions and in-patient days for all wards was obtained from the hospital information system. Separate data was kept for gynaecological (gyn) patients although these patients are nursed in female medical and surgical wards. A 10% systematic sample of admissions registers of these wards was analysed for proportions that are gyn cases, and sample proportions were used to distribute gyn patients and days between these two wards. Total number and identification of caesarean sections obtained from maternity registers. A 20% systematic sample of caesarean section cases was analysed for LOS. Numbers and LOS of NVDs were derived from caesarean section and maternity ward data. A 10% systematic sample of admissions registers for all wards analysed for age and sex.
Letaba	Data on total annual outpatient visits (separate data for general outpatient department and for specialist outpatient clinics), operations, admissions and in-patient days for TB ward, maternity ward , and total days, but not admissions, for all other wards, obtained from the hospital information system. Admissions registers of all wards (except TB and maternity) were analysed for numbers of admissions, allowing calculation of LOS. Analysis of caesarean section and NVDs, and age and sex profiles as for Tintswalo.
Bisho	Data on total annual outpatient visits, operations, and in-patient days, but not admissions, for all wards obtained from the hospital information system. Separate data kept for gyn days and for orthopaedic days, although gyn patients are nursed in female medical and surgical wards, and orthopaedic patients in the adult and paediatric surgical wards. A 10% systematic sample of admissions registers for the appropriate wards was analysed for proportions of cases that are gyn or orthopaedic, and in-patient days were allocated to the appropriate wards on the basis of the sample proportions. Admissions registers for all wards were analysed for total number of admissions, allowing calculation of LOS. 80% of short stay admissions were assumed to be discharged directly, and the remaining 20% were distributed between other non-maternity wards in proportion to the percentage of total admissions accounted for by each ward. The LOS for short stay ward was assumed to be 1 day.[a] The LOS for other wards was adjusted to reflect the addition of short stay patients. Analysis of caesarean section and NVDs, and age and sex profiles as for Tintswalo.
St Dominics	Data on total annual operations, admissions and days for all wards, and numbers and LOS for caesarean sections and NVDs, were obtained from the hospital information system. A 10% systematic sample of all admissions analysed for age and sex.
Pietersburg	Data on total annual outpatient visits, operations, in-patient admissions and days, and day patients (patients not sleeping in the hospital) were obtained from the hospital information system. In-patients and day patients were further categorised as either adult or paediatric, and as medical (all non surgical cases, including normal deliveries) or surgical (all operative cases, including caesarean sections). Adult medical and surgical data were adjusted to exclude caesarean sections and NVDs, which were categorised as maternity. Paediatric medical and surgical data were combined into the paediatrics category. Day patients were added to the appropriate categories, using an assumption of LOS of 0.5 days. Data was available on total numbers of ICU days, but not on ICU admissions, nor on the proportions of ICU cases that are medical or surgical. ICU days were assumed to resemble total adult days in the proportions that are medical or surgical, and estimated numbers of medical and surgical ICU days were deducted from annual medical and surgical day totals. A 10% systematic sample of all admissions analysed for age and sex.
Nelspruit	As Pietersburg

Notes: The estimate of the proportion of short stay ward patients discharged directly, as well as of the LOS in the short stay ward was derived from interviews with hospital staff.

Table A1.10: Weighting factors used in calculation of composite output measures

	Contractor			Public			Private		
	Mat.	Hewu	Shil.	Tints.	Let.	Bisho	St Dom.	Piet.	Nels.
Outpatient visits equivalent to 1 in-patient day	1.03	1.15	3.48	2.89	2.20	1.39	n/a[a]	1.55	2.16
Outpatient visits equivalent to 1 in-patient admission	8.41	9.96	31.32	24.02	18.62	6.98	n/a	4.91	6.58

Notes: a: n/a - not applicable, since no OPD at St Dominics.

Table A1.11: Aggregation of ward level data into standard output categories

Matikwana	General outpatients and ante-natal/postnatal outpatients were combined into the general outpatients category. Adult female and male wards were analysed jointly as an adult ward and then disaggregated into medical and surgical categories.
Hewu	Outpatients as Matikwana. Male and female surgical and medical wards were aggregated into surgical and medical categories.
Shiluvana	Outpatients as Matikwana. No other aggregations.
Tintswalo	General outpatients, ante-natal/postnatal and all specialist outpatient clinics were combined into the general outpatients category. Infectious diseases, TB, psychiatry and adult male and female medical wards were aggregated into the medical category. Individual paediatrics wards were combined into the paediatrics category. Adult male and female surgical wards were combined into the surgical category.
Letaba	As Tintswalo
Bisho	General outpatients and ante-natal/postnatal outpatients clinic were combined into the general outpatients category. Adult male and female medical and chronic wards were combined into the medical category. Adult male and female surgical wards were combined into the surgical category. Individual paediatrics wards were combined into the paediatrics category.
St Dominics	3 separate surgical wards were aggregated into the surgical category.
Pietersburg	Male and female wards were analysed separately and then disaggregated into medical and surgical categories.
Nelspruit	No aggregations.

Table A1.12: Actual and hypothetical service-mix profiles - admissions (%)

	Actual service-mix profiles									Hypothetical service-mix profiles	
Service-mix	Mat.	Hewu	Shil.	Tints.	Let.	Bisho	St Doms.	Piet.	Nels.	All hosps	Con/Pub only
TB	2	0	0	3	1	0	0	0	0	1	1
Psychiatry	0	0	0	2	2	0	0	0	0	1	1
Infect. Diseases	0	0	0	7	3	0	0	0	0	1	2
General medical	14	28	17	20	28	27	16	11	20	20	22
(All medical)	(16)	(28)	(17)	(33)	(35)	(26)	(15)	(11)	(20)	(22)	(26)
Surgical	18	25	29	13	25	38	64	61	53	36	25
Maternity	43	24	23	40	20	17	11	9	8	22	28
Paediatrics	23	23	31	14	21	18	10	18	18	20	22
Total percentage	100	100	100	100	100	100	100	100	100	100	100

Notes: The 'all medical' category includes TB, Psychiatry, Infectious diseases and General Medical patients.

APPENDIX 2: METHODS USED IN COST ANALYSIS OF TRACER CONDITIONS

Table A2.1: Total case numbers and sample sizes for obstetric tracer conditions

	Caesarean Section					Normal Deliveries				
	Total cases identified	Intended sample size		Actual sample size		Total cases identified	Intended sample size		Actual sample size	
		N	%	N	%		N	%	N	%
Matikwana	166	55	33	48	29	2258	112	5	92	4
Hewu	171	86	50	87	51	1236	123	10	97	8
Shiluvana	141	70	50	56	40	1121	112	10	65	6
Tintswalo	649	65	10	66	10	3743	94	2.5	78	2
Letaba	271	89	33	63	23	1773	89	5	65	4
Bisho	148	74	50	76	51	2128	106	5	123	6
St Dominics	377	95	25	85	23	605	90	15	86	14
Pietersburg	381	95	25	91	24	420	63	15	65	15
Nelspruit	153	76	50	71	46	558	83	15	62	11

Table A2.2: Total case numbers and sample sizes for surgical tracer conditions

	Hernia Repair					Appendectomy				
	Total cases identified	Intended sample size		Actual sample size		Total cases identified	Intended sample size		Actual sample size	
		N	%	N	%		N	%	N	%
Matikwana	22	22	100	17	77	14	14	100	10	71
Hewu	4	4	100	4	100	9	9	100	8	89
Shiluvana	7	7	100	3	43	5	5	100	3	60
Tintswalo	25	25	100	13	52	15	15	100	8	53
Letaba	57	57	100	32	56	12	12	100	7	58
Bisho[a]	0	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a
St Dominics	87	87	100	63	72	100	100	100	62	62
Pietersburg	146	73	50	63	43	150	75	50	68	45
Nelspruit	109	54	50	47	43	132	66	50	66	50

Notes: a. No hernia repair or appendectomy operations were conducted at Bisho hospital during the study year.

Table A2.3: Tracer cost analysis: methods and sources of cost data

Cost component	Methods and sources of data	Approach to attachment of costs
Length of stay	Analysis of individual case records.	Costs per in-patient day were obtained from the appropriate average costs per day (from the general cost analysis), adjusted to remove theatre, laboratory, radiology and medicines costs. It was assumed that all caesarean section and normal delivery cases were nursed in the maternity wards, and that all hernia repair and appendectomy cases were nursed in the general surgery wards.
Laboratory usage	Analysis of individual case records. No laboratory services at private hospitals.	For tests conducted by outside laboratories (SAIMR), unit costs per test were obtained from the general cost analysis. For tests conducted at the hospital laboratory, SAIMR relative unit weights for each test were multiplied by estimated value of each unit for the hospital.
Medicines usage	Analysis of individual case records.	Contractor and public hospitals: the costs of all medicines were obtained from relevant government authorities[a] in 1994 prices and deflated to 1992/3 prices.[b] *St Dominics:* the value of sales of medicines was obtained for each case from case records, and adjusted to estimated cost using a standard mark-up factor for the hospital. *Pietersburg and Nelspruit:* data were obtained from the hospital information system on the value of sales of medicines for all cases of tracers during the study year. These estimates were adjusted to reflect actual costs using mark-up factors for each hospital.
Operating theatre usage	Analysis of sample entries in operating theatre registers.	In contractor and public hospitals, theatre duration for each case was multiplied by the estimated costs per theatre minute derived from the general cost analysis.[c] In the private hospitals, total theatre time used for all cases of each tracer over the study year was obtained from the hospital information systems. These data were used to calculate the proportion of total theatre time attributable to each case, and this proportion was applied to the estimate of total theatre costs developed in the cost analysis, to give as estimated theatre cost per case for the relevant tracers.

Notes: a. Matikwana and Shiluvana hospitals are supplied by the Central Pharmaceutical Services of the Gazankulu DoH, as are Tintswalo and Letaba. Medicines prices for Bisho and Hewu were obtained from the authorities which supply them.

b. The deflator used was based on official estimates of medicines price inflation (Central Statistical Services 1994).

c. Total theatre costs were estimated in the course of the general cost analysis at each hospital. Total theatre usage over the study year was estimated through use of interview and theatre schedule data. These data were combined to give an estimated cost per theatre minute.

APPENDIX 3: MATHEMATICAL FORMULATION OF THE DEA TECHNIQUE[162]

Assume that there are *n* DMUs to be analysed, each of which uses *m* inputs to produce *s* outputs. Let $X_{ij} > 0$ be the amount of input *i* used by DMU j, and let $Y_{rj} > 0$ be the amount of output *r* produced by DMU j. The decision variables of the DEA problem are the unit weights to be attached to each of the inputs and the outputs by DMU k. Let v_{ik} be the unit weight placed on input *i* by DMU k, and let u_{ik} the unit weight placed on output *r* by DMU k. A linear fractional programme is then formulated for each of the *n* DMUs being analysed. The objective function of the fractional linear programme is the ratio of the total weighted output of DMU k divided by its total weighted input:

$$\text{Maximise } h_k = \frac{\sum_{r=1}^{s} u_{rk} Y_{rk}}{\sum_{i=1}^{m} v_{ik} X_{ik}}$$

The universality criterion requires DMU k to choose these weights subject to the constraint that no other DMU would have an efficiency greater than 1 if it used the same weights:

$$\frac{\sum_{r=1}^{s} u_{rk} Y_{rk}}{\sum_{i=1}^{m} v_{ik} X_{ik}} \leq 1 ; \; j = 1, \ldots, n$$

---

[162] After Sexton *et al.* (1989).

In addition, these selected weights cannot be negative:

$U_{rk} \geq 0$; r = 1, ... , s

$v_{ik} \geq 0$; i = 1, ... , m

The fractional linear programme is then transformed into an ordinary linear programme, and the simplex method is used to solve it. The transformed linear programme is given by:

Equation 1: Maximise $h_k = \sum_{r=1}^{s} u_{rk} Y_{rk}$

subject to

$$[p_{kj}] \quad \sum_{r=1}^{s} u_{rk} Y_{rj} - \sum_{i=1}^{m} v_{ik} X_{ij} \leq 0 \quad j = 1, \ldots, n$$

$$[q_k] \quad \sum v_{ik} X_{ik} = 1$$

$u_{rk} \geq 0$ r = 1, . . . , s

$v_{ik} \geq 0$ i = 1, . . . , m

The dual variables are shown in square brackets. These dual variables identify the efficient reference set for an inefficient DMU. They also provide the multipliers needed to produce the input and output levels of the hypothetical DMU on the efficiency frontier, from which the input slack and/or output excess of the inefficient DMU can be calculated.

The dual of Equation 1 is:

Minimise $w_k = q_k$

subject to

$$[u_{rk}] \quad \sum_{j=1}^{n} p_{kj} Y_{rj} \geq Y_{rk} ; \quad r = 1, \ldots, s$$

$$[v_{ik}] \quad -\sum_{j=1}^{n} p_{kj} X_{ij} + q_k X_{ik} \geq 0 \quad i = 1, \ldots, m$$

$p_{kj} \geq 0 \quad j = 1, \ldots, n$

q_k unrestricted in sign.

Note that square brackets now show the original primal variables (input and output weights).

APPENDIX 4: LITERATURE REVIEW ON DATA ENVELOPMENT ANALYSIS

The basic principles and methodological approaches of DEA were outlined in Chapter 3. In the following sections, the literature on the advantages and disadvantages of the technique are discussed, following which the applications of DEA to assessments of hospital efficiency are reviewed.

Advantages of DEA over alternative measures of hospital efficiency

DEA has several advantages over the two other main approaches to analysis of hospital efficiency - ratio analysis (RA) and logistic regression analysis (LR). These are summarised in Table A4.1. The capacity of DEA to incorporate multiple inputs and outputs is particularly advantageous in the assessment of hospital efficiency, given the heterogeneous and complex nature of hospital outputs. The incorporation of multiple inputs and outputs is further facilitated by the ability of DEA to deal with variables denominated either in monetary values or in physical units or in any combination of these.[163] This allows the incorporation of data on numerous variables which could not be included if measurement in common units were required, since such data are often not available in most hospital settings. This is well illustrated by the fact that DEA allows hospital outputs (which may be denominated, for example, in days or visits or admissions) to be adjusted for factors such as case mix or severity (which may be denominated in entirely different units, such as a case mix index), thus incorporating a critical factor affecting hospital efficiency. Perhaps the most important advantage of DEA, also noted in the table, concerns its ability to identify and quantify objectively the inefficiencies of particular hospitals, the factors contributing to those inefficiencies, and

[163] The only restriction on this is that any one variable must be denominated in the same units for all DMUs.

the consequent efficiency gains to be made from shifts towards more efficient production.

Table A4.1: Advantages of DEA over alternative approaches

	Ratio Analysis	Logistic Regression	DEA
1. Incorporation of input and output variables	Single input and output in each ratio	Some techniques allow for multiple inputs and outputs	Incorporates multiple inputs and outputs
2. Aggregation of variables	Does not generate 'efficient' weights for aggregation of ratios into single efficiency measure	Co-efficients represent weights for aggregation of variables	Produces single measure of efficiency incorporating efficient variable weights
3. Identification and quantification of inefficiency	No objective measures of inefficiency available. Efficiency 'cut-off' points often arbitrarily defined relative to mean sample values (e.g. 1 SD above or below mean).	Estimate central tendency or average relationships incorporating both efficient and inefficient DMUs. Cannot directly locate inefficient DMUs, nor quantify extent of inefficiency. Unable to quantify relative contribution of different factors to inefficiency.	Uses objective definition of inefficiency, and addresses efficiency issues directly instead of using average relationships. Able to pinpoint inefficient DMUs. Indicates magnitude of existing inefficiencies. Indicates extent of contribution of various inputs and outputs to inefficiency. Indicates extent of savings/efficiency gains from shift to efficient production. Provides input and/or output targets for inefficient hospitals.
4. Use of assumed production function in assessing efficiency	Not applicable.	Parametric methods - require imposition of explicit functional form on the underlying production technology.	Non parametric method - does not impose functional form on production technology.

Sources: (Sexton 1986, Sherman 1986, Sherman 1984, Valdmanis 1990, Rosko 1990, Ozcan *et al.* 1992, Sexton *et al.* 1989)

Limitations and methodological problems of DEA

A key limitation of the DEA approach resides in its use of a narrow definition of efficiency, technical efficiency, which excludes input and output prices from the efficiency analysis. It is thus possible for a hospital to be technically efficient while remaining allocatively inefficient[164] (Sexton 1986, Sexton *et al.* 1986, Morey *et al.* 1990). Where input prices and output prices are available, however, the DEA technique can be used to assess allocative efficiency (Morey *et al.* 1990). An additional limitation emerges from the reliance of DEA on relative efficiency assessment, which means that it is not able to assess the efficiency of individual hospitals in isolation (Rosko 1990, Sherman 1986).

Further limitations of DEA emerge from two fundamental assumptions on which the approach is based. The first is that the approach assumes causal relationships between inputs and outputs, whereas the relationships may be stochastic rather than deterministic (Dittman *et al.* 1991, Grosskopf and Valdmanis 1993, Sexton *et al.* 1986, Dor 1994). The failure of DEA to determine measures of statistical association or causal relations between the variables also means that there is no way of assessing the relative strengths of different model specifications. The implications of this latter problem are dealt with further below. A second assumption is that the constructed efficiency frontier is linear and continuous, implying that all points along the frontier are feasibly attainable production possibilities (Dittman *et al.* 1991, Rosko 1990, Sexton 1986). It is clear that in some cases, hospitals (or other DMUs) may not be able to use the production technologies implied by the efficient frontier[165], so that this assumption may well not be realistic in many cases. It also follows from this observation that it is desirable to

---

[164] This might occur where a technically efficient hospital uses less inputs than other hospitals to produce a given level of output, but where the input mix used by that hospital is more expensive than that of other hospitals with which it is being compared.

[165] This may occur due to environmental factors affecting the hospital, such as supply and price of particular inputs, the nature of the population served, the particular mission of the hospital etc.

compare hospitals operating within a similar environment, and producing a similar range of services, where possible.

Another set of problems emerges from potential measurement errors implicit in the DEA approach. The first of these arises from the process of specification and definition of the input and output variables used in the particular DEA model being used. As noted above, the method prevents any objective assessment of the validity of particular specifications, opening the approach to various biases. For example, omission of valid inputs or outputs from the model would bias the results against efficient users of those inputs or producers of those outputs (Sexton 1986, Morey *et al.* 1990). A subset of problems of this kind arises from the fact that the DEA approach is unable to distinguish between actual inefficiencies and market shocks or environmental variables beyond the control of the hospital itself (Valdmanis 1990, Morey *et al.* 1990, Rosko 1990, Grosskopf and Valdmanis 1987, Nunamaker 1983). Examples of such environmental variables include case-mix of patients, the socio-economic profile of hospital users, and the mission of the hospital. It is clear that these factors will impact on the assessed efficiency of the hospitals, and that unless hospitals are genuinely homogenous in these factors, or the factors are controlled for, the DEA results will be biased.

While these observations suggest that the results of DEA analysis ought to be highly sensitive to the model specifications, some empirical work in the application of DEA to hospitals surprisingly suggests otherwise. Ozcan and Luke (1993) and Ozcan *et al.* (1992) cite data showing that DEA scores are stable across a wide variety of input/output combinations, and that most of these combinations are highly correlated with each other. Grosskopf and Valdmanis (1993) cite data showing that case-mix factors had no statistically significant effect on the DEA scores obtained by assessed hospitals, although they contend that this may be due to the underlying homogeneity of their sample, and that case-mix may have a more profound effect in more heterogeneous samples.

Another crucial problem cited by most authors concerns the inclusion of a factor reflecting the quality of hospital care in the definition of hospital outputs (Ozcan *et al.* 1992, Valdmanis 1990, Rosko 1990). Without adjustment of outputs for quality, it is likely that hospitals delivering higher quality of care will appear less efficient, since higher quality of care may often require a higher level of inputs. In addition to these problems of specification and definition, measurement error may also occur through inaccuracies or variations in reported data.[166] While some of the potential sources of bias mentioned here are generic to all measures of efficiency, DEA is particularly sensitive to these errors for two main reasons. The first is that it is based on extremal predictions, rather than on mean or median relationships (as in LR), so that outliers in the data, resulting for example from reporting or data errors, may have a substantial effect on results (Dittman *et al.* 1991, Sexton *et al.* 1986). This problem is aggravated by the lack of error terms in the DEA model, which means that the effect of data errors cannot be measured (Huang 1989, Grosskopf and Valdmanis 1987). A final problem concerns the impact of scale on hospital efficiency. The early DEA formulations assumed constant returns to scale, and thus eliminated the possibility of any scale effects on hospital efficiency (Sexton 1986). More recent formulations do however allow for variable returns to scale.

Application of DEA to assessment of hospital efficiency

Despite the fact that DEA is a relatively new technique, several papers applying DEA to assessments of hospital efficiency have appeared in the recent literature. These are summarised in Table A4.2, which shows that all but one of the published studies have been conducted in the US, the exception being an unpublished paper examining data from a sample of UK hospitals. Additional applications of DEA to the health sector, not

[166] In the case of hospital efficiency assessment, this is often encountered in the use of the value of plant assets as a proxy for capital inputs. In this case, variations in accounting practices may result in bias in the measurement of this input across hospitals (Valdmanis, 1990, Grosskopf and Valdmanis 1987).

reported here, include an assessment of the efficiency of rural primary health care services, again in the US (Huang and McLaughlin 1989), and of nursing homes in the Netherlands (Kooreman 1994). There have thus far been no studies applying DEA to hospitals in developing countries. The very different nature of US hospitals to those being assessed in this study suggests that the results of the published studies are unlikely to be of much relevance in this context. For this reason, this brief review focuses mainly on methodological issues raised by the published studies. Prior to this, however, it is worth noting that some studies have attempted to compare the results of DEA with those emerging from ratio analysis techniques, indicating strong correlations between the results of these two approaches in all cases (Rosko 1990, Huang and McLaughlin 1989).

The summarised aims of the studies, shown in Table A4.2, indicate that the DMU assessed in most cases was the whole hospital, although in two cases (Sherman 1984, Dittman *et al.* 1991), medical/surgical units within the hospital were assessed, while in another study, individual physicians formed the subject of analysis (Chilingerian and Sherman 1990). In most cases, the major objective of the study was to assess the impact of various hospital characteristics, most often hospital ownership, on technical efficiency. Additional motivations included assessments of potential savings from increased efficiency, and the extent of correlations between results from DEA and translog regression methods (Banker *et al.* 1986, Huang 1990, Nunamaker 1983). In one case, the study used DEA to assess allocative rather than technical efficiency (Morey *et al.* 1990). The table also indicates that the majority of studies used large sample sizes, the data for which were obtained from routine databases. This underlines the usefulness of DEA in its ability to draw on routine data, but also explains the concern expressed by many authors over the accuracy of data. Exceptions to this general pattern was one assessment involving 7 teaching hospitals (Sherman 1984) and the study of individual physicians (Chilingerian and Sherman 1990), in both of which cases data were collected specifically for the DEA study. The table also illustrates the wide variations between studies in choices over the input and output variables specified for study. In all cases, these choices were influenced by judgements over their validity, but

also in part by data availability. The table indicates that in several of the studies, multiple models were specified and their results compared. The table summarises details of the model specifications and approach used, and indicates that the studies varied in their specifications in respect of scale, with several assuming only CRS, while others modelled both CRS and VRS, and compared the resulting data.

The methodological problems summarised in Table A4.2 provide several examples of the general problems outlined above. Examination of the individual studies also illustrates the methods used in attempting to overcome several of these problems. All of the studies reviewed here addressed the need to obtain homogenous samples for comparison, although a number of different approaches were adopted in doing so. In most of the US studies, hospitals from one or two states were selected from national databases (Grosskopf and Valdmanis 1987, Morey *et al.* 1990, Banker *et al.* 1986, Huang 1990, Valdmanis 1990). In some studies, these state-based samples were further subdivided - in one case into functional clusters based on a classification system in use by the state (Nunamaker 1983), and in others, into 'peer groups' based on location within specific metropolitan areas (Grosskopf and Valdmanis 1993, Ozcan and Luke 1993, Ozcan *et al.* 1992).

Another approach utilised hospital characteristics such as size (defined by numbers of beds) or affiliation to particular hospital systems, as the means of classifying hospitals (Valdmanis 1990, Dittman *et al.* 1991, Ozcan *et al.* 1992). One of the state-based studies addressed these problems by explicitly distinguishing between variables assumed to be under the control of the hospital management and environmental variables beyond management control, and by using the environmental variables to define peer groups which formed the basis for comparison (Morey *et al.* 1990). The specific problem of adjusting for the impact of case-mix variations was also addressed in various ways. In some studies, outputs were adjusted for case-mix, usually using a standardised case-mix index[167] (Ozcan and Luke 1993, Grosskopf and Valdmanis 1993,

[167] The Medicare Case-mix Index.

Ozcan *et al.* 1992, Sexton *et al.* 1989). In one study, case-mix and service-mix indices were included as outputs (Huang 1990), while another distinguished between high and low severity cases in its enumeration of outputs (Chilingerian and Sherman 1990).

The problem of the impact of different model specifications on assessed efficiency was explicitly addressed by some studies, which made use of multiple models and compared their results (Valdmanis 1990, Dittman *et al.* 1991). Although all studies conceded the fundamental problem of a lack of quality of care measures with which to adjust hospital outputs, only one of the studies attempted to deal with this problem explicitly (Chilingerian and Sherman 1990). In this case, sophisticated effectiveness measures were applied to define 'successfully treated cases', which were then used as the output of note in the DEA. As will be clear, this required detailed analysis of individual cases, and was carried out in the context of a detailed study of the practices of individual physicians. This level of detail would obviously be impossible to obtain for large samples of hospitals, since routine databases do not contain the required information. A final problem, noted above, is the assumption in some DEA models of CRS. One approach to this problem was to control samples of hospitals for size, while another, also noted above, was to specify models incorporating VRS (Grosskopf and Valdmanis 1987, Banker *et al.* 1986, Grosskopf and Valdmanis 1993).

Table A4.2: Summary of DEA Studies

Authors (date)	Aim of study	Data set used	Input variables	Output variables	Model specifications and approach	Methodological problems noted by authors
Grosskopf and Valdmanis (1987)	Assess relative technical efficiency of public and not for profit (NFP) hospitals	1982 AHA Survey [a] data on 22 public and 60 NFP hospitals in California	1. No of doctors. 2. FTE[b] non doctor labour. 3. Net Plant Assets[c]. 4. No. of admissions[d].	1. Acute in-patient days. 2. ICU in-patient days. 3. Surgical operations. 4. Ambulatory/ emergency visits.	Separate models assuming CRS and VRS. Efficiency ratios calculated on pooled data for all hospitals, as well as separately for the public and NFP groups.	Focused on intermediate instead of true outcome measures. Lack of quality of care adjustment of outputs. Possible sources of measurement error: bias due to differences in case-mix and severity. Errors in estimation of net plant assets due to variations in accounting conventions.
Morey, Fine and Lorey (1990)	Assess relative allocative efficiency of public and NFP hospitals	1982 AHA Survey data on 18 public and 42 NFP hospitals in California	1. No. of beds. 2. Type of ownership. 3. Case-mix severity. 4. Net plant assets. 5. Total annual expenditures.	1. Acute in-patient days. 2. ICU in-patient days. 3. In-patient and outpatient operations. 4. Outpatient visits. 5. Residents per attending doctor[e].	Used cost minimisation (rather than input minimisation) approach. Assumed CRS. Differentiated between controllable and non-controllable inputs. Only total expenditure treated as controllable. All others non-controllable. Non-controllable factors defined environment within which efficiency was assessed. Allocative efficiency ratios calculated on pooled data, and separately for public and NFP groups.	Lack of quality of care adjustment of outputs, and inability to adjust for different level of amenities provided by different groups. Possible specification error: omission of some ancillary services from outputs may bias results for some hospitals. Possible measurement errors: total expenditure includes cost of capital which may differ between the groups.
Banker, Conrad and Strauss (1986)	Assess technical efficiency of sample of hospitals and compare results of DEA and translog methods	114 hospitals - North Carolina	1. Nursing services. 2. Ancillary services. 3. Administrative and general services. 4. Capital.	1. Adult in-patient days. 2. Paediatric in-patient days. 3. Geriatric in-patient days.	Models assumed VRS.	
Sexton *et al.* (1989)	Estimate relative efficiency of individual medical centres. Estimate hypothetical dollar savings if inefficient centres forced to become efficient. Identify appropriate managerial strategies to improve efficiency at inefficient sites	159 Veterans Administration Medical Centres. 1985 data.	1. Nursing FTEE[f]. 2. Physician FTEE. 3. Part-time physician FTEE. 4. Resident FTEE. 5. Health technician FTEE. 6. Drugs and supplies[g]. 7. Equipment[g].	1. Medical WWUs[h]. 2. Psychiatric WWUs. 3. Nursing home WWUs. 4. Intermediate care WWUs. 5. Outpatient visit WWUs.	Models assumed CRS.	Problem of trade-off between detail and sensitivity to efficiency in selection of inputs and outputs. Use of too many variables reduces sensitivity to efficiency.

Table A4.2: Summary of DEA Studies (contd.)

Authors (date)	Aim of study	Data set used	Input variables	Output variables	Model specifications and approach	Methodological problems noted by authors
Huang (1990)	Assess relative efficiency of sample of general hospitals. Assess correlation between DEA measures of efficiency and average unit cost data.	All general hospitals in Florida for which data on defined inputs and outputs available. 213 hospitals analysed, using 1989 data.	1. Adjusted patient days[i]. 2. Adjusted patient admissions[i]. 3. Emergency room visits.	1. Acute and ICU beds. 2. No. of full-time employees. 3. Case-mix index[j]. 4. Service-mix index[k]. 5. Capital assets.	Input minimisation model, assuming CRS.	
Valdmanis (1990)	Assess relative and pure[l] technical efficiency of NFP and public hospitals.	1982 AHA Survey. All acute care general hospitals with 200 or more beds in metropolitan areas of Michigan.	1. No of active and associate physicians. 2. No. of residents. 3. FTE non physician labour and nurses. 4. Net Plant Assets.	1. Acute in-patient days. 2. ICU in-patient days. 3. Surgical operations. 4. Ambulatory/ emergency visits.	Model assumed CRS.	Unclear whether observed efficiency measures represent true inefficiency or 'market shocks' beyond control of management. Potential for measurement error: Alternative definitions of outputs would change efficiency ratings: e.g. if outcome measures included in outputs, higher input levels may be required to achieve efficiency; accounting differences in net plant assets or numbers of administrative staff; data may also be flawed, since self reported; outputs not quality adjusted; some assessments of proxy measures of quality carried out, but not able to adjust data with these.
Sherman (1984)	Field test the DEA technique in evaluation of a group of teaching hospitals. Assess relative efficiency of medical/ surgical departments of study hospitals.	Medical/surgical departments of 7 Massachusetts teaching hospitals. 1976 Data used.	1. FTE non-physician labour. 2. Expenditure on supplies/services. 3. Available bed days.	1. Patient days >65 years. 2. Patient days <65 years. 3. Nurses trained. 4. Interns/residents trained.	Model assumed CRS.	Lack of case-mix data in definition of outputs. Lack of measures of quality of care or of teaching.
Chilingerian (1990)	Assess relative efficiency of physicians in treating heart failure and shock.	15 different physicians treating 128 cases of heart failure and shock.	1. Expenditure on investigations. 2. Length of stay in hospital.	1. Successfully treated low severity cases[m]. 2. Successfully treated high severity cases.	Model assumed CRS. DEA applied to cases judged to successfully treated using specific effectiveness and quality of care measures.	Problem in assumption that the comparison group is homogenous. Ignores possibly important environmental factors such as patient attributes, institutional context, availability of technology.
Grosskopf and Valdmanis (1993)	Assess effects of using case-mix adjusted hospital outputs on DEA analysis of hospital efficiency.	AHA Survey data (1982) for all non-profit hospitals in metro areas with population >500000, in NY (n=49) and Calif. (n=59).	1. No. of physicians. 2. FTE Non-physician labour. 3. Net plant assets. 4. Case mix index[n].	1. Acute medical and surgical in-patient days. 2. Intensive care in-patient days. 3. Surgical operations. 4. Ambulatory and emergency room visits.	Models assuming CRS and VRS separately applied to the two hospital samples. Applied to unadjusted and adjusted outputs. Separate specification treated case-mix as an output instead of as weights for other outputs.	Problem of using Medicare case-mix index due to assumption of correlation between costs and severity, and other measurement problems.

Table A4.2: Summary of DEA Studies (contd.)

Authors (date)	Aim of study	Data set used	Input variables	Output variables	Model specifications and approach	Methodological problems noted by authors
Dittman, Capettini and Morey (1991)	Assess relative efficiency of acute medical/surgical units in national sample of hospitals. Demonstrate usefulness of DEA.	Data on acute medical surgical units from 102 hospitals of size 301-400 beds. Data obtained from AHA Monitrend Data set for 1981.	Model 1: 1. Registered Nurse hours. 2. Licensed Nurse hours. 3. Other nursing hours. 4. Other direct expenses. 5. No. of in-patient days. 6. Total no. of beds. Model 2: 1.-6. as for model 1. 7. Registered nurse salaries. 8. Licensed nurse salaries. 9. Other nursing salaries. Model 3: As for model 2, but excluding in-patient days	Model 1: 1. Discharges. 2. In-patient revenue. Model 2: As for model 1 Model 3: 1. Discharges. 2. In-patient days.	3 different models specified, using variations in input and output variables. Models assumed CRS.	Lack of data on environmental factors affecting sample hospitals, including local market conditions, demographics etc. Did not obtain consensus on range of controllable input and output variables. Choices based only on data availability and 'reasonableness'.
Ozcan and Luke (1993)	Assessment of selected hospital characteristics on variations in technical efficiency	Data obtained from 1987 AHA Survey, for all acute general hospitals in urban areas. Total sample of 3000 hospitals divided into 317 metropolitan statistical areas.	1. No. number of beds. 2. Plant complexity - no. of diagnostic and special services. 3. Non-physician FTEs[o]. 4. Expenditure on supplies[p].	1. In-patient discharges, adjusted by Medicare case-mix index. 2. Outpatient visits. 3. Teaching FTEs[q].	DEA applied to samples of hospitals divided by metropolitan area, as well as to samples of all hospitals falling with metro areas of specific sizes. Covariance analysis of resulting efficiency scores against four hospital characteristics - size, system structure, ownership and payer mix.	Use of limited numbers of inputs and outputs - may not capture full range of activities and inputs used by the hospitals. Use of aggregated OPD visit output fails to capture variations between different types of ambulatory visit. No adjustment of outputs for quality.
Ozcan, Luke and Haksever (1992)	Assessment of effect of ownership on technical efficiency of urban hospitals	As Ozcan and Luke (1993)	As Ozcan and Luke (1993)	As Ozcan and Luke (1993)	DEA applied to samples of hospitals divided by metropolitan area, as well as to samples of all hospitals falling with metro areas of specific population sizes. Also controlled for hospital size and system membership by applying DEA to peer groups defined by these characteristics.	No quality adjustment included in output measures. Results could be affected to an unknown extent by omitted input or output variables.
Nunamaker (1983)	Assessment of relative technical efficiency of routine nursing services in sample of NFP hospitals. Compare DEA with cost per patient day measures.	One cluster of Wisconsin hospitals (n=17) from Wisconsin Hospital Groupings. Data for 1978 and 1979.	1. Total in-patient routine costs.	1. Total routine aged and paediatric days[r]. 2. Total routine maternity days. 3. All other routine days.	Model assumed CRS. DEA applied to samples of 16 and 11 hospitals separately for each year for which data available. Results correlated with cost per patient day data.	Sensitivity of results to definitions of variables. Use of only single aggregate input variable. Did not account for case-mix differences between hospitals. Model did not distinguish between controllable and non controllable input variables. Measurement error likely in routine service costs data, due to accounting differences or reporting errors.

Notes: a. American Hospital Association.
b. Full-time equivalents.
c. Net plant assets, defined as capital value less depreciation, used as a proxy for capital inputs.
d. Number of admissions used since this was regarded as a necessary input for the production of outputs. However, since admissions are not regarded as a scarce social resource, the model was alternatively specified without this input.
e. This ratio was used was a proxy for the intensity of teaching in the study hospitals.
f. Full-time employee equivalent, equal to 2087 hours of labour per year.
g. Inputs in these cases taken as expenditure on the relevant items.
h. Workload weighted units: these were assigned to different diagnosis related groups according to the estimated labour intensity required.
i. Patient days and admissions adjusted to incorporate outpatient visits using weights derived from relative unit costs.
j. Index reflecting severity of cases in each hospital, available from same data source as general hospital data.
k. Index reflected mix of services provided by the hospital, available from same data source as general hospital data.
l. Pure technical efficiency is defined by the author as synonymous with X-efficiency, and measures the extent to which there are too many inputs for a given output level. This measure of technical efficiency does not impose the CRS restriction on the production technology.
m. Specific clinical definitions of low and high severity cases, as well as of successful and unsuccessful treatment episodes were employed in the study.
n. The case-mix index is derived from Medicare data, and reflects the severity of the case-mix of the individual hospital relative to national sample data .
o. FTEs calculated using a weight of 0.5 for part-time personnel.
p. Defined as all operational expenses excluding payroll, capital and depreciation expenses
q. Weighed sum of medical, dental and other trainees trained during the year. Full-time given weight of 1, part-time of 0.5.
r. The output variables listed here were run on a set of 16 hospitals. For a subset of 11 hospitals, routine paediatric days could be separated from aged days, and an additional analysis was therefore conducted on this subset, using the separate output variables.

APPENDIX 5: STRUCTURAL QUALITY OF CARE INSTRUMENT

CLUSTER AND CATEGORY STRUCTURE

Cluster 1: Administration/management
Staff
Functions
MIS
Patient record system
Utilities/services

Cluster 2: Laboratory
Staff
Functions
Supplies and equipment
Buildings

Cluster 3: Radiology Dept
Staff
Functions
Supplies and equipment
Buildings

Cluster 4: Pharmacy
Staff
Functions
Supplies and equipment
Buildings

Cluster 5: Clinical Services
Medical staff
Nursing staff
Ancillary services

Cluster 6: Operating theatres
Staff
Functions
Supplies and equipment
Buildings

Cluster 7: Outpatients Dept
Staff
Functions
Supplies and equipment
Buildings

Cluster 8: Maternity Ward
Supplies and equipment
Buildings

Cluster 9: Other wards
Supplies and equipment
Buildings

STRUCTURAL QUALITY OF CARE INSTRUMENT

Criteria and standards

g = good
a = adequate
p = poor

I. ADMINISTRATION/MANAGEMENT CLUSTER

A. Staff

Formal training in management/administration or public health

1. Hospital superintendent/manager
   g = completion of formal full-time or part-time course at postgraduate level
   a = completion of some part-time training (in-service or other)
   p = no training

2. Hospital administrator
   g = completion of formal full-time or part-time course at postgraduate level
   a = completion of some part-time training (in-service or other)
   p = no training

3. Nursing service manager
   g = completion of formal full-time or part-time course at postgraduate level
   a = completion of some part-time training (in-service or other)
   p = no training

B. Functions

4. Frequency of formal senior management team meetings (hospital manager, hospital secretary/administrator and nursing service manager/chief matron)
   g= weekly or more often
   a= 1 to 3 times per month
   p= less than monthly or no formal meetings

5. Hospital superintendent/manager's awareness of financial and other management issues
   g= fully conversant with financial situation and explanations for situation; and fully in touch with other critical issues in management
   a= partially aware of above issues.
   p= poor awareness of financial and/or other critical management issues

6. In-service training programmes for senior management staff
   g= formal in-service training programme in operation (formal = equivalent of 5 days or more of training per year)
   a= ad hoc or intermittent in service training (does not meet above criteria for formal training)
   p= no in-service training

7. Proportion of non-clinical staff receiving in-service training during the past twelve months
   g= over 50%
   a= 21-50%
   p= 0-20%

C. Management information system (MIS)

(MIS is defined here as a centralised compilation of data for use by hospital management and/or clinical personnel. Routine collection of data without central compilation is excluded from the definition)

8. Hospital MIS
   g= MIS in operation; fully or partially computerised. Data entered on regular basis.
   p= no MIS

9. Data collected in MIS
   1. Demographic (age and sex) data
   2. Diagnostic data
   3. Outcome data e.g. mortality, complication rates
   4. Financial information
   5. Personnel information

   g= data on 3 or more of above categories collected
   a= data on two of above categories collected
   p= data on one or less of above three categories, or no MIS

10. Use of MIS information
   g= regular formal and/or informal feedback of MIS data to management; where appropriate, data used in management and/or clinical decision making
   a= Sporadic feedback of MIS data (not done on regular basis and/or occurs infrequently); MIS data has limited impact on management decisions
   p= No feedback of MIS data. No noticeable impact on management decisions, or no MIS

D. Hospital record system

11. Record storage and linkage
   g= records of different admissions stored together or may be retrieved at admission; OPD records stored with in-patient record, or can be retrieved at admission
   p= one or more of above criteria not fulfilled

The following questions apply to a sample of records to be drawn from record storage. Where question applies to individual records, average score for whole sample to be calculated.

12. Record retrieval (hospital record number supplied)
   g= 95% of sample records retrieved
   a= 80-94% of sample records retrieved
   p= <80% of sample records retrieved

13. Recording of patient details on cover or summarised in file

1. age
2. admission diagnosis
3. discharge diagnosis
4. admission date
5. discharge date

g= 4 or more of above items
a= at least 3 of above items
p= less than three of above items

14. Organisation of records
    1. relevant items stored together in file
    2. easy to identify course of illness and treatment during most recent admission/s
    3. medicine charts present and completed
    4. lab results present or recorded, if ordered.

g= all of above criteria fulfilled
a= three of above criteria fulfilled
p= less than three of above criteria fulfilled

E. Utilities/services

15. Water supply
    g= No water shortages experienced in past 2 years.
    a= Occasional water shortages (not more than 2 per year) over last 2 years.
    p= frequent shortages experienced (more than 2 per year) over last 3 years.

16. Backup electricity system
    g= Backup system available and in working order; able to meet emergency requirements of theatre, casualty and kitchen
    p= no backup generator available, or generator not functioning, or generator unable to cope with emergency requirements

17. Waste disposal
    g= waste disposal handled by professional waste disposal company; or if disposed on site: incineration or concrete encasement for sharps and other contaminated waste and systems for safe handling of other waste.
    p= solid and contaminated waste disposed on site without abovementioned mechanisms for safe disposal

II. LABORATORY

(These questions to be applied to hospital laboratory, and to SAIMR laboratory if separate lab. exists on the hospital site)

A. Staff

18. Staff complement
    - g= at least one qualified medical technologist
    - a= at least one qualified medical technician
    - p= neither of above criteria fulfilled

19. In-service training
    - g= formal in-service training programme in operation (formal = equivalent at least 5 days of training per year)
    - a= ad hoc or intermittent in service training (does not meet above criteria for formal training)
    - p= no in-service training

B. Functions

20. Basic range of investigations
    1. Urine microscopy
    2. Urea and Electrolyte analysis
    3. Serum glucose
    4. Pregnancy test
    5. HB
    6. Malaria slide
    7. VDRL, WR or RPR
    8. CSF microscopy
    9. Widal serology

    - g= all of above tests (unless not malaria area, then all besides malaria)
    - a= at least 7 of above tests
    - p= less than 7 of above tests

21. Additional investigations
    1. FBC
    2. Platelet count
    3. Bacterial culture and sensitivity
    4. Stool microscopy
    5. Liver function tests
    6. CSF chemistry

    - g= all of above tests
    - a= at least 4 of above tests
    - p = less than 4 of above tests

22. Laboratory quality assurance
    - g= Laboratory participates in regular internal and external quality assurance programme; internal quality control procedures performed for all tests done in lab at least daily and recorded; external quality control procedures applied at least monthly
    - a= participation in internal quality assurance programme only. internal quality control procedures performed for all tests done in lab at least daily and recorded
    - p= neither internal nor external quality assurance programmes

23. Laboratory response to **urgent** requests (e.g. U+E, HB) during working hours
    - g= Results available within 2 hrs 90% or more of the time
    - a= Results available within 2 hrs 60-90% of the time
    - p= Results available within 2 hrs less often than 60% of the time

24. Laboratory response to **routine** requests (e.g. U+E, HB) during working hours
    - g= Results available within 24 hrs 90% or more of the time
    - a= Results available within 24 hrs 60-90% of the time
    - p= Results available within 24 hrs less often than 60% of the time

25. Laboratory services after hours
    - g= Laboratory open after hours or on call. HB, U/E, glucose, may be done. Results available within 2 hrs in 90% or more of cases
    - p= one or more of above criteria not fulfilled

C. Supplies and equipment

26. Reagents and disposables
    - g= no shortages of essential reagents or disposables experienced in last 12 months
    - a= occasional shortages (up to 2 episodes during last 12 months in which one or more essential items not available when required)
    - p= frequent shortages (more than 2 episodes in last 12 months in which one or more essential items not available when required

27. Condition and maintenance of chemistry analyser
    - g= machine clean and neat; record of maintenance schedule available and indicates full compliance with schedule for maintenance; calibration daily or with every run (if appropriate)
    - p= one of above criteria not fulfilled

28. Condition and maintenance of haematology analyser
    - g= machine clean and neat; record of maintenance schedule available and indicates full compliance with schedule for external maintenance; calibration daily or with every run (if appropriate)
    - p= one of above criteria not fulfilled

D. Buildings

29. Condition of buildings
    - g= good condition, no repairs required
    - a= minor repairs required
    - p= poor condition, extensive repairs required

30. Space
    - g= laboratory has adequate space for all functions; easy access to all equipment; space for all staff to work without obstruction
    - a= functions could be better performed if more space available; access to some equipment obstructed; insufficient space for all staff to work comfortably
    - p= space clearly inadequate

III. RADIOLOGY DEPARTMENT

A. Staff

31. Staff complement
    - g= minimum of one full-time equivalent qualified radiographer per 3800 investigations per year
    - a= qualified radiographer present, but less than one full-time equivalent per 3800 investigations per year; or at least one full-time equivalent supplementary radiographer per 5700 investigations per year.
    - p= less than one FTE supplementary radiographer per 5700 investigations per year; or no qualified or supplementary radiographer

32. In-service training
    - g= formal in-service training programme in operation (formal = equivalent of at least 5 days of training per year)
    - a= ad hoc or intermittent in service training (does not meet above criteria for formal training)
    - p= no in-service training

B. Functions

33. Fluoroscopic screening machine
    - g= available and functioning
    - p= not available or not functioning

34. Basic maternity Ultrasound
    - g= available and functioning
    - p= not available or not functioning

35. Compliance with safety and other statutory requirements
    1. warning signs for pregnant women displayed
    2. staff wearing radiation monitoring badges
    3. adequate lead aprons available for all staff and patients
    4. most recent Department of Health inspection passed with no problems or minor problems noted which were remediable without interruption to service

    - g= all of above criteria fulfilled
    - a= three of above criteria fulfilled
    - p= less than three of above criteria fulfilled

36. Response time of Xray dept to urgent request (e.g. CXR) outside working hours
    - g= Xray dept available on call. X-rays done within 2 hrs in 90% or more of cases
    - p= one or more of above conditions not fulfilled

C. Supplies and equipment

37. Reagents and disposables
    - g= no shortages of essential reagents or disposables experienced in last 12 months
    - a= occasional shortages (up to 2 episodes during last 12 months in which one or more essential items not available when required)
    - p= frequent shortages (more than 2 episodes in last 12 months in which one or more essential items not available when required

Following questions to be applied to all Xray machines

38. Age and maintenance of machines
    1. machine less than 12 years old, and in working order
    2. machine serviced at least once in last 12 months
    3. maintenance schedules available and adhered to

    g= all three criteria fulfilled
    a= at least criteria 1 and 2 fulfilled.
    p= more than 2 of above criteria not fulfilled

D. Buildings

39. Condition of buildings
    g= good condition, no repairs required
    a= minor repairs required
    p= poor condition, extensive repairs required

40. Space
    g= adequate space for all functions (1 room per 350 investigations per month)
    a= space below abovementioned minimum requirements, but not clearly inadequate
    p= space clearly inadequate

IV. PHARMACY

A. Staff

41. Staff complement
    g= at least one full-time equivalent pharmacist; stock control activities, ordering and dispensing functions undertaken either by pharmacist, or under pharmacist's supervision, by pharmacy trained staff (e.g. pharmacy assistants/technicians/student pharmacy assistant, intern or registered pharmacy students)
    a= at least one full-time equivalent pharmacist; not all stock control, ordering and dispensing undertaken by pharmacy trained staff
    p= less than one FTE qualified pharmacist

42. In-service training
    g= formal in-service training programme in operation (formal = equivalent of at least 5 days of training per year) a= ad hoc or intermittent in service training (does not meet above criteria for formal training)
    p= no in-service training

B. Functions

43. Clinical pharmacy activities
    g= pharmacy staff participate formally in hospital pharmacy committee; or in clinical ward rounds; or some other formal interaction with clinical process
    a= no formal participation, but some informal participation in clinical practice
    p= no participation in clinical practice

44. Items included on outpatient medicine package labels
    1. patients name
    2. dosage and other instructions

    g= both of above criteria fulfilled
    p= one or more of above criteria not fulfilled

45. Outpatient dispensing functions
    g= all prescriptions routinely checked by pharmacy trained staff for accuracy, drug interactions etc.; counselling accompanies dispensing where appropriate
    a= prescription checking criterion fulfilled, but counselling occurs infrequently or not at all
    p= prescription checking criterion not fulfilled

46. Stock control system
    g= formalised stock control system exists, comprising: defined minimum and maximum stock reorder levels for each item; stock control accounting system; system for identification and removal of outdated/obsolete products
    a= formalised stock control system exists, but does not meet all of above criteria
    p= no formalised stock control system

C. Supplies and equipment:

47. Stock levels
    g= no items on list 15 out of stock
    a= 1-5 items on list out of stock
    p= more than 5 items on list out of stock

48. Refrigeration equipment
    g= sufficient refrigerators present and functioning.
    p= insufficient refrigeration capacity

D. Buildings

49. Condition of buildings
    g= good condition, no repairs required
    a= minor repairs required
    p= poor condition, extensive repairs required

50. Space and storage
    1. adequate space for all functions in one central area
    2. adequate shelving and storage space
    3. adequate working surfaces, made of clean, impervious surfaces for handling of medicines
    4. adequate curtaining to prevent drugs being exposed to sunlight

    g= all of above criteria fulfilled
    a= at least 3 of above criteria fulfilled
    p= less than 3 of above criteria fulfilled

51. Air conditioning
    g= air conditioner installed and functioning
    p= no air conditioning, or air conditioner not functioning

CLINICAL SERVICES CLUSTER

V. MEDICAL STAFF

52. Ratio of full-time doctor equivalents to beds
    g= 80% or more of average staff establishment[168]
    a= 50-79% of average staff establishment
    p= below 50% of average staff establishment

53. Years of experience since qualification of full-time medical staff
    g= 50% or more of staff over 5 years since qualification
    a= less than 50% of staff over 5 years since qualification

54. Specialist physician
    g= full-time or part-time
    p= none

55. Specialist surgeon
    g= full-time or part-time
    p= none

56. Specialist obstetrician/gynaecologist
    g= full-time or part-time
    p= none

57. Specialist paediatrician
    g= full-time or part-time
    p= none

58. Specialist psychiatrist?
    g= full-time or part-time
    p= none

59. Proportion of doctors employed by the hospital with full registration with the SAMDC
    g= 100%
    a= 80% or more
    p= below 80%

60. Supervised training of non specialist surgeons
    g= 100% of full-time doctors performing surgery have had at least 6 months of supervised post internship surgical training in academic hospital
    a= 75% or above " "
    p= below 75% " "

61. Supervised training of non specialist obstetricians
    g= 100% of full-time doctors providing obstetric care have had at least 6 months of supervised post internship obstetric training in academic hospital
    a= 75% or above " "
    p= below 75% " "

---

[168] Average staff establishment to be calculated from numbers of full-time equivalent posts on the establishments of the 3 public sector and 3 contractor hospitals in the study.

62. Supervised training of non specialist anaesthetists
    g= 100% of full-time doctors providing anaesthetics care have had at least 6 months of supervised post internship anaesthetic training in academic hospital
    a= 75% or above " "
    p= below 75% " "

VI. NURSING STAFF

For whole hospital:

63. Ratio of total nurses employed to in-patient days
    g= 1.53 nurses per patient day or above (120-350 beds), or 1.2 nurses per patient day (1-120 beds)
    p= ratios below those stated above

64. Professional nurses as percentage of total nurses
    g=30% or above
    a= 20-29%
    p= below 20%

65. ENAs or PNAs as percentage of total nurses
    g= 30% or below
    a= 31-40%
    p= above 40%

66. Night cover
    g= at least one professional nurse for every 2 general wards; one qualified midwife for maternity ward; one professional nurse for OPD/Casualty
    p= above criteria not fulfilled.

67. In-service training for nursing staff
    g= formal in-service training programme in operation (formal = equivalent of at least 5 days of training per year)
    a= ad hoc or intermittent in service training (does not meet above criteria for formal training)
    p= no in-service training

VII. OPERATING THEATRES

A. Staff

68. Staff complement
    g= minimum of 3 professional nurses, 2 EN/ENA and 2 GA per theatre day
    p= staffing levels below above standards

B. Functions

69. Range of operations which hospital can currently perform (in terms of equipment and personnel)
    1. Open reduction and internal fixation
    2. Major abdominal surgery (e.g. bowel resection, abdominal hysterectomy)
    3. Thoracic surgery (lung resection or repair of chest injury)
    4. Craniotomy (burr holes)

    g= all 4 of above
    a= 3 of above
    p= less than 3 of above

C. Supplies and equipment:

For theatre complex:

70. Availability of instruments and other equipment
    g= full range of instruments and equipment necessary for the types of operations currently performed in the hospital
    a= most necessary instruments and equipment available, some constraints experienced on occasion due to shortages
    p= instruments and equipment clearly not adequate for current range of operations

71. Emergency trolley
    g= meets minimal equipment criteria (see attached list); in accessible position; checked daily for completeness
    a= meets minimal equipment criteria; one or both of additional criteria not fulfilled
    p= no emergency trolley, or trolley does not meet minimal equipment criteria

72. DC defibrillator
    g= present and functioning
    p= absent or not functioning

73. CSSD facilities (question to charge nurse)
    g= steam autoclave of sufficient capacity to prevent delays in operations; rapid autoclave facility for urgently required equipment; weekly testing and documentation of effectiveness of autoclaving facilities
    a= sufficient regular autoclave capacity; no rapid autoclave facility; weekly testing and documentation of effectiveness of autoclaving facilities
    p= autoclave facilities inadequate for current workload (some theatre delays due to lack of necessary equipment); or absence of weekly testing and documentation of effectiveness

74. Recovery area
    g= recovery area with space for one stretcher per theatre;
    a= recovery area present but smaller than minimum
    p= no designated recovery area

75. Recovery area equipment
    1. One oxygen and suction outlet per bed
    2. ECG monitor
    3. One baumanometer per bed
    4. Boyles machine
    5. Emergency trolley (meeting all requirements specified above)
    6. Pulse oximeter

    g= all of above criteria fulfilled
    a= 5 of above 6 criteria fulfilled
    p= less than 5 of above 6 criteria fulfilled

Theatre

(to be repeated for all theatres used for major surgery; average for all theatres calculated

76. Boyles machine and vaporiser
    g= functioning machine; vaporiser Mark II or newer
    p= one or more of above criteria not fulfilled

77. Ventilator
    g= present and functioning
    p= absent or not functioning

78. Gas supply
    g= Oxygen, NO2 supply system available and functioning; backup system available and functioning (if bottles only: 2 bottles and one spare of each gas; if pipelines: one spare cylinder for each gas)
    p= gas supply not functioning; or inadequate backup system

79. Mechanical suction
    g= functioning central suction source with at least 2 points; functioning backup facility in theatre (footpump or other)
    p= above criteria not fulfilled

80. Pulse oximeter
    g= available and functioning
    p= not available or not functioning

81. Servicing of equipment
    g= service contract for all equipment; evidence that ventilator, Boyles machine, vaporiser and pulse oximeter each serviced within last 12 months; gas and suction checked at least monthly by hospital maintenance
    a= 2 of above 3 criteria fulfilled
    p= less than 2 of above 3 criteria fulfilled

82. ECG monitor
    g= present and functioning
    p= absent or not functioning

83. Laryngoscope
    g= adult and infant models present and functioning
    p= above criteria not fulfilled

84. Face masks
g= one set of all sizes (neonate to large adult) with retaining ring and head harness
p= above criteria not fulfilled

85. Oral airways (at least one each of three sizes)
g= present
p= absent

86. Endotracheal tubes (at least one each of 8 sizes 6.00mm to 10.00mm); set of nasal endotracheal tubes; endotracheal tube connectors
g= present
p= absent

87. Diathermy equipment
g= present and functioning
p= absent or not functioning

88. Blood pressure monitoring equipment
g= automatic (Dynamapp) equipment present and functioning
p= absent or not functioning

D. Buildings
(applicable to whole theatre complex)

89. Air-conditioning
g= present and functioning
p= absent or not functioning

90. Condition of buildings
g= good condition, no repairs required
a= minor repairs required
p= poor condition, extensive repairs required

91. Space
g= adequate space for all functions; 1 OT per 30-40 surgical beds
p= one of above criteria not fulfilled

VIII. OUTPATIENTS DEPARTMENT

(this section refers to main OPD and/or casualty department)

A. Staff

92. Ratio of staff to OPD visits
g= average of 30-35 visits per FTE consulting staff member per day or below
a= average of 36-45 visits per consultant per day
p= above 45 visits per consultant per day

B. Functions

93. Patient flow
    - g= loop flow; distinct stations in appropriate order (registration-urine/wts-consultation-investigation-dispensary-exit); adequate waiting area with seating at each station
    - a= minor failures in flow or congestion, minor deficiencies in waiting area.
    - p= severe failures in flow or congestion; or clearly inadequate waiting area at each station

94. Specialist outpatient clinics
    - g= specialist clinics available for direct referral; separate MCH clinic with integrated antenatal, postnatal and well baby care services
    - a= one of above two criteria fulfilled
    - p= neither of above two criteria fulfilled

C. Supplies and equipment:

95. Consulting room equipment
    1. examination couch
    2. chairs for patient and consultant (minimum 2)
    3. functioning otolaryngoscope
    4. functioning ophthalmoscope

    - g= all equipment present in all consulting rooms
    - a= all equipment present in at least 80% of rooms
    - p= all equipment present in less than 80% of rooms

96. Emergency trolley
    - g= meets minimal equipment criteria (see attached list); in accessible position; checked daily for completeness
    - a= meets minimal equipment criteria; one or both of additional criteria not fulfilled
    - p= no emergency trolley, or trolley does not meet minimal equipment criteria

97. ECG monitor
    - g= present and functioning
    - p= absent, or not functioning

98. DC Defibrillator
    - g= present and functioning
    - p= absent, or not functioning

D. Buildings:

99. Condition of buildings
    - g= good condition, no repairs required
    - a= minor repairs required
    - p= poor condition, extensive repairs required

100. Cleanliness
    - g= clean appearance; evidence of recent sweeping
    - p= one or both of above criteria not fulfilled

101.Space
- g= consultation rooms comfortably accommodate health worker and patients; privacy allowed during consultations and for patients to change
- a= one of above criteria not fulfilled
- p= both of above criteria not fulfilled

102.Patient ablution facilities
- g= at least one toilet for every 50 patients present at peak hour. Toilets clean and in working order
- a= one of above criteria not fulfilled
- p= neither of above criteria fulfilled

IX. MATERNITY WARD

A. Equipment

Delivery room:

103.Scrubbing up facilities
- g= washbasin with elbow operated taps present; disinfectant soap available
- a= washbasin with elbow operated taps present; no soap available
- p= both of above criteria not fulfilled

104.Oxygen supply
- g= filled oxygen cylinder, or piped oxygen, and masks available
- p= oxygen not available or not functioning

105.Neonatal resuscitation facilities
- g= 1or more equipped and functioning resuscitation stations (table, overhead heating, oxygen and suction facilities) for each delivery bed
- a= at least two equipped and functioning neonatal resuscitation stations
- p= less than 2 equipped and functioning neonatal resuscitation stations

106.Vacuum extractor
- g= present and functioning
- p= absent or not functioning

107.Cardiotocograph
- g= present and functioning
- p= absent or not functioning

108.Emergency trolley
- g= meets minimal equipment criteria (see attached list); in accessible position; checked daily for completeness
- a= meets minimal equipment criteria; one or both of additional criteria not fulfilled
- p= no emergency trolley, or trolley does not meet minimal equipment criteria

109.ECG monitor
- g= present and functioning
- p= absent, or not functioning

110.DC Defribillator

g= present and functioning

p= absent, or not functioning

Nursery:

111.Incubator facilities

g= one functioning incubator per 10 deliveries per day (average)

a= at least two functioning incubators (if more than two required above)

p= less than two functioning incubators

112.Resuscitation equipment

g= 1 or more equipped and functioning neonatal resuscitation tables; emergency trolley meeting criteria specified above

a= 1 or more equipped and functioning neonatal resuscitation tables; emergency trolley criteria not fulfilled

p= neither neonatal resuscitation nor emergency trolley criteria fulfilled

113.Phototherapy facilities

g= at least 1 functioning phototherapy unit per 20 deliveries per day (average)

a= at least 1 functioning phototherapy unit (if more than 1 required above

p= no functioning phototherapy unit

B. Buildings

114.Condition of buildings

g= good condition, no repairs required

a= minor repairs required

p= poor condition, extensive repairs required

115.Nurses station

g= adequate space for nurses station; sited so as to give view of all beds (or functioning call system)

p= one or more of above criteria not fulfilled

116.Cleanliness

g= floors and walls clean; floors swept; no rubbish in or around building

p= one or more of above criteria not fulfilled

117.Delivery and preparation room

g = 1 labour room per 10 beds on ward; or 1 labour room and 1 preparation (1st stage) room per 15 beds on ward

p= above criteria not fulfilled

118.Patient ablution facilities

g= at least one toilet for every 8 patients; toilets clean and in working order; shower facilities available in clean condition and working

a= one of above criteria not fulfilled

p= two or more of above criteria not fulfilled

X. MEDICAL/SURGICAL/PAEDIATRIC/OTHER WARDS

B. Supplies and equipment

119. Baumanometers
- g= at least two functioning baumanometers
- a= at least one functioning baumanometer
- p= no functioning baumanometers

120. Emergency trolley
- g= meets minimal equipment criteria (see attached list); in accessible position; checked daily for completeness
- a= meets minimal equipment criteria; one or both of additional criteria not fulfilled
- p= no emergency trolley, or trolley does not meet minimal equipment criteria

121. ECG monitor
- g= present and functioning
- p= absent, or not functioning

122. DC Defribillator
- g= present and functioning
- p= absent, or not functioning

123. Bedscreens
- g= permanent bedscreens, or sufficient mobile screens to surround at least one bed at time.
- p= neither of above

C. Buildings

124. Condition of buildings
- g= good condition, no repairs required
- a= minor repairs required
- p= poor condition, extensive repairs required

125. Cleanliness
- g = floors and walls clean, floors swept, no rubbish in or around building
- p= two out of three problems (floors or walls dirty, floors, unswept, rubbish in or around building)

126. Space
- g= minimum of 0.9m2 between adjacent bed sides. Adequate area for nursing station.
- p= one of above not satisfied

127. Nurses station
- g= adequate space for nurses station; sited so as to give view of all beds (or functioning call system)
- p= one or more of above criteria not fulfilled

128. Staff washing up facilities
- g= washbasin with soap and towel in accessible position
- p= above criteria not fulfilled

129.Patient ablution facilities

g= one toilet for every 8 patients (or one urinal for every three toilets in male wards. Toilets clean and in working order

p= above criteria not fulfilled

ANCILLARY CLINICAL SERVICES

130.Physiotherapy services

g= one FTE physiotherapist per 200 beds

p= above criteria not fulfilled

131.Speech and Hearing Services

g= one FTE Speech and hearing therapist per 200 beds

p= above criteria not fulfilled

132.Occupational Therapy Services

g= one FTE OT per 200 beds

p= above criteria not fulfilled

CONTENTS OF EMERGENCY TROLLEY

Intubation equipment

Functioning Laryngoscope
Endotracheal tubes (one set of all sizes 6.00mm -10.00mm)
Oral airways (1X No.2 ; No. 3; no. 4)
Ambubag and connector
Face masks (one set of all sizes)

Drugs:

Adrenalin
Atropine
Calcium chloride/gluconate
Dextrose 50%
Dobutamine/Dopamine/Isoprenaline
Furosemide
Hydrocortisone/Dexamethasone
Lignocaine
Mannitol
Naloxone
Sodium Bicarbonate

IV fluids and administration equipment

Dextrose water 5%
Normal Saline
Ringers Lactate
(at least 2 X 1000 ml bags of any one of above solutions)

Jelco and butterfly cannulas:
(3 of at least two sizes (14g, 16g, 18g, 20g)

Giving sets:
(at least 1 x 60 and 15 dpm infusion sets)

APPENDIX 6: SOURCES CONSULTED IN DEVELOPMENT OF STRUCTURAL QUALITY OF CARE INSTRUMENT

Individuals who participated in the development of the instrument

Mr J Jersky, Specialist surgeon, Linksfield Park Clinic
Mr J Ramos, Consultant surgeon, Johannesburg hospital
Prof GJ Hofmeyr, Head, Department of Obstetrics and Gynaecology, JG Strydom Hospital.
Professor R Pattinson, Clinical Head, Department of Obstetrics and Gynaecology, University of Pretoria
Professor E Shipton, Professor of Anaesthiology, Hillbrow Hospital, University of the Witwatersrand
Dr G Sieburg, Consultant anaesthetist, Hillbrow Hospital
Dr H Allsfine, specialist anaesthetist (in private practice, Johannesburg)
Dr R Doehring, Director, South African Institute for Medical Research
Dr M Forrest, Regional Director, Northern Transvaal, South African Institute for Medical Research
Dr E Robertson, Regional Director, Eastern Transvaal, South African Institute for Medical Research
Professor R Summers, Head, Department of Pharmacy, Medical University of South Africa
Dr B Summers, Senior Lecturer, Department of Pharmacy, Medical University of South Africa
Professor B Robertson, Head, Department of Nursing Education, University of Witwatersrand
Ms D Lee, Senior Lecturer, Department of Nursing Education, University of Witwatersrand
Dr N Crisp, Principal Consultant, Deloitte and Touche Management Consultants
Dr W Sive, Superintendent, Johannesburg Hospital
Dr R. Broekman, Registrar, Department of Community Health, University of the Witwatersrand
Ms R vd Riet, Chief Radiographer, Johannesburg Hospital
Matron M Martin, Chief Theatre Matron, Johannesburg Hospital
Mrs M Wallenburg, Head, Department of Organisation, Nursing Department, Department of Health
Mr D Sutherland, Managing Director, Pharmaceutical Management and Distribution Services Pty (Ltd)
Dr S Fonn, Senior Researcher Officer, Centre for Health Policy, University of the Witwatersrand
Dr H Schneider, Senior Researcher Officer, Centre for Health Policy, University of the Witwatersrand
Dr J Doherty, Senior Researcher Officer, Centre for Health Policy, University of the Witwatersrand
Dr M Price, Director, Centre for Health Policy, University of the Witwatersrand
Ms L Rispel, Deputy Director, Centre for Health Policy, University of the Witwatersrand
Mr M Freeman, Deputy Director, Centre for Health Policy, University of the Witwatersrand
Ms A Beattie-Simpson, Research Officer, Centre for Health Policy, University of the Witwatersrand
Mr OMB Pharasi, Research Officer, Centre for Health Policy, University of the Witwatersrand

The following published sources were also utilised in the development of the criteria used in the structural quality of care instrument: Department Health and Welfare, Republic of South Africa 1985, Brownlee 1983; Klug Redman 1984, Transvaal Provincial Administration Hospital Services Branch 1988, Broekman 1993, Broekman 1991, Department of National Health and Population Development, Republic of South Africa 1993, Summers 1991, Department of National Health and Population Development, Republic of South Africa 1991, Republic of South Africa 1980, Transvaal Provincial Administration Hospital Services Branch 1982, South African Nursing Council 1992.

APPENDIX 7: SCORES FOR STRUCTURAL QUALITY OF CARE INSTRUMENT

Table A7.1: Evaluation of structural quality of care: scores for individual criteria

Item	Adequate				Poor			
	min	max.	mean	median	min	max.	mean	median
1	0.70	0.80	0.77	0.80	0.30	0.70	0.47	0.40
2	0.30	0.80	0.60	0.70	0.10	0.40	0.27	0.30
3	0.70	0.80	0.77	0.80	0.30	0.40	0.37	0.40
4	0.50	0.85	0.72	0.80	0.30	0.40	0.33	0.30
5	0.50	0.75	0.58	0.50	0.10	0.45	0.28	0.30
6	0.70	0.80	0.77	0.80	0.50	0.65	0.58	0.60
7	0.50	0.90	0.67	0.60	0.40	0.75	0.52	0.40
8					0.10	0.40	0.20	0.10
9	0.30	0.60	0.50	0.60	0.20	0.40	0.30	0.30
10	0.20	0.65	0.48	0.60	0.10	0.40	0.22	0.15
11					0.30	0.60	0.43	0.40
12	0.50	0.80	0.67	0.70	0.40	0.60	0.50	0.50
13	0.70	0.90	0.80	0.80	0.40	0.80	0.53	0.40
14	0.70	0.85	0.78	0.80	0.30	0.70	0.47	0.40
15	0.70	0.90	0.80	0.80	0.20	0.60	0.43	0.50
16					0.10	0.50	0.37	0.50
17					0.40	0.60	0.53	0.60
18	0.70	0.80	0.77	0.80	0.20	0.40	0.27	0.20
19	0.70	0.80	0.77	0.80	0.30	0.70	0.47	0.40
20	0.60	0.80	0.70	0.70	0.30	0.40	0.37	0.40
21	0.40	0.90	0.70	0.80	0.20	0.70	0.53	0.70
22	0.75	0.90	0.82	0.80	0.40	0.50	0.43	0.40
23	0.50	0.80	0.63	0.60	0.20	0.60	0.40	0.40
24	0.50	0.70	0.60	0.60	0.40	0.50	0.43	0.40
25					0.10	0.60	0.40	0.50
26	0.50	0.90	0.73	0.80	0.40	0.60	0.53	0.60
27					0.60	0.80	0.73	0.80
28					0.60	0.80	0.73	0.80
29	0.85	0.90	0.88	0.90	0.50	0.70	0.57	0.50
30	0.65	0.80	0.72	0.70	0.40	0.50	0.47	0.50
31	0.60	0.90	0.75	0.75	0.20	0.80	0.50	0.50
32	0.80	0.90	0.83	0.80	0.70	0.70	0.70	0.70
33					0.65	0.90	0.77	0.75
34					0.30	0.60	0.47	0.50
35	0.70	0.85	0.78	0.80	0.50	0.70	0.60	0.60
36					0.20	0.70	0.53	0.70
37	0.65	0.90	0.82	0.90	0.40	0.80	0.55	0.45
38	0.50	0.95	0.80	0.95	0.10	0.85	0.55	0.70
39	0.80	0.90	0.85	0.85	0.50	0.60	0.53	0.50
40	0.80	0.80	0.80	0.80	0.45	0.60	0.52	0.50
41	0.85	0.95	0.90	0.90	0.10	0.80	0.53	0.70

Notes: Where no score is given for the 'adequate' standard, the criterion did not have an 'adequate' standard defined.

Table A7.1: Evaluation of structural quality of care: scores for individual criteria (contd.)

Item	Adequate				Poor			
	min	max.	mean	median	min	max.	mean	median
42	0.80	0.95	0.88	0.88	0.70	0.80	0.75	0.75
43	0.70	0.95	0.82	0.80	0.45	0.80	0.62	0.60
44					0.50	0.65	0.58	0.60
45	0.70	0.80	0.77	0.80	0.40	0.70	0.53	0.50
46	0.50	0.90	0.73	0.80	0.25	0.50	0.38	0.40
47	0.60	0.80	0.67	0.60	0.20	0.40	0.33	0.40
48	0.40	0.95	0.68	0.70	0.20	0.30	0.27	0.30
49	0.90	0.90	0.90	0.90	0.50	0.70	0.57	0.50
50	0.80	0.85	0.82	0.80	0.40	0.70	0.53	0.50
51					0.50	0.90	0.70	0.70
52	0.60	0.80	0.72	0.75	0.20	0.40	0.30	0.30
53					0.30	0.90	0.67	0.80
54					0.30	0.80	0.53	0.50
55					0.40	0.60	0.47	0.40
56					0.30	0.70	0.53	0.60
57					0.30	0.60	0.50	0.60
58					0.65	0.90	0.75	0.70
59	0.75	0.90	0.85	0.90	0.60	0.70	0.63	0.60
60	0.75	0.80	0.78	0.80	0.40	0.60	0.52	0.55
61	0.60	0.80	0.73	0.80	0.40	0.60	0.50	0.50
62	0.70	0.80	0.73	0.70	0.40	0.55	0.48	0.50
63					0.40	0.90	0.60	0.50
64	0.50	0.90	0.75	0.85	0.35	0.60	0.47	0.45
65	0.65	0.90	0.80	0.85	0.50	0.60	0.57	0.60
66					0.30	0.50	0.40	0.40
67	0.65	0.90	0.75	0.70	0.30	0.70	0.48	0.45
68					0.40	0.80	0.57	0.50
69	0.70	0.90	0.83	0.90	0.20	0.70	0.50	0.60
70	0.70	0.90	0.80	0.80	0.20	0.60	0.42	0.45
71	0.60	0.90	0.70	0.60	0.10	0.50	0.32	0.35
72					0.10	0.65	0.37	0.35
73	0.80	0.90	0.87	0.90	0.10	0.70	0.42	0.45
74	0.70	0.85	0.78	0.80	0.10	0.55	0.35	0.40
75	0.80	0.90	0.87	0.90	0.20	0.60	0.40	0.40
76					0.00	0.10	0.05	0.05
77					0.00	0.10	0.05	0.05
78					0.00	0.30	0.13	0.10
79					0.00	0.10	0.05	0.05
80					0.25	0.25	0.25	0.25
81	0.60	0.60	0.60	0.60	0.50	0.50	0.50	0.50
82					0.00	0.10	0.05	0.05
83					0.00	0.10	0.05	0.05
84					0.00	0.35	0.18	0.18
85					0.00	0.10	0.05	0.05
86					0.00	0.10	0.05	0.05

Table A7.1: Evaluation of structural quality of care: scores for individual criteria (contd.)

Item	Adequate				Poor			
	min	max.	mean	median	min	max.	mean	median
87					0.00	0.70	0.35	0.35
88					0.40	0.40	0.40	0.40
89					0.30	0.70	0.47	0.40
90	0.70	0.80	0.75	0.75	0.20	0.60	0.40	0.40
91					0.40	0.75	0.55	0.50
92	0.70	0.75	0.72	0.70	0.40	0.55	0.48	0.50
93					0.45	0.80	0.62	0.60
94	0.50	0.90	0.72	0.75	0.25	0.70	0.48	0.50
95	0.60	0.90	0.80	0.90	0.20	0.75	0.52	0.60
96	0.50	0.80	0.60	0.50	0.10	0.50	0.33	0.40
97					0.10	0.60	0.43	0.60
98					0.10	0.70	0.47	0.60
99	0.85	0.90	0.87	0.85	0.50	0.70	0.57	0.50
100					0.60	0.85	0.68	0.60
101	0.60	0.80	0.73	0.80	0.20	0.50	0.40	0.50
102	0.50	0.80	0.65	0.65	0.20	0.60	0.40	0.40
103	0.40	0.90	0.67	0.70	0.10	0.60	0.37	0.40
104					0.10	0.50	0.33	0.40
105	0.70	0.90	0.83	0.90	0.10	0.50	0.37	0.50
106					0.10	0.70	0.47	0.60
107					0.40	0.60	0.50	0.50
108	0.60	0.80	0.67	0.60	0.10	0.60	0.30	0.20
109					0.10	0.75	0.45	0.50
110					0.10	0.80	0.52	0.65
111	0.75	0.90	0.85	0.90	0.10	0.75	0.48	0.60
112	0.50	0.80	0.63	0.60	0.10	0.50	0.32	0.35
113	0.60	0.95	0.80	0.85	0.10	0.90	0.43	0.30
114	0.80	0.90	0.83	0.80	0.40	0.70	0.53	0.50
115					0.50	0.90	0.70	0.70
116					0.50	0.80	0.63	0.60
117					0.40	0.75	0.55	0.50
118	0.60	0.80	0.70	0.70	0.30	0.70	0.47	0.40
119	0.70	0.70	0.70	0.70	0.20	0.40	0.30	0.30
120	0.60	0.80	0.70	0.70	0.10	0.50	0.30	0.30
121					0.80	0.80	0.80	0.80
122					0.35	0.90	0.63	0.63
123					0.50	0.80	0.65	0.65
124	0.80	0.95	0.85	0.80	0.40	0.70	0.53	0.50
125					0.40	0.85	0.62	0.60
126					0.60	0.85	0.73	0.73
127					0.45	0.75	0.63	0.70
128					0.45	0.65	0.55	0.55
129					0.10	0.90	0.57	0.70
130					0.40	0.80	0.55	0.45
131					0.40	0.90	0.63	0.60
132					0.40	0.90	0.60	0.50

Table A7.2: Evaluation of structural quality of care: weights for categories and clusters

	Min.	Max.	Mean	Median
Administration/management				
Staff	20	30	25	25
Functions	20	30	25	25
MIS	10	30	20	20
Patient record system	10	25	18	20
Utilities/services	5	20	12	10
Total	10	20	15	15
Laboratory				
Staff	25	30	28	30
Functions	25	50	38	40
Supplies and equipment	15	30	22	20
Buildings	10	15	12	10
Total	8	10	9	10
Radiology Dept				
Staff	25	30	27	25
Functions	20	30	25	25
Supplies and equipment	25	40	32	30
Buildings	10	20	17	20
Total	8	11	10	10
Pharmacy				
Staff	20	30	27	30
Functions	20	30	23	20
Supplies and equipment	20	50	35	35
Buildings	10	20	15	15
Total	12	15	13	13
Clinical Services				
Medical staff	30	55	43	45
Nursing staff	35	50	42	40
Ancillary services	10	20	15	15
Total	20	30	25	25
Operating theatres				
Staff	10	30	23	30
Functions	20	40	27	20
Supplies and equipment	30	50	37	30
Buildings	10	20	17	20
Total	11	15	13	14

Table A7.2: Evaluation of structural quality of care: weights for categories and clusters (contd.)

	Min.	Max.	Mean	Median
Outpatients Dept				
Staff	25	30	28	30
Functions	15	40	25	20
Supplies and equipment	30	40	33	30
Buildings	10	20	17	20
Total	5	9	7	8
Maternity Ward				
Supplies and equipment	55	90	75	80
Buildings	10	45	25	20
Total	1	2	2	2
Other wards				
Supplies and equipment	55	90	75	80
Buildings	10	45	25	20
Total	4	7	6	6
Total all wards	10	18	14	15

Interpretation of Table A7.1

These scores represent the minimum, maximum, mean and median weights allocated to the clusters and categories by each of the experts in the group involved in development of the SQOC instrument. The 'total' scores represent the weights for each cluster in relation to the total for all wards, whereas the weights attached to the individual categories represent their weighting relative to the other categories within each cluster.

APPENDIX 8: CHECKLIST USED FOR DATA COLLECTION IN EVALUATION OF STRUCTURAL QUALITY OF CARE[169]

LABORATORY DIRECT OBSERVATION

Hospital_____

Chemistry analyser (26)

Appearance clean and neat	Yes/No
Record of maintenance schedule available	Yes/No
Record demonstrates full compliance over last year	Yes/No

Haematology analyser (27)

Appearance clean and neat	Yes/No
Record of maintenance schedule available	Yes/No
Record demonstrates full compliance over last year	Yes/No

Condition of buildings:

good condition, no repairs required
minor repairs required
poor condition, extensive repairs required

Space

Adequate space for all functions	Yes/No
Easy access to all equipment	Yes/No
Space for all staff to work without obstruction	Yes/No
Functions could be better performed if more space available	Yes/No
Access to some equipment obstructed	Yes/No
Space clearly inadequate	Yes/No

[169] The layout of the checklists and questionnaires in this and the following Appendix have been modified so as to shorten their length for reproduction. The numbers in brackets in all checklists and questionnaires refer to the criterion number on the survey instrument to which the item refers.

RADIOLOGY DEPT DIRECT OBSERVATIONS

Hospital_____

Warning signs for pregnant women on display (34)	**Yes/No**
Staff wearing exposure monitors (34)	
Staff 1	**Yes/No**
Staff 2	**Yes/No**
Staff 3	**Yes/No**
Staff 4	**Yes/No**
Staff 5	**Yes/No**
Staff 6	**Yes/No**
Xray machine/s (36)	
Record of maintenance schedule available	**Yes/No**
Record demonstrates full compliance over last year	**Yes/No**
Condition of buildings: (37)	
good condition, no repairs required	
minor repairs required	
poor condition, extensive repairs required	
Space (38)	
Adequate space for all functions	**Yes/No**
Functions could be better performed if more space available	**Yes/No**
Access to some equipment obstructed	**Yes/No**
Space clearly inadequate	**Yes/No**
Number of rooms available	

PHARMACY DIRECT OBSERVATION

Hospital_____

Outpatient medicine labelling (42)

Patient name present	Yes/No
dosage instructions	Yes/No
other instructions	Yes/No
Expiry date	Yes/No

Refrigeration capacity adequate or insufficient? (46) Yes/No

Any items not stored in refrigerators which should be? (46)

Temperature monitoring (46)

Fridge 1	Yes/No
Fridge 2	Yes/No
Fridge 3	Yes/No

Condition of buildings: (47)

good condition, no repairs required
minor repairs required
poor condition, extensive repairs required

Space (48)

Adequate space for all functions in one central area, or functions could be better performed if more space available

Adequate shelving and storage space	Yes/No
Adequate working surfaces?	
Are working surfaces clean and made of smooth, impervious material	Yes/No
Air conditioning	
Installed	Yes/No
Functioning	Yes/No

Pharmacy stock level check

Item	In stock (tick)
1. Gentamycin inj 80mg	_____
2. Hydralazine 25mg tab	_____
3. Magnesium sulphate inj 50%	_____
4. Carbemazapine tabs 200mg	_____
5. Cotrimoxazole tabs 400mg	_____
6. Digoxin tabs 0.25mg	_____
7. Indomethacin caps 25mg	_____
8. INH tabs 100mg	_____
9. Thyroxine tabs 0.05mg	_____
10. Warfarin tabs 5mg	_____
11. Insulin Actrapid/Humulin R 10ml	_____
12. Aminophylline 250mg/10ml inj	_____
13. Flagyl 500mg/100ml inj	_____
14. Solucortef 100mg inj	_____
15. Chlorpromazine tabs 50mg or 100mg	_____

OPERATING THEATRES DIRECT OBSERVATION

Hospital_____

Theatre complex:

Number of functioning operating theatres

Condition of buildings: (88)

good condition, no repairs required
minor repairs required
poor condition, extensive repairs required

Air conditioning (87)

Installed	Yes/No
Functioning	Yes/No
Emergency trolley present?	Yes/No
In an accessible position?	Yes/No
DC Defibrillator	
Present	Yes/No
Functioning	Yes/No

Recovery area

Designated recovery area	Yes/No
Number of beds/stretcher bays in recovery	

Equipment for each recovery bed/bay:

Bay 1

Item	Present (tick)	Functioning
Oxygen outlet		
Suction outlet		
Baumanometer		

General recovery area equipment

Item	Present (tick)	Functioning
ECG monitor		
Boyles machine		
Pulse oximeter		
Emergency trolley		

CONTENTS OF EMERGENCY TROLLEY

Location: Theatre complex

Location: Recovery area

(see previous contents list)

Theatre 1:

Theatre equipment

Item	Present (tick)	Functioning	Notes
Ventilator			
Boyles machine			
Vaporiser	(specify Mark)		
Bottle or pipe gas supply			
Backup gas supply	(no./types of cylinders)		
Mechanical suction	(no. of points)		
Backup suction	(Describe)		
Pulse oximeter			
ECG monitor			
Adult laryngoscope			
Infant laryngoscope			
Face masks (full set, retaining ring, harness)	no. of each size		
Oral airways (set of three sizes)	no. of each size		
ET Tubes (set of 10 sizes)	no. of each set		
Diathermy			
BP monitor (automatic)			

OUTPATIENTS DEPARTMENT DIRECT OBSERVATION

Hospital_____

Is patient flow well organised? Is there loop flow, with distinct stations. Does each station have adequate waiting area with seating. Any evidence of failure of flow (91)

Condition of buildings: (95)

good condition, no repairs required
minor repairs required
poor condition, extensive repairs required

Cleanliness. Does the OPD appear clean. Is there evidence of recent sweeping? (96)

Do consultation rooms accommodate health worker and patients comfortably? Is there privacy for changing? Is there privacy for consultations?

Patient toilet facilities

No of toilets

Toilets generally clean and in working order?

ECG Monitor

Present:	Yes/No
Functioning	Yes/No

DC Defibrillator

Present:	Yes/No
Functioning	Yes/No

Emergency trolley

Present:	Yes/No
Accessible	Yes/No

CONTENTS OF EMERGENCY TROLLEY
Location: OPD
(See previous content lists)

Examination rooms

Examination room No: _____

Item	Present/no.	Functioning
examination couch		
chairs		
otolaryngoscope		
ophthalmoscope		

MATERNITY WARD DIRECT OBSERVATION

Hospital_____

Number of delivery rooms/cubicle and beds per room

Number of 1st stage rooms, size and beds per room

Does nurses station have adequate space? (112)	Yes/No
Is it sited to give full view of patients	Yes/No
Is there a functioning call system	Yes/No
Are floors and walls clean? (113)	Yes/No
Are floors swept?	Yes/No

Is there any rubbish lying around Yes/No

Patient toilet facilities (115)

No of toilets
Toilets generally clean and in working order?
Shower facilities available? Yes/No
Are these clean and working? Yes/No

What is the condition of the buildings: (111)

good condition, no repairs required
minor repairs required
poor condition, major repairs required

ECG Monitor
Present: Yes/No
Functioning Yes/No

DC Defibrillator
Present: Yes/No
Functioning Yes/No

Emergency trolley
Present: Yes/No
Accessible Yes/No

Contents of emergency trolley

Location: Maternity ward
(see previous contents list)

Delivery room:

Are there scrubbing up facilities? (102) Yes/No
Do these have elbow operated taps? Yes/No
Is there soap/disinfectant? Yes/No

Equipment:

Item	Present/No.	Functioning
Oxygen supply		
Vacuum extractor		
Cardiotocograph		

Neonatal resuscitation facilities:

Number of stations_____

Station no. 1

Item	Present/No.	Functioning

Table
Overhead heating
Oxygen
Suction

Nursery facilities:

Number of functioning incubators_____

Number of functioning phototherapy units_____

GENERAL WARDS DIRECT OBSERVATION

Hospital_____

Ward_____

Equipment:

Number of functioning baumanometers

Emergency trolley	
Present:	Yes/No
Accessible	Yes/No
Checked daily	Yes/No
ECG Monitor	
Present:	Yes/No
Functioning	Yes/No
DC Defibrillator	
Present:	Yes/No
Functioning	Yes/No

Are there bedscreens between each bed? Yes/Nos

If not, are there sufficient screens to surround at least one bed at a time?

What is the condition of the buildings: (111)

good condition, no repairs required
minor repairs required
poor condition, major repairs required

Are floors and walls clean? (113)	Yes/No
Are floors swept?	Yes/No

Is there any rubbish lying around	Yes/No
Is there adequate space between beds (0.9m)?	Yes/No
Does nurses station have adequate space? (112)	Yes/No
Is it sited to give full view of patients	Yes/No
Is there a functioning call system	Yes/No
Is there a washing up basin for staff?	Yes/No
Does it have soap and towel?	Yes/No

Patient toilet facilities (115)

No of toilets
Toilets generally clean and in working order?

Record Review (retrieved records)

Hospital_____

Record No:_____

Patient details on file cover or in summary:

Age	Yes/No
Admission diagnosis	Yes/No
Discharge diagnosis	Yes/No
Admission date	Yes/No
Discharge date	Yes/No

Summary score:

g = 4 or more of above criteria fulfilled
a = at least three of above criteria
p = less than three of above criteria

Organisation of records:

Relevant items held together in record	Yes/No
Easy to identify course of illness and treatment during most recent admission/s	Yes/No
Medicine charts present and completed	Yes/No
Laboratory results present or recorded	Yes/No

Summary score:

g = all of above criteria fulfilled
a = at least 3 of above criteria
p = less than 3 of above criteria

APPENDIX 9: INTERVIEW SCHEDULES FOR EVALUATION OF STRUCTURAL QUALITY OF CARE

QUESTIONNAIRE TO SUPERINTENDENT/HOSPITAL MANAGER

HOSPITAL:_____

INTERVIEWER/OBSERVER:_____

INTERVIEWEE:_____

Have you had any formal training in management/administration or public health? (1)
If Yes:
Undergraduate/postgraduate level
Full time/part time
Nature and duration of course (1)

How often does the senior management team (hospital manager, hospital secretary/administrator and nursing service manager/chief matron) meet on a formal basis? (4)

Could you summarise the financial situation of the hospital over the past year; in particular, what was (approximate) total expenditure over the past year; what was the (approximate) extent of variance with budget; could you explain this variance? (5)

Could you describe some of the critical management issues or problems that you have faced over the past year or two. Have there been any significant staffing problems or changes? Have there been any particular administrative problems in the recent past? (5)

Are there in-service training programmes for senior management at the hospital? If yes, please describe these. How often do they occur? Who are they aimed at? What is the nature of the training? (6)

Approximately what proportion of non-clinical staff received some form of in-service training course/programme during the past twelve months? (7)

over 50% / 21-50% / 0-20%

Management information system

Does the hospital have a MIS? (8)

(MIS is defined here as a centralised compilation of data for use by hospital management and/or clinical personnel. Routine collection of data without central compilation is excluded from the definition)

If yes; could you describe its operation, including extent of computerisation; frequency of data entry; how data is entered (8)

Type of data entered (9)

age/sex data		Yes/No
patient address information	Yes/No	
diagnostic data		Yes/No
mortality data		Yes/No
complication data	Yes/No	
financial information		Yes/No
personnel information		Yes/No
Other data (list below)		

Is data from the MIS fed back to relevant management and/or clinical personnel and used in management and/or clinical decision making? (10)

If yes, please describe this process. Is there any formal reporting or is it informal? Does this occur on a regular basis, or sporadically?

Have any important decisions been influenced by the MIS? Please describe these (10)

Hospital record system

Are records of separate in-patient admissions stored together or separately? (11)
If not; can records of previous admissions be retrieved at subsequent admissions? Is this routinely done? (11)
Are outpatient records stored with in-patient records (11)
if not; can outpatient records be retrieved at the time of an admission. Is this routinely done? (11)

On how many occasions has there been a shortage of water in the hospital over the past 2 years? (16)
Is water purity/quality formally monitored at the0hospital? (16)
If yes; how often
If no : comment

Does the hospital have a backup energy supply system? (17)
Please describe this
Is it functioning at the moment? (17)
Is it sufficient to cope with the needs of the theatre, casualty and kitchen (17)
Is solid and contaminated waste handled by an outside contractor or is it disposed of on site?(18)
If disposed on site, what methods are used for disposal of sharps and other forms of contaminated waste? (18)

Laboratory services
(apply all questions to hospital lab and to SAIMR lab if a separate one exists on the hospital grounds

How many medical technologists and medical technicians currently employed in the lab? (19)
Do lab staff receive in service training? Which categories of staff have received training over the past 2 years? Please describe the nature and duration of the training. (20)

Radiology department

How many FTE radiographers currently employed? (30)
How many FTE supplementary radiographers currently employed? (30)
Are X-rays conducted and processed by staff without formal training? (30)

Pharmacy

Numbers of pharmacy staff (FTE) (39)

pharmacists
pharmacy assistant
pharmacy technician
student pharmacy technician/assistant

Medical staff data

Details of doctors currently on the medical staff establishment

Name of Dr	FT/PT	Specialist/ GP	If FT: Yrs since qual-ification	If PT: No of sessions	Full SAMDC registration	MO. post intern training (s/og/a)*

*specify whether post intern training in surgery/obstets and gynae/anaesthetics, or combination of these.

Operating theatres

What operations can currently be performed (in terms of equipment and personnel) Which of these have been performed in the last 6 months? (67)

	Can be performed	Performed last 6 months
Open reduction and internal fixation	Yes/No	Yes/No
Major abdominal surgery (e.g. bowel resection, abdominal hysterectomy)	Yes/No	Yes/No
Thoracic surgery (lung resection or repair of chest injury)	Yes/No	Yes/No
Craniotomy (burr holes)	Yes/No	Yes/No

Do you think that the hospital has the full range of equipment and instruments necessary to carry out the current range of operations performed in the hospital? (69)

Pick a statement:

full range of instruments and equipment necessary for the types of operations currently performed in the hospital
most necessary instruments and equipment available, some constraints experienced on occasion due to shortages
instruments and equipment clearly not adequate for current range of operations

Outpatient department

Does the hospital have specialist OPDs to which patients may be directly referred? List these (92)
Does the hospital have a separate MCH clinic. Are ANC, Postnatal and well baby services integrated?

Paramedical staff data

How many full-time equivalent occupational therapists are employed by the hospital?
How many full-time equivalent physiotherapists are employed by the hospital?
How many full-time equivalent speech and hearing are employed by the hospital?

QUESTIONNAIRE TO HOSPITAL ADMINISTRATOR

HOSPITAL:_____

INTERVIEWER/OBSERVER:_____

INTERVIEWEE:_____

Have you had any formal training in management/administration or public health? (2)

If Yes:

Undergraduate/postgraduate level
Full time/part time

Nature and duration of course (2)

How often does the senior management team (hospital manager, hospital secretary/administrator and nursing service manager/chief matron) meet on a formal basis? (4)

Could you describe some of the critical management issues or problems that you have faced over the past year or two. Have there been any significant staffing problems or changes? Have there been any particular administrative problems in the recent past? (5)

Are there in-service training programmes for senior management at the hospital? If yes, please describe these. How often do they occur? Who are they aimed at? What is the nature of the training? (6)

Approximately what proportion of non-clinical staff received some form of in-service training course/programme during the past twelve months? (7)

over 50% / 21-50% / 0-20%

QUESTIONNAIRE TO CHIEF NURSING SERVICE MANAGER

HOSPITAL:_____

INTERVIEWER/OBSERVER:_____

INTERVIEWEE:_____

Have you had any formal training in management/administration or public health? (3)
If Yes:

Undergraduate/postgraduate level

Full time/part time

Nature and duration of course (3)

How often does the senior management team (hospital manager, hospital secretary/administrator and nursing service manager/chief matron) meet on a formal basis? (4)

Could you describe some of the critical management issues or problems that you have faced over the past year or two. Have there been any significant staffing problems or changes? Have there been any particular administrative problems in the recent past? (5)

Are there in-service training programmes for senior management at the hospital? If yes, please describe these. How often do they occur? Who are they aimed at? What is the nature of the training? (6)

Are there in-service training programmes for nursing staff at the hospital? If yes, please describe these. How often do they occur? Who are they aimed at? What is the nature of the training? How many hours or days per month/year are used for in-service training ? (65)

Are there any particular problems with the hospital at the moment?
Are these related to staff, equipment, facilities or other problems?
What could be done to improve the services delivered by the hospital?

QUESTIONNAIRE TO HEAD OF LABORATORY SERVICES

(applies to both hospital and SAIMR lab if one exists on hospital premises)

HOSPITAL:_____

INTERVIEWER/OBSERVER:_____

INTERVIEWEE:_____

How many medical technologists and medical technicians currently employed in the lab? (19)

Do lab staff receive in service training? Which categories of staff have received training over the past 2 years? Please describe the nature and duration of the training. (20)

Which of the following tests are carried out by your laboratory? (21 and 22)
(tick tests which are carried out)

Basic range:

Urine microscopy
Urea and Electrolyte analysis
Serum glucose
Pregnancy test
HB
Malaria slide
VDRL, WR or RPR
CSF microscopy
Widal serology

Additional range:

FBC
Platelet count
Bacterial culture and sensitivity
Stool microscopy
Liver function tests
CSF chemistry

Does the lab conduct internal quality assurance testing. If so, on which tests, and how often? Are the results recorded? (23)

Does the lab participate in an external quality assurance programme? How often is this undertaken? Please describe this process (23)

Have you experienced any shortages of reagents or other disposables required for your tests during the last 12 months? (24)
If yes, on how many occasions have these shortages occurred in the past year? (24)
once or twice/ more than twice

Main chemistry analyser (26)

Is there a formal schedule of external maintenance for this machine	Yes/No
Is there a service contract for this machine?	Yes/No
Is compliance with the schedule recorded?	Yes/No
How often is the machine calibrated?	daily/every run/other

Main haematology analyser (27)

Is there a formal schedule of external maintenance for this machine	Yes/No
Is there a service contract for this machine?	Yes/No
Is compliance with the schedule recorded?	Yes/No
How often is the machine calibrated?	daily/every run/other

Do you feel that there is sufficient space for all the functions carried out by the lab? Please comment

Are there any particular problems with the laboratory at the moment? Are these related to staff, equipment, facilities or other problems?

What could be done to improve the services delivered by the laboratory?

Urgent specimen in working hours: in what percentage of cases would you have the result within 2 hours?
Routine specimen in working hours: in what percentage of cases would you have the result within 24 hours?
Urgent specimen after working hours: in what percentage of cases would you have the result within 2 hours?
What tests are available after hours?

QUESTIONNAIRE TO HEAD OF RADIOLOGY SERVICES

HOSPITAL:_____

INTERVIEWER/OBSERVER:_____

INTERVIEWEE:_____

How many FTE radiographers and supplementary radiographers are employed in your department? (30)

Are X-ray procedures and processing carried out by staff without formal training?

Do Xray staff receive in service training? Which categories of staff have received training over the past 2 years?
Please describe the nature and duration of the training. (31)

Can your department carry out fluroscopic screening? (32)
Does the hospital have basic maternity ultrasound capacity? (33)

Do you comply with Dept of Health safety requirements?

Please describe the personal protection available for staff. How many aprons are available? Are these sufficient for staff and patients?

Do all staff wear radiation badges? How often are staff exposure levels monitored? (34)

Was the last inspection passed? Were adjustments or modifications required? Were these minor, or did they require interruption to service? (34)

Have you experienced any shortages of reagents or other disposables required for your tests during the last 12 months? (35)
If yes, on how many occasions have these shortages occurred in the past year? (35)
once or twice/ more than twice

Xray Machines (36)

How old is the machine?
Is it currently functioning? Yes/No
Is there a schedule of external maintenance for this machine Yes/No
Is there a service contract for this machine? Yes/No
Is compliance with the schedule recorded? Yes/No
How often is the machine serviced normally? When was it last serviced?

Do you feel that there is sufficient space for all the functions carried out by the department? Please comment Are there any particular problems with the department at the moment?
Are these related to staff, equipment, facilities or other problems?
What could be done to improve the services delivered by the dept?
Is there an after hours service? What tests done? Urgent Xray request after working hours: in what percentage of cases would you have the film within 2 hours?

less than 60%
More than 60% or more

QUESTIONNAIRE TO HEAD OF PHARMACY SERVICES

HOSPITAL:_____
INTERVIEWER/OBSERVER:_____
INTERVIEWEE:_____

Numbers of pharmacy staff (FTE) (39)

pharmacists
pharmacy assistant
pharmacy technician
student pharmacy technician/assistant

Are the following activities undertaken by a pharmacist or under supervision by another category of pharmacy trained staff. If no, who undertakes the activity? (39)

Stock control	Yes/No
Dispensing	Yes/No
Ordering	Yes/No

Do staff receive in service training? Which categories of staff have received training over the past 2 years? Please describe the nature and duration of the training. (40)

Do pharmacy staff participate formally in any clinical activities, such as pharmacy committees, clinical ward rounds or others. How often do these take place. Please describe these. If activities not formalised, is there any informal participation in clinical activities. Please describe (41)

What information is included on outpatient prescription labels?

name of patient	Yes/No
dosage instructions	Yes/No
other instructions	Yes/No
Expiry date	Yes/No

Are outpatient prescriptions routinely checked for accuracy? Please describe how this is done (42)
Is there any counselling with outpatient prescriptions? When is this done? what form does it take?

Is there a formalised stock control system. Please describe briefly(43)
Does the stock control system comprise the following elements? (43)

defined min and max. reorder levels for each item	Yes/No
stock control accounting system	Yes/No
system for identification and removal of outdated products	Yes/No
Other elements?	

Are there sufficient refrigerators? (46)	Yes/No
Are the refrigerator temperatures monitored?	Yes/No

Are any items normally requiring refrigeration currently not refrigerated?

Do you feel that there is sufficient space for all the functions carried out by the department? Please comment (48)

Do you feel that there is adequate storage capacity?

Are there adequate working surfaces? Are these constructed of the appropriate materials? Do you think that there is adequate protection from sunlight? (48)

Is the pharmacy air conditioned? Does the air-conditioner work at the moment?

Are there any particular problems with the department at the moment?
Are these related to staff, equipment, facilities or other problems?

What else could be done to improve the services offered by the department?

QUESTIONNAIRE TO THEATRE MATRON

HOSPITAL:_____
INTERVIEWER/OBSERVER:_____
NAME OF MATRON: _____

Do you think that the hospital has the full range of equipment and instruments necessary to carry out the current range of operations performed in the hospital? (69)

Choose one statement:

full range of instruments and equipment necessary for the types of operations currently performed in the hospital

most necessary instruments and equipment available, some constraints experienced on occasion due to shortages

instruments and equipment clearly not adequate for current range of operations

Is there a steam autoclave of sufficient capacity to prevent delays in theatre? (72)

Is there a rapid autoclave for urgently required equipment. If not, what is done when something is urgently required? (72)

Is the effectiveness of autoclaving tested? If so, how often; is this recorded? (72)

Is there a service contract for the theatre equipment? Yes/No

How often are the main items of equipment serviced?

Servicing details of equipment:

Item	date of last service
Boyles machine	
Vaporiser	
Pulse oximeter	

How often are the gas and suction checked by hospital maintenance? Monthly or less frequently?

How often is the emergency trolley checked?

Are there any particular problems with the theatres at the moment?

Are these related to staff, equipment, facilities or other problems?

What could be done to improve the services delivered by the theatres

APPENDIX 10: DOCTORS' QUESTIONNAIRE FOR EVALUATION OF STRUCTURAL QUALITY OF CARE

QUESTIONNAIRE TO INDIVIDUAL FULL-TIME DOCTORS

HOSPITAL:_____

1. Do you think that the hospital has the full range of equipment and instruments necessary to carry out the current range of operations performed in the hospital? (69)

Choose one statement:

full range of instruments and equipment necessary for the types of operations currently performed in the hospital
most necessary instruments and equipment available, some constraints experienced on occasion due to shortages
instruments and equipment clearly not adequate for current range of operations

Any other comments on instruments, equipment or facilities in the theatres:

2. Which wards do you work in at the moment?

3. How frequently do you do a ward round? How long does this last?

4. Could you estimate how many hours per day you spend, on average, on the following activities (please complete the table)

ACTIVITY	Monday (hours spent)	Tuesday (hours spent)	Wednesday (hours spent)	Thursday (hours spent)	Friday (hours spent)
Ward rounds and ward work					
Outpatients Dept					
Operating theatre					
District services					
Other (specify)					

Additional comments:

5. If you requested an urgent laboratory specimen in working hours: in what percentage of cases would you have the result within 2 hours? (please tick appropriate choice)

90% of cases or more often
60-89% of cases
less than 60% of cases

6. If you requested a non urgent laboratory specimen in working hours: in what percentage of cases would you have the result within 24 hours? (please tick appropriate choice)

90% of cases or more often
60-89% of cases
less than 60% of cases

7. If you requested an urgent laboratory specimen **after working hours:** in what percentage of cases would you have the result within 2 hours? (please tick appropriate choice)

90% of cases or more often
60-89% of cases
less than 60% of cases

8. If you submitted an urgent Xray request **after working hours:** in what percentage of cases would you have the film within 2 hours?

90% of cases or more often
60-89% of cases
less than 60% of cases

9. What is your opinion of the quality of lab services at the hospital? Please explain your comments.

10. What is your opinion of the quality of Xray services at the hospital? Please explain your comments.

11. Are there any particular problems with the hospital at the moment?
Are these related to staff, equipment, facilities or other problems? Please explain your comments.

12. What could be done to improve the services delivered by the hospital? Please explain your comments.

APPENDIX 11: SURVEY INSTRUMENT FOR EVALUATION OF THE QUALITY OF NURSING CARE

A. Nursing care cluster[170]

1. Nursing assessment and diagnosis

		Criteria Scores
1.1 Patient assessment		
Good:	Patients interviewed, examined and information taken during admission	1.0
Satisfactory:	Record assessment only, using doctor's notes or other sources	0.5
Unsatisfactory:	No evidence of patient assessment	0.1
1.2 Information collected		
Good:	Relevant, complete, signed and dated	
Satisfactory:	Incomplete, but information recorded of satisfactory standard	0.5
Unsatisfactory:	Information not adequate for safe patient care	0.1
1.3 Nursing diagnosis		
Good:	All patient problems need nursing intervention are identified on a continuous basis	1.0
Satisfactory:	Emphasis on medical diagnosis; no full nursing diagnosis made	0.5
Unsatisfactory:	Patient problems needing nursing intervention not correctly diagnosed	0.1

2. Nursing care planning, monitoring and control

2.1 Nursing care planning		
Good:	Nursing Care Plan (NCP) well formulated according to nursing diagnosis	
Satisfactory:	NCP formulated, but not always appropriate	0.5
Unsatisfactory:	NCP poorly formulated, and/or use of the NCP not understood	0.1
2.2 Implementation of the NCP		
Good:	Implemented fully according to diagnosis and plan	
Satisfactory:	Only partially implemented	0.6
Unsatisfactory:	Not implemented at all	0.1

[170] This cluster was repeated for several wards in each hospital.

2.3 Use of patient records

Good:	Records complete, correct and up to date	
Unsatisfactory:	Records incomplete and/or incorrectly completed and/or not up to date	0.1

2.4 Use of temperature charts

Good:	Complete, correct and up to date	
Unsatisfactory:	Incomplete, and/or incorrect and/or not up to date	0.2

2.5 Use of input/output charts

Good:	Complete, correct and up to date	
Unsatisfactory:	Incomplete, and/or incorrect and/or not up to date	0.2

2.6 Use of medicines charts

Good:	Complete, correct and up to date	
Unsatisfactory:	Incomplete, and/or incorrect and/or not up to date	0.2

2.7 Recording of dependence producing drugs

Good:	Legal requirements satisfied; correct dosage given. Dosage given at correct time	
Unsatisfactory:	One or more of above criteria not met	0.2

2.8 NCP upgrading

Good:	NCP upgraded as often as required	
Satisfactory:	NCP upgraded at least daily	0.5
Unsatisfactory:	NCP not upgraded on regular basis, therefore nursing care unsafe	0.1

3. Equipment

3.1 Linen

Good:	Available in sufficient quantities; clean	
Unsatisfactory:	One or more of above criteria not fulfilled	0.2

3.2 Trays and trolleys

Good:	Complete, clean and well organised	
Satisfactory:	Clean and complete, but not well organised	0.6
Unsatisfactory:	Incomplete and/or not clean	0.1

3.3 Oxygen supply

Good:	Complete, clean and well organised	
Satisfactory:	Clean and complete, but not well organised	0.6
Unsatisfactory:	Incomplete and/or not clean	0.1

3.4 Checking of trays and emergency trolleys

Good:	Checked twice daily against check-list	
Satisfactory:	Checked daily against check-list	0.6
Unsatisfactory:	Checked less frequently than daily	0.3

4. Patient Diets

4.1 Normal diets

Good:	Nutritionally balanced diets available	
Unsatisfactory:	Normal patient diets not nutritionally balanced	0.3

4.2 Special Diets

Good:	Diets formulated according to patient's diagnosed need	
Unsatisfactory:	Required special diets either not available, or not meeting specific needs	0.1

B. Nursing management cluster

1. Human resource management

1.1 Staff awareness of and access to service conditions

Good:	All staff have own copy of service conditions, updated as appropriate	
Satisfactory:	Service conditions document available through hospital matron upon request	0.5
Unsatisfactory:	Service conditions document not available, or not readily accessible by staff	0.3

1.2 Staff satisfaction with salary and benefits

Good:	Staff generally satisfied with all aspects of salary and benefits	
Unsatisfactory:	Staff dissatisfied with elements of salary and benefits; disruptive to productive work environment	0.3

1.3 Recruitment and placement of staff

Good:	Staff selected and placed according to hospital's current requirements	
Unsatisfactory:	Staff selection and/or placement does not meet hospital's current requirements	0.3

1.4 Provision of occupational health services

Good:	Full service provided, catering for injuries on duty and for all other health care requirements	
Satisfactory:	Service for injuries on duty only	0.5
Unsatisfactory:	No occupational health service for nursing staff	0.1

1.5 Staff turnover

Good:	**Less than 10% per annum**	
Satisfactory:	**10-15% per annum**	**0.6**
Unsatisfactory:	**More than 15% per annum**	**0.1**

1.6 Absenteeism

Good:	**Low (in opinion of nursing service managers and hospital superintendent/manager)**	
Satisfactory:	**Average levels**	**0.6**
Unsatisfactory:	**High**	**0.1**

1.7 Provision of in-service training

Good:	**Minimum of monthly activities for all nurses. Training meets needs of both the institution and of staff members**	
Satisfactory:	**Minimum of monthly activities for all nurses. Training focussed on needs of the institution only**	**0.5**
Unsatisfactory:	**Training occurs less than monthly and/or does not meet needs of institution or of staff**	**0.2**

1.8 Availability of policy and procedure manuals

Good:	**Comprehensive policy and procedure manuals exist, and are available to staff as appropriate**	
Satisfactory:	**Adequate policy and procedure manuals exist, and are available to staff as appropriate**	**0.5**
Unsatisfactory:	**Policy and procedure manuals are incomplete or do not exist; or not available to staff as appropriate**	**0.3**

1.9 Matron's role in general hospital management

Good:	**Matron participates actively in policy decisions and daily management of the hospital**	
Satisfactory:	**Matron attends management meetings, but not fully included in all aspects of policy making and daily management**	**0.6**
Unsatisfactory:	**Matron not consulted on most aspects of hospital management**	**0.1**

1.10 Matron's interaction with nursing staff

Good:	**Meeting with all nursing staff at least monthly, and more often as required**	
Satisfactory:	**Meeting with all nursing staff monthly, but poor response to more urgent situations**	**0.5**
Unsatisfactory:	**Meetings occur less than monthly, or no organised meetings**	**0.2**

1.11 Nursing staff career development

Good:	**Study leave granted as appropriate. Short term leave for seminars/conferences also granted.**	
Satisfactory:	**No long term study leave allowances. Some short term leave arrangements**	**0.6**
Unsatisfactory:	**None of the above criteria met**	**0.2**

1.12 Staff to patient ratios

Good:	Ratios adequate for observed acuity level of patients	
Satisfactory:	Ratios adequate for most shifts, but evidence of some shifts where ratios inadequate	0.6
Unsatisfactory:	Ratios inadequate; presents danger to patient care	0.1

Table A11.1: Cluster and category weights for evaluation of the quality of nursing care

Nursing care: Maternity ward	
Nursing Assess/Diagnosis	0.31
Nursing care planning/monitoring/control	0.46
Equipment	0.15
Diet	0.08
Nursing care: Medical/Surgical wards	
Nursing Assess/Diagnosis	0.31
Nursing care planning/monitoring/control	0.46
Equipment	0.15
Diet	0.08
Nursing management	**0.35**

APPENDIX 12: DATA CAPTURE FORM FOR BEDSIDE REVIEW OF PATIENT RECORDS

WARD RECORD REVIEW

HOSPITAL:_____

WARD:_____

RECORD NO._____

Admitted less than 48 hrs ago **Yes/No**

If yes: hours since admission_____

Number of doctors' notes in last 48hrs_____

Examination and Treatment description described in detail? **Yes/No**

Interpretable **Yes/No**

Comments:

_____

_____

APPENDIX 13: INDICATORS INCLUDED AND EXCLUDED FROM ANALYSIS OF OUTCOMES OF CARE BY EXPERT CLINICIANS

	Indicators included	Indicators excluded
Hernia repair	Other complications	Delay between admission and operation Inadequate pre-operative assessment Wound sepsis
Appendectomy	Peritonitis Other complications Mortality	Delay between presentation and operation Delay between admission and operation Inadequate diagnostic work-up and pre-operative assessment Histology results absent Negative histology Wound sepsis
Normal deliveries	Third degree tears Puerperal sepsis Other complications	Failed assisted deliveries Partograph absent or incomplete
Caesarean Sections	Other complications	Wound sepsis Anaesthetic complications Proportion of elective cases
All maternity cases	Neonatal deaths Maternal deaths	

APPENDIX 14: DATA CAPTURE FORMS FOR QUALITY OF CARE ANALYSIS IN TRACER CONDITIONS

Hernia Repair Analysis Hospital_____

Age	Stay	Delay Adm.-Op	PreOp Assess	Duration	Sepsis	Other complications

C Section Analysis **Hospital**_____

Age	Parity	Elect or TOL[171]	Stay	Sepsis	Labs	Other complications Comments

[171] This refers to whether or not the caesarean section was carried out on an elective basis, or after a trial of labour. Although data on this indicator were not required for the analysis of outcomes of tracer conditions, it was anticipated that it might highlight interesting differences between the study hospitals, and was thus included.

NVD Analysis **Hospital**_____

Age	Parity	Stay	Third degree tear	Other complications/ eclampsia	Labs	Partograph Chart present/ complete	Comments

Appendectomy Analysis **Hospital**_____

Age	Stay	Delay Pres-Op	Delay admiss - op	Pre op invest	OP Durat.	Histo present/ Neg or Pos	Peritonitis	Sepsis	Other complications Comments

APPENDIX 15: DATA CAPTURE FORMS FOR EXPERT ANALYSIS OF OUTCOMES OF SURGICAL AND OBSTETRIC TRACER CONDITIONS

Data Entry form for expert analysis of tracer conditions

Tracer_____

Hospital_____

Record No._____

1. Indicator/s identified:

1._____

2._____

3._____

4._____

2. Evidence of poor outcomes of care:

_____

_____

_____

3. Poor outcomes possibly or probably avoidable
(specify which outcome, whether possibly or probably avoidable, and comments if appropriate)

_____

_____

_____

APPENDIX 16: INDIVIDUALS INTERVIEWED FOR ASSESSMENT OF MANAGEMENT STRUCTURES AND SYSTEMS, AND THE CONTRACTUAL ENVIRONMENT.

Ciskei Department of Health

Director-General, Department of Health
Dr L Bitalo, Chief Director, Hospital Services

Bisho Hospital

Dr Rubomboro, Hospital Superintendent
Mr Dube, Hospital administrator
Chief Nursing Service Manager

Gazankulu Department of Health

Dr P Robert, Director-General
Dr FRS Maluleke, Director, Medical Services
Mr Nkomonde, Chief Director, Finance
Mr Phakula, Chief Director, Administration

Tintswalo Hospital

Dr J Pienaar, Hospital Superintendent
Dr A Pugh, Superintendent, Community Services
Matron Maphanga, Chief Nursing Service Manager

Letaba Hospital

Dr RV Dando, Hospital Superintendent
Dr M Ncube, Deputy Superintendent
Matron Maluleka, Chief Nursing Service Manager

Lifecare Head Office

Mr WGM Somerville, Managing Director
Mr P Le Grange, Director, Contract Hospitals Division
Dr L Moolman, Medical Director
Mr Pote, Regional Director, Northern Transvaal
Mr van Huysteen, Regional Director, Eastern Cape

Hewu Hospital

Dr Thind, Medical Superintendent
Mr L Kum, Hospital Manager
Mr E Le Roux, Assistant Hospital Manager
Matron L Ntlale, Chief Matron

Matikwana Hospital

Mr W Theunissen, Hospital Manager
Dr Heimgartner, Hospital Superintendent
Matron T Madonsela, Chief Matron

Shiluvana Hospital

Mr WA Osborne, Hospital Manager
Dr MS Shilumani, Hospital Superintendent

HospiPlan Head Office

Mr N Sinclair-Thompson, Managing Director
Dr H Wicht , Medical Director
Mr Hein Kalitz, Financial Director

Nelspruit Hospital

Mr Anton Robbertse, Hospital Manager
Matron Kruger, Chief Nursing Service Manager

Pietersburg Private Hospital

Mr A Truttle, Hospital Manager
Matron van Jaarsfeld, Chief Nursing Service Manager

Afrox Head Office

Mr R Williamson, Managing Director
Mr B Davidson, Director

St Dominics Hospital

Dr Steve Taylor, Hospital Manager
Mr D Marais, Hospital Administrator
Matron F Thompson, Chief Matron

APPENDIX 17: STRUCTURED INTERVIEW SCHEDULES USED IN ANALYSIS OF MANAGEMENT STRUCTURES AND SYSTEMS, AND OF THE CONTRACTUAL ENVIRONMENT

Schedule 1: Management structures and processes, and 'transparency of trading'

For administration to: Head office officials of government departments
Senior executives of private and contractor hospital companies
Hospital managers at all hospitals

Head office and hospital management and management relationships

1. Describe the organisational and management structure of your head office and of each hospital

2. Describe the management relationship between head office and each hospital

   2.1. Is there any particular management philosophy which guides these relationships. How does this manifest itself?

   2.2. What is the division of responsibilities between head office and the hospital management. Can the local hospital manager take decisions over:

      2.2.1. Capital expenditure. If so, up to what level. If not, how are such decisions taken?

      2.2.2. Staffing issues: hiring, firing, remuneration levels. If not, how are such decisions taken?

      2.2.3. Other recurrent expenditure items?

      2.2.4. Clinical matters. If not, who takes such decisions; what is the role of the medical staff in these matters. What interface exists between management and clinicians/ clinical decision making?

   2.3. What incentives are there to encourage efficiency and productivity on the part of hospital management?

   2.4. Does the head office monitor efficiency, productivity and quality of care in hospitals?

      2.4.1. How is this done. How frequently. Describe systems of monitoring. What type of remedial actions are taken when deficiencies are found?

   2.5. What specific mechanisms does the company use to enhance efficiency; for example, bulk purchasing or other ways of achieving economies of scale?

3. What are the strengths and weaknesses of the management systems in the company. Are management systems reviewed periodically. Give examples of recent reviews, and any remedial actions taken?

Information systems

4. Describe the management information system (MIS) currently in operation at head office and at each hospital? Are these systems linked? Describe the functions of each.

   4.1. Does the hospital MIS cover both management and clinical information. At what level of detail in each case?

      4.1.1. Can the system generate data on the costs and utilisation of all relevant inputs, including capital, staff, drugs, supplies, transport etc.? Is data available for separate cost centres (alternatively, does the Head Office MIS contain this data)?

      4.1.2. Can the system generate data on costs and quantities of outputs? To what level of detail (costs per patient day at hospital/ward/case level; costs per operation etc.)?

   4.2. Are the staff using the MIS specifically trained for this purpose?

   4.3. Describe how the MIS is used in taking management and clinical decisions.

   4.4. What are the strengths and weaknesses of the MIS currently in operation? Are there any plans to improve the system?

The 'trading' relationship between purchasers and providers

5. Describe process by which the prices of your services are set. To what extent does detailed information on costs of inputs, expected utilisation rates etc. enter into price setting?

6. How do the 'purchasers' assess these prices? Do they have equivalent information on costs and prices of inputs and outputs, and of expected needs and utilisation rates?

7. Would you regard the trading relationship between you and the purchaser as transparent (needs, utilisation, costs of inputs and outputs are explicit)?

SCHEDULE 2: THE CONTRACTING PROCESS AND THE CONTRACTUAL ENVIRONMENT

For administration to: Head office officials of government departments
Senior executives of the contractor company

1. Overview of institution

1.1. Could you outline the structure of the department of health, and the functions of the various divisions/departments.

1.2. How many hospitals/beds fall under the administration of this department?

1.3. What proportion of these are operated under contract?

1.4. How long has the department/company been involved in contracting for hospital or other health services? Could you describe the history of this process.

1.5. Could you describe the different categories/types of contract currently in operation, including nature of services provided, the identity of the purchaser, and how many hospitals/beds fall into each category.

1.6. To whom does the department/company consider itself accountable?

1.7. What would you regard as the department/ministry's/company's main motivations?

1.8. How do these factors of accountability and motivation influence the contracting process? For example, do they influence choices over which services to let out for contract? (note: this relates to attitudes to risk - see below)

THE CURRENT CONTRACT

2. Mechanism of letting the contract

2.1. What factors influenced the decision of the department to contract out the services in this instance? For example, was this because the department believed that this would be the most efficient way to provide services, or because the department was not able to provide these services itself?

2.2. When was this contract awarded?

2.3. Was it a first or subsequent contract? If subsequent, what was the duration of the initial contract? On what basis was the initial contract awarded - competitive tender, direct negotiation, or some other mechanism?

2.4. On what basis was current contract awarded - competitive tender, direct negotiation, or some other mechanism?

2.5. If competitive - open or closed tender; how many competitors, who were the competitors, what factors entered into the decision to award the contract? How was the decision made?

2.6. If direct negotiation, could you describe the process?

2.7. Any explanations for why this form of contracting was used? Does this mechanism have any advantages over any of the other possible approaches to awarding contracts?

2.8. What proportion of total expenditure on hospital services does each of the contracts, and all contracts, account for?

3. Contract design

Scope and nature of contract, review mechanisms and contract duration

3.1. What are Lifecare's responsibilities in terms of provision of clinical and other services? What specific outputs are specified in the contract; in what level of detail are these specified? Are any standards of quality or other standards defined in the contract?

3.2. What are Lifecare's responsibilities, as defined in the contract, with respect to:

Capital items

3.3. Was investment in land, buildings, equipment etc. required? If so, what was the scale of this investment? If not, who owns the capital stock at present? Who is responsible for maintenance of buildings and equipment; what happens at termination of contract?

Staff

3.4. Who employs various categories of staff? If contractor - does purchaser have any influence over staffing decisions; if purchaser, does contractor exert any influence?

Supplies

3.5. Does the contract place any constraints on the contractor in terms of costs, the use of particular inputs (e.g. staff, supplies, drugs etc.), or any other constraints?

Contract review mechanisms

3.6. Are any performance review mechanisms built in to the contract? What are these? How frequently is contractor performance supposed to be reviewed? What happens with performance review in practice?

3.7. Are any penalties for breach of contract specified? What are these? Are they enforceable? Have their been contract related disputes or breaches of contract in the past, in this or other contracts? Were penalties applied in these or other cases?

What is the duration of the current contract? What is planned to happen at the end of the contract term? Will the contract be put out to competitive tender, or will another mechanism be used?

Reimbursement mechanisms

3.8. What is the payment mechanism/s specified in the contract?

3.9. Are there any minimum or maximum payment levels specified?

3.10. Are payments made promptly?

3.11. How do these payment mechanisms affect the riskiness of the contract from the departments perspective.

3.12. How do these payment mechanisms impact on the efficiency of contractor hospitals?

4. Attitudes to risk, and responses to contractual incentives

4.1. How does the department/company perceive the existing or potential risks in the present contractual situation?

4.2. Are risks assessed prior to agreeing a contract, and during the contract term? If yes, how is this done?

4.3. What strategies are undertaken to minimise risks?

4.4. What are the major risks in the current contract? Is this contract generally regarded as posing high, medium or low risk to the department/company? Could you give reasons for this?

4.5. Is there a conscious process of spreading risks between contracts? For example, would the presence of some low risk contracts encourage letting some more risky contracts?

4.6. What factors allow for risk spreading? For example, is this contract small relative to overall contract expenditure? (see question 2.9)

5. Performance of the contract

5.1. Do the current contracting arrangements encourage efficiency in the production of hospital services by Lifecare?

5.2. What are the effects of these contracting arrangements on the costs of services, and on the quality of care in Lifecare hospitals?

5.3. What specific aspects of the current contract encourage efficiency in production of hospital services?

5.4. What elements of the contract could be improved to enhance efficiency?

5.5. What are the advantages and disadvantages of the various contract models which Lifecare currently operates?

5.6. What would an ideal contract look like from your perspective?

5.7. Do you believe that contracting for hospital services is more efficient than direct public sector ownership and management of hospitals in terms of costs of services, quality of care, or any other factors? Can you give reasons for your answer? To what extent is this due to:

Competition for contracts (actual or potential competition) in the case of contractors
The particular incentives in the contract
The existence of a trading relationship between purchasers and contractors, in place of a direct management relationship
The approach to general and hospital management adopted by Lifecare as compared to public authorities
The profit motive
Other factors. Could you specify these?

5.8. What are the costs of the contracting process for your department, as compared to direct management of hospitals?

5.8.1 How many additional staff are required to monitor the contracts?

5.8.2 Are additional skills required for monitoring of contracts by the department?

5.8.3 Are there any other costs involved?

5.9. What are the benefits of contracting, as compared to direct management?

5.10. Do the benefits of contracting outweigh the costs?

5.11. Could you describe the liaison with the contractor hospitals and head office

5.12 Do you encounter any problems in the liaison process. How might these be solved?

SCHEDULE 3: COMPETITION AND MARKET CONDITIONS

For administration to: Head office officials of government departments
Senior executives of private and contractor hospital companies

Current patterns of competition in the private hospital sector

1. How would you describe present levels of competition in the private hospital sector?

2. Does the level of competition vary between different market segments, for example, different geographical areas or different types of services?

3. Have there been any significant changes in patterns of competition in the recent past? What are the explanations for these trends?

4. How do private hospitals compete at the moment; for example, is there direct competition for patients, or to encourage doctors to admit patients?

5. In making decisions, do you consider the impact of potential, as well as existing competitors?

6. Do you regard competition as positive? Are current levels of competition at the right level or not? Could you explain your answer

Factors promoting or hindering hospital competition

7. What factors in the current system do you believe promote competition? What factors hinder competition?

Legislative factors:

8. What specific aspects of government policy and legislation encourage/hinder competition (contracting policy, licensing regulations, other regulations etc.)?

   8.1. Are these aspects of policy adequately and uniformly enforced?
   8.2 Are they appropriate?
   8.3 What modifications would you make to these policies? Why?

Economic/technical factors

9. Do you believe that any of the following features of hospitals impact on the level of competition? If so, how?

   9.1 high start up costs of hospitals
   9.2 the specificity of hospital assets
   9.3 economies of scale
   9.4 geographical monopolies
   9.5 market segmentation/product differentiation by hospital operators

10. Does the current system of hospital financing (including reimbursement methods, sources of payment, payment arrangements) impact on competition?

Financial factors

11. What is your experience with obtaining investment capital for construction of new facilities?

12. What factors determine access to capital markets for hospital operators?

13. Have there been changes or trends in access to capital recently? What factors explain these trends?

14. Could access to investment capital be improved? If so, how (changes in structure of capital markets, changes in legislation)?

Prospects for expansion of contracting by the public sector for services provided by the private sector

15. Do you believe that there should be an expansion of public sector contracting for services provided by the private sector? Can you give reasons for this?

16. What would be the major advantages and disadvantages of a policy of this kind?

17. Assuming govt policy shifted in this direction, what would be the major obstacles to your participation in provision of services under contract. (legislative, economic, financial etc.) What would be the solutions to these obstacles?

18. Should competition between contractors be encouraged?

19. What would be the ideal structure of a contracting arrangement: (advantages and disadvantages in each case)?

20. Should private hospitals construct own facilities or lease public assets?

21. How should contracts be awarded - competitive tender or negotiation?

22. What should contract length be?

23. What form of payment systems should be used?

24. What form of monitoring/review systems should be used?

APPENDIX 18: PROBLEMS ENCOUNTERED IN EVALUATION OF CLINICAL RECORDS IN THE PRIVATE HOSPITALS

Most patients admitted to private hospitals tend to be initially assessed and investigated outside the hospital (usually in the doctor's consulting rooms). In the case of surgical patients, this interfered with the interpretation of findings concerning delays between initial presentation and operation, as well as of the adequacy of pre-operative investigation. Additional problems arise from the fact that patients in these hospitals tend to be discharged after shorter periods than those in the other study hospitals, with follow up again occurring in the doctor's consulting rooms. This may result in a bias towards lower rates of complications being detected in the analysis of the records from the first admission, since complications are more likely to arise after discharge, and may then be treated on an outpatient basis, or may result in a subsequent admission. It was also not possible to assess the histological results in most of the appendectomy cases in the private hospitals, since these appear to be sent directly to the doctors' rooms, rather than to the hospital itself.

A further problem noted in the private hospitals was the extreme paucity of notes recording the actual medical care provided to the patients. Since doctors treating patients in these hospitals very seldom make notes in the patient records, only changes in medication or other alterations in treatment are recorded by the nursing staff. The lack of medical notes proved a significant obstacle to a proper evaluation of the records from the private hospitals by the expert clinicians. In the case of the obstetric tracer conditions, for example, none of the records submitted from the private hospitals were regarded as suitable for evaluation of the causes of peri-natal and maternal mortality.

APPENDIX 19: HOSPITAL UTILISATION STATISTICS AND COST ANALYSIS

Table A19.1: Profile of services and ward structure

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tlats.	Letaba	Bisho	St Doms.	Piet.	Nels.
Outpatient services									
general	✓	✓	✓	✓	✓	✓		✓	✓
antenatal/postnatal	✓	✓	✓	✓	✓	✓			
other specialist				✓	✓	✓			
In-patient beds									
psychiatry	-	-	-	18	26	-	-	-	-
Tuberculosis	32	-	-	38	28	-	-	-	-
infectious diseases	-	-	-	35	26	-	-	-	-
ICU	-	-	-	-	-	-	4	4	3
day ward	-	-	-	-	-	24	9	-	-
medical	-	66	62	42	77	90	20	-	-
surgical	-	32	32	50	79	60	72	-	
adult medical/surgical	64	-	-	-	-	-	-	72	73
maternity	43	49	40	69	34	38	21	12	12
paediatrics	39	69	36	70	94	75	12	12	6
Total beds	*178*	*250*	*170*	*322*	*364*	*287*	*138*	*100*	*94*
Operating theatres	1	2	2	3	3	3	4	4	3
Nurse Training	✓	✓	✓	✓	✓	✓	✓	✓	✓
Community Services			✓	✓	✓	✓			

Note: ✓ indicates that services are provided

Table A19.2: Detailed hospital utilisation profiles

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.
In-patient admissions									
TB	111	0	0	275	131	0	0	0	0
Psychiatry	0	0	0	271	235	0	0	0	0
Infectious diseases	0	0	0	803	326	0	0	0	0
General medical	808	1620	919	2,239	2,925	3,241	1,346	986	1,903
All medical	919	1,620	919	3,588	3,617	3,241	1,346	986	1,903
Surgical	1,011	1,413	1,563	1,475	2,562	4,617	6,484	5,301	5,005
Maternity	2,424	1,407	1,262	4,392	2,044	2,276	1,056	801	751
Paediatrics	1,281	1,321	1,720	1,539	2,127	2,212	921	1,559	1,702
Total in-patient admissions	5,635	5,761	5,464	10,994	10,350	12,346	9,807	8,647	9,361
In-patient days									
TB	6800	0	0	4854	5643	0	0	0	0
Psychiatry	0	0	0	5258	4873	0	0	0	0
Infectious diseases	0	0	0	7242	6310	0	0	0	0
General medical	8,066	12,479	9,911	20,036	20,749	19,048	8,596	4,079	8,088
All medical	14,866	12,479	9,911	37,390	37,575	19,048	8,596	4,079	8,088
Surgical	9,076	9,806	12,282	16,547	24,219	18,969	20,736	18,119	13,831
Maternity	10,687	6,797	8,562	22,909	6,402	9,189	4,030	2,865	2,706
Paediatrics	11,532	20,646	18,416	14,464	19,371	14,300	2,484	2,276	3,823
Total in-patient days	46,161	49,728	49,170	91,310	87,567	61,506	35,846	27,339	28,448

Table A19.3: Turnover rate, by hospital and group

	Contractor			Public			Private			Mean			Median		
	Matik.	Hewa	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.	Con.	Public	Private	Con.	Public	Private
Medical	n/a[a]	24.2	14.8	27.0	23.0	32.5	56.1	n/a	n/a	19.5	27.5	56.1	19.5	27.0	n/a
Surgical	n/a	23.6	48.8	29.5	32.4	69.4	80.0	n/a	n/a	36.2	43.8	80.1	36.2	32.4	n/a
Adult	20.1	23.9	26.4	27.7	26.2	47.3	74.6	82.7	90.9	23.5	33.7	82.7	23.9	27.7	82.7
Maternity	56.4	27.6	31.6	63.7	60.1	59.9	50.3	66.8	62.6	38.5	61.2	59.9	31.6	60.1	62.6
Paediatrics	32.8	18.3	47.8	22.0	22.6	26.7	76.8	129.9	283.7	33.0	23.8	163.4	32.8	22.6	129.9
All in-patients	31.7	23.0	32.1	34.1	28.4	43.0	71.1	86.5	99.6	29.0	35.2	85.7	31.7	34.1	86.5

Notes: a: n/a - not applicable, since Matikwana, Pietersburg and Nelspruit hospitals do not have specific medical or surgical wards, preventing calculation of turnover rates for these wards.

Table A19.4: Average length of stay (days), by hospital and group

	Contractor			Public			Private			Mean			Median		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.	Con.	Public	Private	Con.	Public	Private
TB	61.3	n/a[a]	n/a	17.7	43.1	n/a	n/a	n/a	n/a	61.3	30.4	n/a	n/a	30.4	n/a
Psychiatry	n/a	n/a	n/a	19.4	20.7	n/a	n/a	n/a	n/a	n/a	20.1	n/a	n/a	20.7	n/a
Infectious diseases	n/a	n/a	n/a	9.0	19.4	n/a	n/a	n/a	n/a	n/a	14.2	n/a	n/a	14.2	n/a
General medical	10.0	7.7	10.8	9.0	7.1	5.9	6.4	4.1	4.3	9.5	7.3	4.9	10.0	7.1	4.3
All medical	16.2	7.7	10.8	10.4	10.4	5.9	6.4	4.1	4.3	11.6	8.9	4.9	1.8	10.4	4.3
Surgical	9.0	6.9	7.9	11.2	9.5	4.1	3.2	3.4	2.8	7.9	8.3	3.1	7.9	9.5	3.2
Maternity	4.4	4.8	6.8	5.2	3.1	4.0	3.8	3.6	3.6	5.3	4.1	3.7	4.8	4.0	3.6
Paediatrics	9.0	15.6	10.7	9.4	9.1	6.5	2.7	1.5	2.3	11.8	8.3	2.1	10.7	9.1	2.3
All in-patients	8.2	8.6	9.0	8.3	8.5	5.0	3.7	3.2	3.0	8.6	7.3	3.3	8.6	8.3	3.2
All in-patients - adjusted	8.2	8.2	8.6	8.7	7.7	4.9	3.9	3.1	3.1	8.3	7.1	3.4	8.2	7.7	3.1

Notes: a: n/a - not applicable, since these hospitals do not have dedicated TB, psychiatry and infectious diseases wards.

Table A19.5: Average Bed Occupancy Rates (%), by hospital and group

	Contractor			Public			Private			Mean			Median		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.	Con.	Public	Private	Con.	Public	Private
Medical	n/a[a]	51	44	77	66	52	98	n/a	n/a	n/a	65	n/a	n/a	66	n/a
Surgical	n/a	45	105	91	84	78	70	n/a	n/a	n/a	84	n/a	n/a	84	n/a
Adult	68	48	65	81	72	63	77	80	79	60	72	79	65	72	79
Maternity	68	37	59	91	52	66	53	65	62	54	70	60	59	66	62
Paediatrics	81	79	140	57	56	47	57	52	175	100	53	94	81	56	57
All in-patients	71	54	79	78	66	59	71	75	83	68	67	76	71	66	75
All in-patients - adjusted	71	51	84	80	64	61	70	70	95	67	68	77	71	64	70

Notes: a: n/a - not applicable, since ward structure at the hospital excludes these wards.
The very high occupancy rates in the paediatric wards at Shiluvana and Nelspruit hospitals are in part attributable to the practice of routinely using beds not formally defined as paediatric beds for use in the care of paediatric patients. This same phenomenon explains some of the increase in overall occupancy resulting from the service-mix adjustment at these two hospitals (6% and 14% respectively), since the hypothetical profile increases the relative proportion of paediatric cases at these two hospitals.

Table A19.6: Hospital expenditure profiles (Rand, 1992/93)

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tintz.	Letuba	Bisho	St Doms.	Piet.	Nels.
Outpatients	1,470,653	2,256,385	922,313	4,138,367	3,996,200	7,030,322	0	282,473	634,540
In-patients	5,713,759	8,817,265	6,864,715	13,955,432	16,892,212	19,582,469	19,113,564	14,673,219	13,769,276
Nurse training	115,350	67,975	156,771	357,137	397,859	1,155,060	187,821	0	0
Community services	12,316	147,406	1,302,295	8,377,464	5,378,278	13,130,094	0	0	0
Total	7,312,078	11,289,031	9,246,094	26,828,400	26,664,549	40,897,946	19,301,385	14,955,691	14,403,815

Table A19.7: Production costs adjusted for comparison with private hospitals (Rand, 1992/93)

	Contractor			Public			Private			Mean				Median			
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.	Con.	Pub.	Pvte	Pvte-Pub Margin[a] (%)	Con.	Pub.	Pvte	Pvte-Pub Margin (%)
In-patient days																	
Medical		120	138	123	159	266	377	675	390	129	183	481	163	129	159	390	145
Surgical		127	176	174	170	271	524	444	528	152	205	499	143	152	174	528	204
Adult medical/surgical	102	123	159	138	163	269	481	486	477	128	190	481	153	123	163	481	195
[illegible]	182	299	205	163	351	439	823	903	781	229	318	836	163	205	351	823	134
Paediatrics	95	54	70	107	151	311	681	569	370	73	190	540	185	70	151	569	278
All in-patient days	119	131	134	139	174	304	533	537	492	128	206	521	153	131	174	537	208
All in-patient days - adjusted	90	141	139	121	174	319	452	463	434	123	205	450	120	139	174	452	160
In-patient admissions																	
Medical		1,473	1,485	1,279	1,650	1,565	2,406	2,794	1,657	1,479	1,498	2,285	53	1,479	1,565	2,406	54
Surgical		1,415	1,385	1,952	1,608	1,115	1,676	1,516	1,460	1,400	1,558	1,551	0	1,400	1,608	1,516	-6
Adult medical/surgical	1,271	1,446	1,422	1,475	1,632	1,363	1,693	1,716	1,514	1,380	1,490	1,641	10	1,422	1,475	1,693	15
Maternity	801	1,663	1,391	849	1,100	1,772	3,142	3,231	2,816	1,285	1,240	3,063	147	1,391	1,100	3,142	186
Paediatrics	854	873	754	1,002	1,371	2,013	1,836	830	832	827	1,462	1,166	-20	854	1,371	832	-39
All in-patient admissions	974	1,464	1,204	1,158	1,474	1,515	1,949	1,697	1,494	1,214	1,382	1,713	24	1,204	1,474	1,697	15
All in-patient admissions - adjusted	1,049	1,382	1,268	1,197	1,427	1,617	2,126	1,945	1,728	1,233	1,413	1,933	37	1,268	1,427	1,945	36
Outpatient visits	89	113	27	38	62	183		345	146	76	95	246	160	89	62	246	297
Operations	1,132	871	679	567	680	3,164	977	396	472	894	1,471	615	-58	871	680	472	-31
Composite output	113	127	100	93	136	264	533	531	460	113	164	508	210	113	136	531	291
Composite output - adjusted	90	135	102	86	136	272	452	460	411	109	165	441	168	102	136	452	234

Notes: a: Margin here refers to the private- public margin, expressed as a percentage, and is calculated as: [(Pvte-Pub)/Pub] X 100

Table A19.8: Effects of different definitions of composite outputs on unit costs (Rand, 1992/93)

	Contractor			Public			Mean			Median		
	Matik.	Hewu	Shil.	Tint.	Letaba	Bisho	Con.	Public	Margin[a] (%)	Con.	Public	Margin (%)
Composite patient day output	123	140	108	107	157	288	124	184	49	123	157	27
Composite admission output	403	543	274	203	373	615	406	397	-2	403	373	-7

Notes: a: Margin refers to the public-contractor margin, expressed as a percentage, and is calculated as: [(Pub-Con)/Con] X 100

Table A19.9: Effects of variations in capital cost assumptions on capital and total costs (% change)

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.
Effects on capital costs									
4% Discount rate	-33	-34	-27	-33	-32	-37	-34	-31	-33
0% Discount rate	-60	-61	-49	-58	-57	-66	-61	-56	-59
Reduced lifespan	26	21	27	21	25	18	27	36	31
Equip. estimates (high)	35	26	39	26	34	19	22	32	26
Equip. estimates (low)	-4	-3	-5	-3	-4	-2	-10	-15	-12
Combined assumptions (high)	86	65	92	64	82	51	64	89	75
Combined assumptions (low)	-62	-63	-52	-60	-60	-67	-68	-66	-67
Effects on total hospital costs									
4% Discount rate	-5	-6	-3	-3	-3	-3	-4	-3	-4
0% Discount rate	-10	-11	-6	-6	-5	-6	-7	-6	-8
Reduced lifespan	4	4	3	2	2	2	3	4	4
Equip. estimates (high)	6	5	5	3	3	2	3	3	3
Equip. estimates (low)	-1	-1	-1	0	0	0	-1	-2	-2
Combined assumptions (high)	14	11	11	7	6	4	8	9	10
Combined assumptions (low)	-10	-11	-6	-6	-5	-6	-8	-7	-9

Figure A19.1: Effect of Variations in Assumptions on Capital Costs

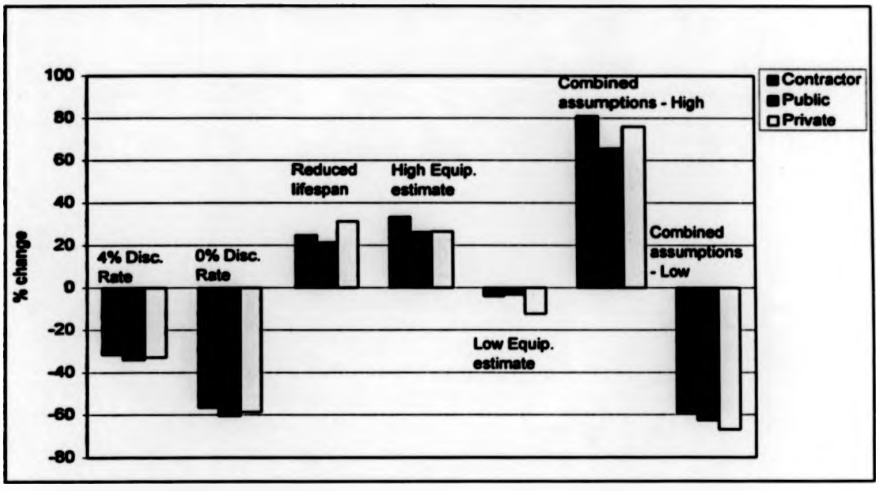

Figure A19.2: Effect of Variations in Assumptions on Total Costs

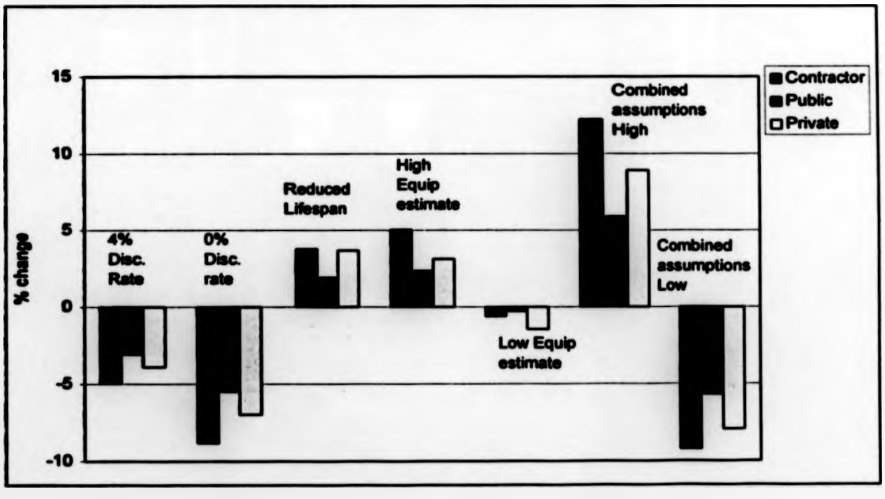

Table A19.10: Effects of variations in discount rate assumptions on estimates of unit production costs (Rand, 1992/93)

	Contractor			Public			Mean			Median		
	Matik.	Hewu	Shil.	Tintn.	Letsbo	Bisbo	Con.	Public	Margin	Con.	Public	Margin
Cost per day												
8%	124	137	140	153	193	318	133	221	66%	137	193	41%
4%	117	128	134	146	187	305	126	213	68%	128	187	46%
0%	112	121	130	141	183	294	121	206	70%	121	183	51%
Cost per admission												
8%	1,014	1,533	1,256	1,269	1,632	1,586	1,268	1,496	18%	1,256	1,586	26%
4%	958	1,433	1,206	1,212	1,584	1,518	1,199	1,438	20%	1,206	1,518	26%
0%	915	1,356	1,166	1,168	1,545	1,466	1,146	1,393	22%	1,166	1,466	26%
Cost per OPD visit												
8%	121	154	40	53	88	227	105	123	17%	121	88	-27%
4%	114	148	39	50	85	216	100	117	17%	114	85	-25%
0%	108	144	38	48	83	207	97	113	17%	108	83	-24%
Cost per composite output												
8%	123	140	108	107	157	288	124	184	49%	123	157	27%
4%	116	132	104	102	152	275	117	176	50%	116	152	31%
0%	111	125	100	98	149	265	112	171	52%	111	149	34%

Table A19.11: Effects of combined changes in capital cost assumptions on unit production cost estimates (Rand, 1992/93)

	Contractor			Public			Mean			Median		
	Matik.	Hewa	Shil.	Tints.	Letaba	Bisho	Con.	Public	Margin	Con.	Public	Margin
Cost per day												
Standard	124	137	140	153	193	318	133	221	66%	137	192.91	41%
High	142	153	158	168	209	341	151	239	58%	153	209.11	36%
Low	111	120	129	140	182	293	120	205	71%	121	182.11	51%
Cost per admission												
Standard	1,014	1,533	1,256	1,269	1,632	1,586	1,268	1,496	18%	1,256	1,586.19	26%
High	1,163	1,719	1,423	1,396	1,769	1,697	1,435	1,621	13%	1,423	1,697.21	19%
Low	910	1,350	1,160	1,163	1,541	1,462	1,140	1,389	22%	1,160	1,462.14	26%
Cost per OPD visit												
Standard	121	154	40	53	88	227	105	123	17%	121	88	-27%
High	134	166	45	57	94	239	115	130	13%	134	94	-30%
Low	108	144	38	48	83	207	97	113	17%	108	83	-23%
Cost per composite output												
Standard	123	140	108	107	157	288	124	184	49%	123	157	27%
High	140	156	122	117	170	307	139	198	42%	140	170	21%
Low	110	125	100	98	148	265	112	170	52%	110	148	34%

Commentary on sensitivity analysis of variations in capital cost assumptions

As discussed in Chapter 4, the first assumption varied was the level of the discount rate, and alternative rates of 4% and 0% were applied. Figure A19.1 shows that these variations produce significant, and very similar reductions in capital costs for the three groups. Figure A19.2 shows smaller reductions in total expenditure, with some relevant differences between the hospital groups: notably the contractors show the largest estimated reductions in total expenditure, while the public hospitals show the smallest reductions.[172]

Table A19.10 shows the effects of these variations on hospital unit costs for the contractor and public hospitals. These data confirm the greater reductions in unit costs at the contractor compared to public hospitals when lower discount rates are assumed, as illustrated by the higher public-contractor margins in costs per in-patient day, per admission and per composite output and by a narrowing of the negative margin in costs per OPD visit.

The second set of variations involved reduction in the estimated lifespans of buildings and equipment from 50 to 30 years, and from 10 years to 5 years, respectively. Figures 19.1 and 19.2 illustrate the estimated cost increases resulting from these changes to estimated lifespans. The estimated increases in capital costs vary more widely than the changes noted for variations in the discount rate, with private hospitals showing the largest estimated increases, followed by the contractors. In the case of total costs, contractors and private hospitals both show an estimated increase of 4%, while the equivalent public hospital figure is 2%. As discussed in Chapter 3, varying adjustment factors were used in the estimations of the replacement costs of hospital equipment. Figures A19.1 and A19.2 show the effect of changes in these

[172] The pattern in the reduction in total expenditure is the converse of that observed for the reductions in capital costs, and reflects the varying proportions of total hospital expenditure attributable to capital costs among the different hospital groups, with capital costs accounting for a higher percentage of total expenditure in the contractor hospitals than in the public hospitals.

adjustment factors, the high estimate reflecting the use of a factor of 1, and the low estimate a factor of 0.4.[173] As Figure A19.1 shows, the high estimate produces a significant increase in estimated capital costs, with contractors showing the largest increase, while the low estimate produces a much smaller reduction in these figures. A similar pattern is demonstrated in the case of total hospital expenditure shown in Figure A19.2.[174]

Figures A19.1 and A19.2 also show the effect of two extreme combinations of these variations in capital cost assumptions. The 'high' value refers to a combination of the assumptions producing the maximum estimate in all cases (8% discount rate, 30 and 5 year lifespans and equipment adjustment factor of 1), while the 'low' value refers to the combination producing the minimum estimate (4% discount rate, 50 and 10 year lifespans, adjustment factor of 0.4). As Figure A19.1 shows, both high and low sets of assumptions produce significant changes in estimated total capital expenditure, with greater increases for the high set than decreases for the low set. Figure A19.2 shows a similar relationship between the high and low sets of assumptions, with the contractor hospitals in this case showing the largest overall changes on both sets of estimates. The differences in the responses of the contractor and public hospitals (which again reflect the different proportions of total expenditure accounted for by capital costs) are reflected in Table A19.11 in this Appendix, which shows the effect of these two sets of combined assumptions on unit costs. As the table shows, the high estimate reduces the public-contractor margin for all outputs (since contractor costs are increased proportionately more than public hospital costs), whereas the opposite is the case for the low estimates.

---

[173] A factor of 1 has the effect of no adjustment to the estimated total replacement costs, while 0.4 has the effect of a 60% reduction.

[174] In the standard assumptions, contractor and public hospitals' equipment replacement costs were adjusted by a factor of 0.47 and private hospital costs by a factor of 0.59. These differences, together with the differences in capital intensity, account for the differential responses of the different groups to these variations in adjustment factors.

Table A19.12: Factor analysis of hospital expenditure (Rand, 1992/93)

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.
Recurrent Costs									
External admin. overhead	376,327	373,685	416,125	3,438,055	3,102,892	2,861,706	506,000	719,222	676,069
Internal admin./domestic	840,973	1,287,208	1,020,360	2,825,078	3,695,587	5,061,804	2,493,714	2,333,306	2,483,126
Staff[a]	4,162,820	6,282,526	6,170,731	14,286,783	14,583,386	26,383,625	9,534,667	5,060,915	5,151,168
Drugs, outside lab. tests and blood supplies	739,714	1,070,106	504,405	3,473,216	3,564,626	3,002,335	4,398,249	5,266,903	4,260,260
Total Recurrent	6,119,834	9,013,525	8,111,622	24,023,131	24,946,491	37,309,470	16,932,630	13,380,346	12,570,623
Capital Costs									
Buildings	763,174	1,321,991	504,289	1,790,499	1,283,106	2,850,546	1,579,425	844,049	1,134,790
Equipment	429,070	596,547	384,121	627,589	626,299	609,049	747,677	721,792	688,903
Total Capital Costs	1,192,244	1,918,538	1,134,473	2,805,307	2,134,552	3,619,315	2,368,755	1,575,340	1,833,192
Total annual expenditure	7,312,078	10,932,063	9,246,095	26,828,438	27,081,043	40,928,785	19,301,385	14,955,686	14,403,815
RCC ratio (Total)	51%	46%	70%	89%	120%	95%	112%	104%	114%
RCC ratio (excluding community)	51%	46%	65%	64%	97%	64%	112%	104%	114%
% Variable[b]	19%	16%	8%	17%	18%	10%	25%	40%	35%

Notes: a: Staff costs refer to medical, paramedical and nursing staff costs. Other staff costs are incorporated within the other two recurrent cost categories.
b: Percentage of total costs accounted for by variable costs

Table A19.13: Composition of in-patient day costs, adjusted for comparison with private hospitals (Rand, 1992/93)

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.
External administration	7.09	4.35	7.55	13.09	18.70	15.66	16.86	18.64	19.08
Internal administration	2.77	2.40	1.94	0.36	0.54	6.53	28.28	20.34	19.18
Admin. total	*9.87*	*6.75*	*9.49*	*13.45*	*19.24*	*22.19*	*45.14*	*38.98*	*38.26*
Transport	2.55	3.32	9.16	6.62	6.93	3.90	10.07	0.65	2.13
Laundry	6.92	5.17	7.55	5.39	5.28	19.25	3.18	4.09	4.73
Catering	12.02	8.76	12.96	11.07	17.33	27.26	16.31	25.79	28.24
Housekeeping/Maintenance	5.53	9.96	12.94	11.37	22.75	35.62	24.20	32.54	27.88
Domestic services total	*27.02*	*27.21*	*42.61*	*34.44*	*52.30*	*86.03*	*53.76*	*63.07*	*62.98*
Pharmacy	8.05	10.32	5.61	7.54	8.73	11.49	58.23	193.95	149.67
Radiology	0.64	3.04	2.64	1.10	0.97	1.05	0.00	0.00	0.00
Rehabilitation services	0.55	0.22	1.71	1.75	1.83	5.15	0.00	0.00	0.00
Laboratory	2.76	1.94	1.01	2.18	10.59	3.73	0.00	0.00	0.00
Operating theatres	21.45	16.79	20.81	22.75	26.34	38.79	175.59	95.13	98.22
Clinical support services total	*33.43*	*32.32*	*31.79*	*35.32*	*48.46*	*60.20*	*233.82*	*289.08*	*247.88*
Nursing Staff	43.67	57.55	48.40	53.69	60.30	129.75	168.74	121.53	120.13
Medical Staff	1.66	1.87	1.40	8.32	5.34	4.39	0.00	0.00	0.00
Staff total[a]	*45.33*	59.41	49.80	62.00	65.64	134.14	168.74	122.63	121.20
Capital costs	8.13	11.17	5.92	7.62	7.27	15.82	31.75	22.96	21.45
Total costs	123.78	136.87	139.61	152.84	192.91	318.38	533.21	536.72	491.77
Total fixed costs	108.75	120.97	126.44	111.49	149.68	255.49	407.97	320.71	317.02
Total variable costs	15.03	15.89	13.17	41.35	43.22	62.89	125.24	216.02	174.75

Notes: a: Staff costs refer to medical, paramedical and nursing staff costs. Other staff costs are incorporated within the other recurrent cost categories.

Table A19.14: Composition of outpatient visit costs, adjusted for comparison with private hospitals (Rand, 1992/93)

	Contractor			Public			Private		
	Matik.	Hewa	Shil.	Tlats.	Letaba	Bisho	St Doms.	Piet.	Nels.
External administration	4.88	3.36	1.79	4.28	4.12	11.31	n/a[b]	26.53	8.15
Internal administration	1.91	1.85	0.46	0.12	0.12	4.72	n/a	28.96	8.19
Admin total	*6.78*	*5.21*	*2.26*	*4.40*	*4.24*	*16.03*	*n/a*	*55.49*	*16.34*
Transport	6.97	12.38	0.00	1.83	19.54	5.84	n/a	0.55	2.16
Laundry	1.58	1.76	1.79	1.79	1.54	6.32	n/a	1.14	1.14
Catering	1.09	1.56	0.58	0.82	1.00	8.50	n/a	10.41	0.00
Housekeeping/Maintenance	7.02	4.10	1.51	2.43	11.29	26.99	n/a	47.59	15.31
Domestic services total	*16.66*	*19.79*	*3.87*	*6.87*	*33.37*	*47.65*	*n/a*	*59.68*	*18.60*
Pharmacy	16.52	30.57	5.15	6.51	6.13	11.70	n/a	25.02	34.80
Radiology	7.28	12.80	2.68	1.80	4.82	13.31	n/a	0.00	0.00
Rehabilitation services	2.62	1.11	3.61	3.40	6.15	4.60	n/a	0.00	0.00
Laboratory	3.10	2.10	1.88	1.46	0.51	2.21	n/a	0.00	0.00
Operating theatres	0.00	0.00	0.00	0.00	0.00	0.00	n/a	0.00	0.00
Clinical support services total	*29.53*	*46.59*	*13.33*	*13.17*	*17.61*	*31.81*	*n/a*	*25.02*	*34.80*
Nursing Staff	32.43	44.37	11.79	15.31	13.70	94.55	n/a	150.71	58.39
Paramedical staff	1.52	1.03	0.00	0.00	1.18	1.09	n/a	0.00	0.00
Medical Staff	21.98	30.61	7.50	8.32	14.14	22.63	n/a	0.00	0.00
Other staff	0.00	0.00	0.00	1.93	0.00	0.00	n/a	0.00	0.00
Staff total[a]	*55.93*	*76.01*	*19.29*	*25.56*	*29.02*	*118.27*	*n/a*	*150.71*	*58.39*
Capital costs	*11.61*	*6.42*	*1.36*	*2.84*	*3.43*	*13.45*	*n/a*	*54.43*	*17.92*
Total costs	*120.51*	*154.02*	*40.11*	*52.84*	*87.67*	*227.22*	*n/a*	*345.32*	*146.04*
Total fixed costs	*109.89*	*134.38*	*37.12*	*46.64*	*81.51*	*217.18*	*n/a*	*323.14*	*117.34*
Total variable costs	*10.62*	*19.64*	*2.99*	*6.20*	*6.16*	*10.04*	*n/a*	*22.18*	*28.71*

Notes: a: Staff costs refer to medical, paramedical and nursing staff costs. Other staff costs are incorporated within the other recurrent cost categories.
b: n/a - not applicable since no OPD at St Dominics

Table A19.15: Staff to output ratios (per 1000)

	Contractor			Public			Private			Mean			Median		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.	Con.	Pub.	Pvte.	Con.	Pub.	Pvte.
Staff per composite output:															
All Nurses	1.74	1.74	1.94	2.54	2.82	6.21	4.63	4.13	4.47	1.81	3.86	4.41	1.74	2.82	4.47
Professional nurses	0.52	0.67	0.59	0.86	0.78	1.83	2.73	2.16	2.73	0.59	1.16	2.54	0.59	0.86	2.73
Other nurses	1.22	1.08	1.34	1.68	2.03	4.38	1.90	1.97	1.74	1.21	2.70	1.87	1.22	2.03	1.90
Administrative/domestic staff	1.12	1.03	1.57	1.18	1.66	4.30	0.66	1.79	1.75	1.24	2.38	1.40	1.12	1.66	1.75
Medical/paramedical staff	0.17	0.14	0.11	0.31	0.48	0.21	0.12	0.00	0.00	0.14	0.33	0.04	0.14	0.31	n/a[a]
All staff	3.03	2.90	4.16	4.72	5.50	11.24	5.55	6.36	6.69	3.37	7.16	6.20	3.03	5.50	6.36
All nurses per[b]:															
In-patient day	1.62	1.54	1.71	2.21	2.62	5.22	3.49	3.07	3.62	1.62	3.35	3.39	1.62	2.62	3.49
In-patient admission	13.31	17.21	15.37	18.37	22.13	26.00	12.75	9.72	11.00	15.30	22.17	11.16	15.37	22.13	11.00
Outpatient visit	1.07	1.23	0.43	0.64	0.50	3.75	0.00	4.58	3.17	0.91	1.63	2.59	1.07	0.64	3.17
Operation	11.24	10.56	5.98	10.17	10.75	59.68	5.59	3.70	4.56	9.26	26.87	4.62	10.56	10.75	4.56

Notes: a: n/a - not applicable, since no medical and paramedical staff employed at Pietersburg and Nelspruit hospitals.
b: Only nurses working in the respective services where included in the calculation of these ratios.

Table A19.16: Tracer cost analysis: caesarean sections (costs per case in Rand, 1992/93)

Contractor	Matikwana					Hewu					Shiluvana				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	7.00	21.00	11.28	0.54	11.00	7.00	44.00	12.71	1.49	10.00	7.00	40.00	11.57	1.51	10.00
Lab. Costs	0	35	8	2.75	5	0	117	13	5	4	0	46	5	3	0
Drug Costs	0	61	15	4.81	9	0	232	23	13	13	0	132	40	7	39
Theatre Costs	n/a	n/a	1,742	n/a	n/a	n/a	n/a	1,304	n/a	n/a	n/a	n/a	1,422	n/a	n/a
Hotel and Staff Costs	973	2,920	1,569	76	1,530	1,454	9,137	2,639	310	2,077	1,231	7,032	2,034	266	1,758
Total production cost	2,749	4,708	3,326	76	3,272	2,758	10,449	3,968	312	3,411	2,703	8,482	3,499	266	3,216
Total Prod Cost (adj. for pvte)	2,736	4,666	3,299	75	3,252	2,724	10,229	3,894	304	3,345	2,656	8,203	3,416	255	3,148
Total Contract Cost	3,175	5,988	4,013	109	3,942	3,148	12,902	4,677	395	3,968	3,295	11,863	4,477	393	4,061
Public	Tintswalo					Letaba					Bisho				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	5	17	8.22	0.66	8	4	14	6.56	0.49	6	5	19	8.01	0.54	8
Lab Costs	0	75	7	4	0	0	126	17	7	4	0	77	7	3	4
Drug Costs	0	61	15	5	9	0	90	25	5	19	0	94	18	4	17
Theatre Costs	n/a	n/a	1,221	n/a	n/a	n/a	n/a	932	n/a	n/a	n/a	n/a	5,580	n/a	n/a
Hotel and Staff Costs	671	2,283	1,103	89	1,074	1,061	3,713	1,741	129	1,591	1,673	6,357	2,681	179	2,677
Total production cost	1,892	3,564	2,338	91	2,295	2,012	4,771	2,714	133	2,552	7,253	11,940	8,285	179	8,262
Total Prod Cost (adj. for pvte)	1,857	3,393	2,273	85	2,239	1,931	4,380	2,571	121	2,429	7,233	11,864	8,247	177	8,226

Table A19.16: Tracer cost analysis: caesarean sections (costs per case in Rand, 1992/93) (contd.)

Private	St Dominics					Pietersburg					Nelspruit				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	2	44	5	0.96	5	1	40	6	0.88	5	3	37	6	1.11	5
Drug Costs	106	1496	496	61	512	n/a	n/a	994	n/a	n/a	n/a	n/a	1,169	n/a	n/a
Theatre Costs	n/a	n/a	1,000	n/a	n/a	n/a	n/a	383	n/a	n/a	n/a	n/a	416	n/a	n/a
Hotel and Staff Costs	1,240	27,280	3,304	594	2,790	653	26,122	3,617	574	3,265	1,618	19,957	3,003	598	2,697
Total production cost	2,803	28,843	4,867	594	4,353	2,031	27,500	4,995	574	4,643	3,203	21,542	4,587	598	4,282

Notes: n/a (not available) indicates that average costs, rather than individual costs per case, where used. As a result, statistical analysis could not be carried out for that parameter. In the caesarean section analysis, this was the case for theatre costs at all hospitals, and for drug costs at Nelspruit and Pietersburg hospitals.

Table A19.17: Tracer cost analysis: normal deliveries (costs per case in Rand, 1992/93)

Contractor	Matikwana					Hewu					Shiluvana				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	1.00	6.00	2.21	0.18	2.00	1.00	31.00	4.40	1.14	3.00	1.50	24.00	4.78	0.88	3.50
Lab. Costs	0	8	2	1	0	0	57	5	2	4	0	4	0	0	0
Drug Costs	0	16	2	1	2	0	0	0	0.00	0	0	109	26	21	17
Hotel and Staff Costs	139	834	307	25	278	208	6,437	914	237	623	264	4,219	840	154	615
Total production cost	139	836	310	25	283	208	6,441	919	237	631	264	4,219	842	154	631
Total Prod Cost (adj. for pvte)	137	825	304	25	276	203	6,288	893	231	609	254	4,058	810	148	608
Total sontract Cost	200	1,202	445	36	405	263	8,169	1,165	301	799	390	6,248	1,246	229	927
Public	**Tintswalo**					**Letaba**					**Bisho**				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	2	26	3.88	0.85	3	1	11	2.11	0.39	2	n/a	n/a	3.76	n/a	n/a
Lab. Costs	0	25	0	1	0	0	132	9	6	4	n/a	n/a	0	n/a	n/a
Drug Costs	1	20	2	1	1	0	12	4	4	3	n/a	n/a	67	n/a	n/a
Hotel and Staff Costs	269	3,491	521	114	403	265	2,917	559	104	530	n/a	n/a	1,258	n/a	n/a
Total production cost	270	3,494	524	114	404	265	3,049	568	109	530	n/a	n/a	1,325	n/a	n/a
Total Prod Cost (adj. for pvte)	255	3,310	496	108	383	246	2,706	518	97	492	n/a	n/a	1,310	n/a	n/a

Table A19.17: Tracer cost analysis: normal deliveries (costs per case in Rand, 1992/93) (contd.)

Private	St Dominics					Pietersburg					Nelspruit				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	2	8	3	0.31	4	1	6	3	0.24	3	1	15	4	0.73	4
Drug Costs	n/a	n/a	460	n/a	n/a	n/a	n/a	437	n/a	n/a	n/a	n/a	422	n/a	n/a
Hotel and Staff Costs	930	4960	2,166	192	2170	653	3,918	1,663	154	1,632	539	8,090	2,043	391	1,888
Total production cost	1,390	5,420	2,627	192	2,630	1,090	4,355	2,100	154	2,069	962	8,513	2,465	391	2,310

Notes: n/a (not available) indicates that average costs for the relevant ward, rather than individual costs per case, where used. As a result, statistical analysis could not be carried out for that parameter. In the NVD analysis, this was the case for drug costs at the private hospitals, and for all parameters at Bisho hospital.

Table A19.18: Tracer cost analysis: appendectomy (costs per case in Rand, 1992/93)

Contractors	Matikwana					Hewu					Shiluvana				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	7.00	33.00	15.67	5.70	12.00	6.00	42.00	14.00	8.28	11.00	6.50	7.00	6.75	0.49	6.75
Lab. Costs	0	249	85	60	64	0	55	24	16	23	0	0	0	0.00	0
Drug Costs	1	50	24	8	24	6	125	56	26	50	7	34	22	16	26
Theatre costs	n/a	n/a	1,888	n/a	n/a	n/a	n/a	1,849	n/a	n/a	n/a	n/a	2,098	n/a	n/a
Hotel and Staff Costs	528	2,487	1,181	430	904	624	4,371	1,457	862	1,145	768	827	798	58	798
Total Production cost	2,430	4,402	3,159	445	2,962	2,479	6,262	3,385	852	3,082	2,891	2,959	2,925	66	2,925
Total Prod Cost (adj. for pvte)	2,407	4,294	3,041	412	2,803	2,439	5,982	3,268	800	2,970	2,851	2,916	2,884	63	2,884
Total Contract Cost	2,661	5,492	3,676	632	3,358	2,646	7,436	3,777	1,083	3,390	3,261	3,357	3,309	94	3,309
Public	Tintswalo					Letaba					Bisho				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	3	14	8.13	2.17	8	4	23	8.43	4.86	6	n/a	n/a	n/a	n/a	n/a
Lab. Costs	0	84	40	22	45	24	87	57	15	52	n/a	n/a	n/a	n/a	n/a
Drug Costs	0	134	37	34	12	0	134	42	38	21	n/a	n/a	n/a	n/a	n/a
Theatre costs	n/a	n/a	1,140	n/a	n/a	n/a	n/a	956	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hotel and Staff Costs	317	1,478	858	229	792	471	2,711	993	572	707	n/a	n/a	n/a	n/a	n/a
Total production cost	1,502	2,698	2,071	237	2,022	1,503	3,754	2,049	574	1,746	n/a	n/a	n/a	n/a	n/a
Total Prod Cost (adj. for pvte)	1,443	2,470	1,947	201	1,919	1,397	3,489	1,927	528	1,638	n/a	n/a	n/a	n/a	n/a

Table A19.18: Tracer cost analysis: appendectomy (costs per case in Rand, 1992/93) (contd.)

Private	St Dominics					Pietersburg					Nelspruit				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	1	11	4	0.40	3	1	9	3	0.38	3	1	9	3	0.38	3
Drug Costs	217	1155	458	44	402	n/a	n/a	742	n/a	n/a	n/a	n/a	487	n/a	n/a
Theatre costs	n/a	n/a	829	n/a	n/a	n/a	n/a	453	n/a	n/a	n/a	n/a	465	n/a	n/a
Hotel and Staff Costs	213	2,240	767	85	640	161	1,445	525	60	442	265	1,237	536	51	530
Total production cost	1,490	3,517	2,044	85	1,917	1,356	2,640	1,720	60	1,637	1,217	2,189	1,488	51	1,482

Notes: n/a (not available) indicates that average costs for the relevant ward, rather than individual costs per case, where used. As a result, statistical analysis could not be carried out for that parameter. In the appendectomy analysis, this was the case for theatre costs at all hospitals, and drug costs at Pietersburg and Nelspruit hospitals. No cases were identified at Bisho hospital during the study year.

Table A19.19: Tracer cost analysis: hernia repair (costs per case in Rand, 1992/93)

Contractor	Matikwana					Hewu					Shiluvana				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	3.00	13.00	8.00	1.55	7.00	7.00	13.00	10.00	2.53	10.00	9.50	14.00	12.17	2.67	13.00
Lab. Costs	0	40	5	6	0	0	52	15	25	4	0	23	8	15	0
Drug Costs	0	229	20	25	3	1	33	10	15	2	8	59	33	29	32
Theatre costs	n/a	n/a	2,482	n/a	n/a	n/a	n/a	1,452	n/a	n/a	n/a	n/a	1,502	n/a	n/a
Hotel and Staff Costs	226	980	603	117	528	729	1,353	1,041	263	1,041	1,123	1,655	1,438	316	1,536
Total Production Cost	2,708	3,517	3,114	121	3,085	2,184	2,810	2,518	277	2,538	2,684	3,212	2,981	306	3,046
Total Prod Cost (adj. for pvte)	2,699	3,439	3,083	114	3,059	2,138	2,720	2,436	250	2,444	2,625	3,103	2,898	279	2,966
Total Contract Cost	2,808	3,946	3,379	171	3,349	2,380	3,173	2,797	347	2,818	3,223	4,007	3,672	457	3,785
Public	**Tintswalo**					**Letaba**					**Bisho**				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	3	7	5.56	0.93	6	3	27	10.75	7.00	9	n/a	n/a	n/a	n/a	n/a
Lab Costs	0	0	0		0	0	123	38	39	28	n/a	n/a	n/a	n/a	n/a
Drug Costs	0	120	15	21	6	1	28	8	7	4	n/a	n/a	n/a	n/a	n/a
Theatre costs	n/a	n/a	1,136	n/a	n/a	n/a	n/a	1,182	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hotel and Staff Costs	317	739	586	99	633	354	3,182	1,267	825	1,002	n/a	n/a	n/a	n/a	n/a
Total production cost	1,459	1,892	1,732	100	1,779	1,537	4,489	2,494	853	2,215	n/a	n/a	n/a	n/a	n/a
Total Prod Cost (adj. for pvte)	1,428	1,821	1,675	90	1,718	1,513	7,022	2,565	447	2,024	n/a	n/a	n/a	n/a	n/a

Table A19.19: Tracer cost analysis: hernia repair (costs per case in Rand, 1992/93) (Contd.)

Private	St Dominics					Pietersburg					Nelspruit				
	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median	Min.	Max.	Mean	CI (95%)	Median
Length of Stay	1	11	2	0.38	2	1	11	4	0.54	4	1	6	3	0.35	3
Drug Costs	104	1,742	319	57	283	n/a	n/a	437	n/a	n/a	n/a	n/a	422	n/a	n/a
Theatre costs	n/a	n/a	958	n/a	n/a	n/a	n/a	384	n/a	n/a	n/a	n/a	439	n/a	n/a
Hotel and Staff Costs	107	2,347	497	81	427	161	1,766	598	86	562	177	1,060	459	62	442
Total production cost	1,388	3,629	1,779	81	1,709	1,153	2,759	1,590	86	1,554	971	1,855	1,253	62	1,236

Notes: n/a (not available) indicates that average costs for the relevant ward, rather than individual costs per case, where used. As a result, statistical analysis could not be carried out for that parameter. No cases were identified at Bisho hospital during the study year.

Table A19.20: Regression of age and sex against costs

	Age			Sex		
	R2	F statistic	F significant[a]	R2	F statistic	F significant[a]
Caesarean Section						
Contractor/public hospitals	0.0002	0.07	0.78	n/a	n/a	n/a
Private Hospitals	0.0037	0.68	0.41	n/a	n/a	n/a
Normal Delivery						
Contractor/public hospitals	0.0072	2.31	0.12		n/a	n/a
Private Hospitals	0.015	3.4	0.41		n/a	n/a
Appendectomy						
Contractor/public hospitals	0.05	2.05	0.16	0.014	0.361	0.55
Private Hospitals	0.04	9.7	0.002	0.002	0.133	0.71
Hernia Repair						
Contractor/public hospitals	0.06	3.65	0.06	0.007	0.36	0.54
Private Hospitals	0.09	17	0	0.13	9.53	0.003

Notes: a. The value of the F statistic above which statistical significance at the 5% level is reached.

Table A19.21: Effects of variations in discount rate on comparison of total contract costs and public sector production costs (Rand, 1992/93)

	Total Contract Costs			Public Sector Produn. Costs			Mean Values			Median Values		
	Matik.	Hewu	Shilu.	Tints.	Letaba	Bisho	Con.	Pub.	Margin	Con.	Pub.	Margin
In-patient days												
8%	178	174	207	153	193	318	186	221	19%	178	193	8%
4%	178	174	207	146	187	305	186	213	14%	178	187	5%
0%	178	174	207	141	183	294	186	206	11%	178	183	3%
Admissions												
8%	1458	1945	1860	1,269	1,632	1,586	1755	1,496	-15%	1860	1,586	-15%
4%	1458	1945	1860	1,212	1,584	1,518	1755	1,438	-18%	1860	1,518	-18%
0%	1458	1945	1860	1,168	1,545	1,466	1755	1,393	-21%	1860	1,466	-21%
OPD visits												
8%	173	195	n/a[a]	53	88	227	184	123	-33%	184	88	-52%
4%	173	195	n/a	50	85	216	184	117	-36%	184	85	-54%
0%	173	195	n/a	48	83	207	184	113	-39%	184	83	-55%
Composite outputs												
8%	177	178	154	107	157	288	169	184	9%	177	157	-11%
4%	177	178	154	102	152	275	169	176	4%	177	152	-14%
0%	177	178	154	98	149	265	169	171	1%	177	149	-16%

Notes: a: n/a - not applicable, since OPD visits at Shiluvana hospital were excluded from the contract.

Table A19.22: Effects of combined variations in capital cost assumptions on comparison of total contract costs and public sector production costs (Rand 1992/93)

	Total Contract Costs			Public Sector Prodn. Costs			Mean Values			Median Values		
	Matik.	Hewu	Shilu.	Tints.	Letaba	Bisho	Con.	Pub.	Margin	Con.	Pub.	Margin
In-patient days												
Standard	178	174	207	153	193	318	186	221	19%	174	193	11%
High	178	174	207	168	209	341	186	239	29%	174	209	20%
Low	178	174	207	140	182	293	186	205	10%	174	182	5%
Admissions												
Standard	1,458	1,945	1,860	1,269	1,632	1,586	1,755	1,496	-15%	1,860	1,586	-15%
High	1,458	1,945	1,860	1,396	1,769	1,697	1,755	1,621	-8%	1,860	1,697	-9%
Low	1,458	1,945	1,860	1,163	1,541	1,462	1,755	1,389	-21%	1,860	1,462	-21%
OPD visits												
Standard	173	195	n/a[a]	53	88	227	184	123	-34%	184	88	-52%
High	173	195	n/a	57	94	239	184	130	-29%	184	94	-49%
Low	173	195	n/a	48	83	207	184	113	-39%	184	83	-55%
Composite outputs												
Standard	177	178	154	107	157	288	169	184	8%	154	157	2%
High	177	178	154	117	170	307	169	198	17%	154	170	10%
Low	177	178	154	98	148	265	169	170	0%	154	148	-4%

Notes: a: n/a - not applicable, since OPD visits at Shiluvana hospital were excluded from the contract.

Table A19.23: Effect of removal of capital costs on comparison of total contract cost and public sector production costs (Rand 1992/93)

	Total Contract Costs			Public Sector Produn. Costs			Mean Values			Median Values		
	Matik.	Hewu	Shilu.	Tintu.	Letaba	Bisho	Con.	Pub.	Margin	Con.	Pub.	Margin
In-Patient days												
Total	178	174	207	153	193	318	186	221	19%	174	186	7%
Elimination of capital costs	178	174	207	145	186	303	186	211	13%	174	186	7%
Admissions												
Total	1,458	1,945	1,860	1,269	1,632	1,586	1,755	1,496	-15%	1,860	1,586	-15%
Elimination of capital costs	1,458	1,945	1,860	1,206	1,571	1,507	1,755	1,428	-19%	1,860	1,507	-19%
OPD visits												
Total	173	195	n/a[a]	53	88	227	184	123	-34%	184	88	-52%
Elimination of capital costs	173	195	n/a	50	84	214	184	116	-37%	184	84	-54%

Notes: a: n/a - not applicable, since OPD visits at Shiluvana hospital were excluded from the contract.

APPENDIX 20: DATA ENVELOPMENT ANALYSIS

Table A20.1: DEA results - comparison of contractor and public hospitals (VRS)

	Con.			Pub.			Mean	
	Matik.	Hewu	Shilu	Tints.	Letaba	Bisho	Con.	Pub.
Medical/Surgical wards								
Model 1	1.0000	0.9253	1.0000	1.0000	1.0000	1.0000	0.9751	1.0000
Model 2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Paediatric ward								
Model 1	1.0000	0.6052	1.0000	0.8306	1.0000	1.0000	0.8684	0.9435
Model 2	1.0000	0.6505	1.0000	0.8306	1.0000	1.0000	0.8835	0.9435
Maternity ward								
Model 1	0.9415	1.0000	0.4316	1.0000	1.0000	0.4391	0.7910	0.8130
Model 2	1.0000	1.0000	0.4316	1.0000	1.0000	0.4391	0.8105	0.8130
All wards								
Model 1	1.0000	0.6102	1.0000	1.0000	1.0000	1.0000	0.8701	1.0000
Model 2	1.0000	0.6307	1.0000	1.0000	1.0000	1.0000	0.8769	1.0000
Outpatient Dept.								
Model 1	0.3328	0.2604	1.0000	0.7590	0.4575	0.1765	0.5311	0.4644
Model 2	0.6198	0.4051	1.0000	1.0000	0.5594	0.1969	0.6750	0.5854
Operating theatres	1.0000	0.9297	1.0000	1.0000	0.7950	0.4150	0.9766	0.7367
Whole hospital								
Model 1	1.0000	0.6997	1.0000	1.0000	1.0000	1.0000	0.8999	1.0000
Model 2	1.0000	0.6976	1.0000	1.0000	1.0000	1.0000	0.8992	1.0000
Whole hospital - SQOC quality adjusted								
Model 1	1.0000	0.7128	1.0000	1.0000	1.0000	1.0000	0.9043	1.0000
Model 2	1.0000	0.7128	1.0000	1.0000	1.0000	1.0000	0.9043	1.0000
Whole hospital - NQOC quality adjusted								
Model 1	1.0000	0.6485	1.0000	1.0000	0.6059	0.5156	0.8828	0.7072
Model 2	1.0000	0.6485	1.0000	1.0000	0.6059	1.0000	0.8828	0.8686
Whole hospital - Combined quality adjusted								
Model 1	1.0000	0.6569	1.0000	1.0000	0.6902	0.6480	0.8856	0.7794
Model 2	1.0000	0.6569	1.0000	1.0000	0.6902	1.0000	0.8856	0.8967

Note: a. Adjusted for quality of nursing care, as measured by the survey instrument.

Table A20.2: DEA - effects of in-patient days vs. admissions as key output variable in comparison of contractor and public hospitals

	Con.			Pub.			Mean	
	Matik.	Hewu	Shilu	Tints.	Letaba	Bisho	Con.	Pub
Medical/Surgical wards								
Admissions	1.0000	0.8770	1.0000	1.0000	0.6893	1.0000	0.9590	0.8964
Days	1.0000	0.9182	1.0000	0.5679	0.5202	0.4309	0.9727	0.5063
Paediatric ward								
Admissions	0.9562	0.5787	1.0000	0.8178	0.6341	0.4778	0.8450	0.6432
Days	0.8040	0.8710	1.0000	0.7178	0.5394	0.2885	0.8917	0.5152
Maternity ward								
Admissions	0.7164	1.0000	0.3853	0.7337	1.0000	0.3651	0.7006	0.6996
Days	0.5674	1.0000	0.4696	0.6876	0.3205	0.2648	0.6790	0.4243
All wards								
Admissions	1.0000	0.6066	1.0000	0.9193	0.8091	0.7028	0.8689	0.8104
Days	1.0000	0.8390	1.0000	0.8713	0.7467	0.4188	0.9463	0.6789
Whole hospital								
Admissions	1.0000	0.6943	1.0000	1.0000	0.7551	0.6030	0.8981	0.7860
Days	1.0000	0.9056	1.0000	1.0000	0.7540	0.3743	0.9685	0.7094

Table A20.3: DEA - comparison of all hospitals (VRS)

	Contractor			Public			Private			Mean		
	Matik.	Hewu	Shilu	Tints.	Letuba	Bisho	St. Doms.	Piet.	Nels.	Con.	Pub	Pri
Medical/surgical wards												
Model 1	1.0000	0.9162	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9721	1.0000	1.0000
Model 2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Paediatric ward												
Model 1	0.8592	0.5053	1.0000	0.6198	1.0000	1.0000	0.8612	1.0000	1.0000	0.7882	0.8733	0.9537
Model 2	1.0000	0.5085	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8362	1.0000	1.0000
Maternity ward												
Model 1	0.9359	1.0000	0.4258	1.0000	1.0000	0.4315	0.2276	0.2687	0.3293	0.7872	0.8105	0.2752
Model 2	1.0000	1.0000	0.4934	1.0000	1.0000	0.4389	0.2549	0.3044	0.3711	0.8311	0.8130	0.3101
All wards												
Model 1	1.0000	0.5955	1.0000	1.0000	1.0000	1.0000	0.3053	0.4399	0.4601	0.8652	1.0000	0.4017
Model 2	1.0000	0.6318	1.0000	1.0000	1.0000	1.0000	0.8933	0.8794	1.0000	0.8773	1.0000	0.9242
Outpatient Dept.												
Model 1	0.4155	0.2931	1.0000	1.0000	0.5339	0.1560	n/a[a]	1.0000	0.7432	0.8448	0.5633	0.8716
Model 2	0.4155	0.2931	1.0000	1.0000	1.0000	0.1560	n/a	1.0000	0.7432	0.9766	0.6227	0.9293
Operating theatres	1.0000	0.9297	1.0000	0.7980	0.6551	0.4150	0.4072	1.0000	0.8586	0.9766	0.6227	0.7553
Whole hospital												
Model 1	1.0000	0.6981	1.0000	1.0000	1.0000	1.0000	n/a	1.0000	1.0000	0.8994	1.0000	1.0000
Model 2	1.0000	0.6981	1.0000	1.0000	1.0000	1.0000	n/a	1.0000	1.0000	0.8994	1.0000	1.0000
Whole hospital - SQOC quality adjusted												
Model 1	1.0000	0.7017	1.0000	1.0000	0.8226	1.0000	n/a	1.0000	1.0000	0.9006	0.9409	1.0000
Model 2	1.0000	0.7017	1.0000	1.0000	1.0000	1.0000	n/a	1.0000	1.0000	0.9006	1.0000	1.0000
Whole hospital - NQOC quality adjusted												
Model 1	1.0000	0.6530	1.0000	1.0000	0.5629	0.4166	n/a	1.0000	1.0000	0.8843	0.6598	1.0000
Model 2	1.0000	0.6530	1.0000	1.0000	0.5629	1.0000	n/a	1.0000	1.0000	0.8843	0.8543	1.0000
Whole hospital - Combined quality adjusted												
Model 1	1.0000	0.6625	1.0000	1.0000	0.6527	0.5461	n/a	1.0000	1.0000	0.8875	0.7329	1.0000
Model 2	1.0000	0.6625	1.0000	1.0000	0.6527	1.0000	n/a	1.0000	1.0000	0.8875	0.8842	1.0000

Notes: a: n/a - not applicable since no OPD at St Dominics. Whole hospital analysis includes wards and OPD, and thus not required at St Dominics.

Table A20.4: DEA - comparison of single and multiple output models

	Contractor			Public			Private			Mean		
	Matik.	Hewu	Shilu	Tints.	Letaba	Bisho	St. Doms.	Piet.	Nels.	Con.	Pub	Pri
All wards												
Total admissions	1.0000	0.6066	1.0000	0.9193	0.8091	0.7028	0.8689	0.8104	1.0000	0.8753	0.8594	0.6062
Admissions by service-mix	1.0000	0.9345	1.0000	1.0000	1.0000	1.0000	0.9782	1.0000	1.0000	1.0000	1.0000	1.0000
Whole hospital												
Total admissions	1.0000	0.6943	1.0000	1.0000	0.7551	0.6030	0.8981	0.7860	1.0000	0.8993	0.9199	1.0000
Admissions by service-mix	1.0000	0.9175	1.0000	1.0000	1.0000	0.9387	0.9725	0.9796	1.0000	1.0000	1.0000	1.0000

Table A20.5: DEA - comparison of input models 1 and 3

	Contractor			Public			Private			Mean		
	Matik.	Hewu	Shilu	Tints.	Letaba	Bisho	St. Doms.	Piet.	Nels.	Con.	Pub	Pri
Medical/Surgical wards												
Model 1	1.0000	0.8798	0.9180	1.0000	0.7281	0.9812	1.0000	1.0000	1.0000	0.9326	0.9031	1.0000
Model 3	1.0000	1.0000	1.0000	1.0000	0.9473	1.0000	1.0000	1.0000	1.0000	1.0000	0.9824	1.0000
Paediatric ward												
Model 1	0.7062	0.4154	0.7358	0.6118	0.4553	0.3440	0.5091	1.0000	0.8076	0.6191	0.4704	0.8076
Model 3	1.0000	0.4783	1.0000	1.0000	0.5890	0.4417	0.6623	1.0000	1.0000	0.8261	0.6769	1.0000
Maternity ward												
Model 1	0.6902	1.0000	0.3802	0.7076	1.0000	0.3506	0.1701	0.1524	0.1751	0.6901	0.6860	0.1701
Model 3	1.0000	1.0000	0.4404	1.0000	1.0000	0.3764	0.1905	0.1726	0.1973	0.8135	0.7921	0.1905
All wards												
Model 1	0.5224	0.3173	1.0000	1.0000	0.8551	0.3681	0.2735	0.3488	0.3940	0.6132	0.7411	0.3488
Model 3	1.0000	1.0000	1.0000	0.9380	0.8328	0.8073	1.0000	0.9242	1.0000	1.0000	0.8594	1.0000
Outpatient Dept												
Model 1	0.2909	0.2297	1.0000	0.6801	0.4104	0.1332	n/a[a]	0.0708	0.1673	0.5069	0.4079	0.1190
Model 3	0.2909	0.2297	1.0000	0.6801	0.4011	0.1332	n/a	0.0708	0.1672	0.5069	0.4048	0.1190
Whole hospital												
Model 1	1.0000	0.6979	1.0000	1.0000	0.7596	0.5916	n/a	1.0000	1.0000	0.8993	0.7837	1.0000
Model 3	1.0000	0.6979	1.0000	1.0000	0.7596	1.0000	n/a	1.0000	1.0000	0.8993	0.9199	1.0000
Whole hospital - SQOC quality adjusted												
Model 1	1.0000	0.6859	1.0000	1.0000	0.8324	0.6526	n/a	1.0000	1.0000	0.8953	0.8283	1.0000
Model 3	1.0000	1.0000	1.0000	1.0000	0.8709	1.0000	n/a	1.0000	1.0000	1.0000	0.9570	1.0000
Whole hospital - NQOC quality adjusted												
Model 1	1.0000	0.4611	1.0000	1.0000	0.5620	0.3774	n/a	1.0000	1.0000	0.8204	0.6465	1.0000
Model 3	1.0000	0.4611	1.0000	1.0000	0.5620	1.0000	n/a	1.0000	1.0000	0.8204	0.8540	1.0000
Whole hospital - Combined quality adjusted												
Model 1	1.0000	0.5454	1.0000	1.0000	0.6428	0.4805	n/a	1.0000	1.0000	0.8485	0.7078	1.0000
Model 3	1.0000	0.5454	1.0000	1.0000	0.6794	1.0000	n/a	1.0000	1.0000	0.8485	0.8931	1.0000

Note: Input Model 1 (Base model) aggregated production costs into two categories - total recurrent costs and capital costs: Input Model 3 divided production costs into 8 variables: administrative costs, domestic services costs, drug costs, X-ray and laboratory investigations costs, theatre costs, nursing staff costs, medical, paramedical and other staff costs, and capital cost

a n/a - not applicable since no OPD at St Dominics. Whole hospital analysis includes wards and OPD, and thus not required at St Dominics.

Table A20.6: DEA analysis of tracer conditions at contractor and public hospitals (VRS)

	Contractor			Public			Mean	
	Matik.	Hewu	Shilu	Tints.	Letaba	Bisho	Con.	Pub
Caesarean section								
Production costs only	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Con. Price vs. Pub. sector production costs	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Normal Deliveries								
Production costs only	1.0000	1.0000	1.0000	1.0000	0.6912	1.0000	1.0000	0.8971
Con. Price vs. Pub. sector production costs	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Appendectomy								
Production costs only	1.0000	1.0000	1.0000	1.0000	1.0000	n/a[a]	1.0000	1.0000
Con. Price vs. Pub. sector production costs	1.0000	1.0000	1.0000	1.0000	1.0000	n/a	1.0000	1.0000
Hernia Repair								
Production costs only	0.5651	1.0000	0.7112	1.0000	1.0000	n/a	0.7588	1.0000
Con. Price vs. Pub. sector production costs	0.5223	1.0000	0.6145	1.0000	1.0000	n/a	0.7123	1.0000

Notes: a: n/a - not applicable, since no appendectomy or hernia repair cases undertaken at Bisho hospital during the study year.

APPENDIX 21: EVALUATION OF STRUCTURAL QUALITY OF CARE

Table A21.1: Evaluation of structural quality of care: category and cluster scores for individual hospitals (% max. possible score)

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.
Administration/ management									
Staff	49	82	65	49	49	89	93	49	93
Functions	71	88	71	71	59	56	95	75	71
MIS	17	17	17	100	17	17	100	100	100
Patient record system	89	99	75	78	82	95	80	72	79
Utilities/services	100	93	79	79	74	93	93	100	93
Total	61	75	60	74	54	68	92	76	86
Laboratory									
Staff	28	40	28	63	80	89	n/a	n/a	n/a
Functions	51	69	69	92	76	79	n/a	n/a	n/a
Supplies and equipment	100	100	100	80	60	100	n/a	n/a	n/a
Buildings	71	100	100	67	84	100	n/a	n/a	n/a
Total	56	70	66	78	75	88	n/a	n/a	n/a
Radiology Dept									
Staff	59	59	59	72	72	72	n/a	n/a	n/a
Functions	88	82	93	75	82	81	n/a	n/a	n/a
Supplies and equipment	100	92	92	97	79	100	n/a	n/a	n/a
Buildings	100	100	100	50	63	100	n/a	n/a	n/a
Total	87	83	86	76	75	88	n/a	n/a	n/a
Pharmacy									
Staff	87	87	94	94	100	87	94	94	94
Functions	95	100	95	89	100	52	88	79	77
Supplies and equipment	84	84	42	100	100	100	100	77	100
Buildings	100	93	79	100	68	100	93	100	93
Total	89	89	74	96	95	86	95	86	92
Clinical Staff									
Medical staff	73	61	69	80	92	68	n/a	n/a	n/a
Nursing staff	79	70	81	100	94	97	93	100	100
Ancillary services	14	14	14	100	100	100	n/a	n/a	n/a
Total	66	57	66	91	94	84	93	100	100
Operating theatres									
Staff	100	100	100	100	100	100	100	50	50
Functions	90	60	60	100	90	60	100	100	100
Supplies and equipment	99	88	84	89	89	94	100	100	96
Buildings	100	100	100	100	67	100	100	100	100
Total	98	88	87	97	88	90	100	85	84

Notes: n/a - not applicable, since laboratory and radiology services not provided directly by private hospitals, and clinical staff working in the private hospitals are self employed, and not regarded as part of the staff of these hospitals.

Table A21.1: Evaluation of structural quality of care: category and cluster scores for individual hospitals (% max. possible score) (contd.)

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.
Outpatients Dept									
Staff	100	100	50	50	100	100	n/a	0	0
Functions	87	100	87	100	100	100	n/a	71	71
Supplies and equipment	62	77	62	88	100	77	n/a	100	100
Buildings	100	100	100	100	85	100	n/a	100	100
Total	86	93	71	81	97	93	n/a	92	92
Maternity Ward									
Supplies and equipment	72	80	66	75	78	75	100	71	86
Buildings	93	100	93	93	87	100	100	100	100
Total	77	84	71	78	79	80	100	77	89
Other wards									
Supplies and equipment	59	67	47	54	60	72	59	90	72
Buildings	93	99	94	75	78	98	100	100	97
Total	66	73	57	58	64	77	68	92	77
All Wards	71	78	64	68	72	79	84	85	83
Grand Total	75	76	71	84	82	84	92	86	89

Notes: n/a - not applicable, since no OPD at St. Dominics hospital

Table A21.2: Evaluation of structural quality of care: aggregated category scores for individual hospitals (% max. possible score)

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St Doms.	Piet.	Nels.
Staff	79	78	78	89	96	92	94	81	88
Supplies and equipment	82	83	67	83	82	89	87	89	90
Buildings	96	99	95	85	72	100	98	100	98
Functions/Services	72	76	70	87	73	67	93	85	84

Table A21.3: Evaluation of structural quality of care: individual criteria scores for groups

	Contractor	Public	Private
Staff			
Admin			
Managers qualifications	0.53	0.60	0.73
Administrator's qualifications	0.57	0.43	0.77
Nursing Managers qualifications	1.00	1.00	0.93
In-service training (senior staff)	0.73	0.73	0.93
In-service training (domestic staff)	0.60	0.40	0.60
Laboratory			
Staff numbers and qualifications	0.20	0.93	0.00
In-service training	0.53	0.67	0.00
Xray Dept			
Staff numbers and qualifications	0.50	0.75	0.00
In-service training	0.70	0.70	0.00
Pharmacy			
Staff numbers and qualifications	1.00	1.00	1.00
In-service training	0.79	0.88	0.88
Clinical personnel			
Medical staff	0.60	1.00	0.00
Medical staff to bed ratio	1.00	1.00	0.00
Experience of medical staff	0.50	0.67	0.00
F/T or P/T physician	0.60	0.80	0.00
F/T or P/T surgeon	0.60	0.73	0.00
F/T or P/T obstetrician	0.73	0.73	0.00
F/T or P/T paediatrician	0.70	0.80	0.00
F/T or P/T psychiatrist	0.60	0.70	0.00
% Drs with full registration	0.87	0.93	0.00
Supervision of junior doctors	0.79	0.87	0.00
Nursing staff			
Total nursing staff complement	0.50	1.00	1.00
Registered nurses as % total	1.00	0.90	1.00
Nurse assistants as % total	0.82	0.95	1.00
Night cover	0.80	1.00	1.00
In-service training	0.90	1.00	0.90
Ancillary medical staff			
Physiotherapist to pt day ratio	0.45	1.00	0.00
Speech therapist to pt day ratio	0.60	1.00	0.00
Occupational Therapist to pt day ratio	0.50	1.00	0.00
Operating theatres			
Staff numbers	1.00	1.00	0.67
OPD			
Staff numbers	0.83	0.83	0.00
Functions			
Admin			
Frequency/organisation of meetings	0.87	0.70	0.80
Manager's financial awareness	1.00	0.83	1.00
Existence of MIS	0.10	0.40	1.00
Data collected in MIS	0.30	0.53	1.00
Use of MIS	0.15	0.43	1.00
Patient record storage	1.00	1.00	0.40
Patient record retrieval	0.73	0.73	0.90
Patient details in record	0.89	0.83	0.99
Internal organisation of records	0.93	0.89	0.98
Water supply	0.77	0.70	0.87
Backup power system	1.00	0.83	1.00

Table A21.3: Evaluation of structural quality of care: individual criteria scores for groups (contd.)

	Contractor	Public	Private
Waste disposal	1.00	1.00	1.00
Laboratory			
Basic investigations	0.40	1.00	0.00
Additional investigations	0.70	0.93	0.00
Quality assurance	0.53	0.93	0.00
Response to urgent requests	0.67	0.73	0.00
Response to routine requests	0.87	0.67	0.00
After hours service	0.67	0.83	0.00
Xray Dept			
Fluoroscopy facility	0.83	0.75	0.00
Ultrasound facility	1.00	1.00	0.00
Compliance with safety requirement	0.73	0.67	0.00
Response to urgent requests	1.00	0.80	0.00
Pharmacy			
Clinical pharmacy activities	0.93	0.80	0.60
Outpatient labelling	1.00	0.87	0.87
Outpatient dispensing functions	0.93	0.77	0.93
Stock control and management	1.00	0.80	0.93
Operating theatres			
Range of operations	0.70	0.83	1.00
OPD			
Patient flow	1.00	1.00	0.67
Availability of specialist clinics	0.83	1.00	0.33
Supplies			
Laboratory reagents/disposables	1.00	0.80	0.00
Xray reagents/disposables	0.97	0.97	0.00
Pharmacy stock levels	0.87	1.00	0.87
Equipment			
Laboratory			
Condition/maint. of chemistry analyser	0.67	0.93	0.00
Condition/maint. of haematology analyser	0.60	0.93	0.00
X Ray Dept			
Age and maintenance of Xray machines	0.93	0.88	0.00
Pharmacy			
Pharmacy refrigeration equipment	0.57	1.00	1.00
Operating Theatres			
Availability of surgical instruments	0.87	0.87	1.00
Emergency trolley	1.00	1.00	1.00
DC Defibrillator	1.00	1.00	1.00
Sterilisation facilities	0.90	0.90	0.97
Recovery area	0.80	0.93	1.00
Recovery equipment	0.57	0.57	1.00
Anaesthetic machine	1.00	1.00	0.93
Ventilators	1.00	1.00	0.93
Gas supply	1.00	1.00	1.00
Suction equipment	1.00	1.00	1.00
Pulse oximeters	0.92	1.00	0.96
Servicing of equipment	0.87	0.87	1.00
ECG monitors (theatre)	0.85	0.80	1.00
Laryngoscopes	1.00	1.00	1.00
Masks	1.00	1.00	1.00
Oral airways	1.00	1.00	1.00
Endotracheal tubes	1.00	1.00	1.00
Diathermy equipment	0.95	0.83	1.00
Automated blood pressure monitors	0.80	0.80	1.00

Table A21.3: Evaluation of structural quality of care: individual criteria scores for groups (contd.)

	Contractor	Public	Private
OPD			
Consulting room equipment	1.00	1.00	0.67
Emergency trolley	0.60	1.00	0.67
ECG monitor	0.60	0.87	0.67
DC Defibrillator	0.60	0.73	0.67
Maternity ward			
Scrubbing facilities	1.00	0.80	1.00
Oxygen supply	1.00	1.00	1.00
Neonatal resuscitation equipment	0.50	0.63	1.00
Vacuum extractor	0.87	1.00	1.00
Cardiotocograph	0.50	1.00	1.00
Emergency trolley	0.87	0.87	0.60
ECG monitor	0.50	0.50	0.67
DC defibrillator	0.65	0.65	0.77
Nursery incubator facilities	1.00	1.00	1.00
Nursery resuscitation equipment	0.57	0.35	0.78
Phototherapy facilities	1.00	1.00	1.00
General wards			
Baumanometers	0.63	0.80	1.00
Emergency trolley	0.54	0.62	0.69
ECG monitor	0.60	0.60	0.62
DC defibrillator	0.35	0.35	0.56
Bedscreens	0.97	0.94	1.00
Buildings			
Laboratory			
Condition	1.00	0.97	0.00
Adequacy of space and organisation	0.83	0.73	0.00
Xray dept			
Condition	1.00	0.67	0.00
Adequacy of space and organisation	1.00	0.77	0.00
Pharmacy			
Condition	1.00	0.97	1.00
Adequacy of space and storage/organisation	0.77	0.83	0.87
Air conditioning	1.00	0.90	1.00
Operating theatres			
Condition	1.00	0.92	1.00
Adequacy of space and organisation	1.00	1.00	1.00
OPD			
Condition	1.00	0.95	0.67
Cleanliness	1.00	0.87	0.67
Adequacy of space and organisation	1.00	1.00	0.67
Patient ablution facilities	1.00	1.00	0.67
Maternity ward			
Condition	1.00	1.00	1.00
Nurses station	0.80	0.80	1.00
Cleanliness	1.00	1.00	1.00
Delivery and preparation rooms	1.00	1.00	1.00
Patient ablution facilities	1.00	0.90	1.00
General wards			
Condition	1.00	0.75	1.00
Cleanliness	1.00	0.88	1.00
Adequacy of space and organisation	0.97	0.87	1.00
Nurses station	0.80	0.81	0.98
Staff ablution facilities	1.00	0.88	0.97
Patient ablution facilities	0.98	0.85	1.00

Commentary on Table A21.3

The table shows the mean values of the raw scores for individual criteria, obtained by each of the groups. These data show that in the case of the aggregated *staff* category, for example, the superiority of the contractor group in the staff aspects of the administration cluster is attributable only to better performance on the issue of the qualifications of the hospital administrator. In the case of the operating theatres and OPD clusters, the contractor and public groups show the same performance in regards to staff, which relates in this case to questions of adequacy of staff complements. With few exceptions, the contractors perform more poorly than the public hospitals on all staff related criteria in all of the remaining clusters. These criteria primarily concern staff numbers and levels of training, focussing specifically on medical and nursing staff. In the case of medical staff, for example, the contractor group performs more poorly than the public group in terms of the total numbers of doctors, the presence of specialists and supervision of junior doctors, and the proportion of doctors with full registration. The only exception to this pattern is the equal performance of the two groups on the question of the total number of years of experience of the medical staff.

Similarly, in the case of nurses, the contractor hospitals appear inferior to the public hospitals on questions relating to total numbers of nurses, the proportion of nursing staff at the nurse assistant level, levels of night cover and the adequacy of in-service training. Interestingly, the one exception to this pattern here is the superior performance of the contractors on the question of the proportion of total nursing staff who are registered nurses. In the case of para-medical staff, the contractors perform worse than the public group on questions of numbers of staff in all categories of ancillary personnel.

Similar observations can be made from analysis of the data for the aggregated *functions* category. Here, the superior performance of the contractor group in the administration cluster is seen to be attributable to superior performance on criteria

concerned with the frequency of management meetings, the level of financial awareness of the manager, and the adequacy of in-service training. On the question of patient records, the two groups demonstrated equal performance in criteria concerned with storage and retrieval of records, but the contractors were again superior on issues relating to the detail kept in records and internal organisation of records.

Analysis of the functioning of the clinical support services cluster presents a more mixed picture. In the case of laboratory services, the contractor group performed worse than the public group on criteria concerned with the range of basic and additional tests offered, quality assurance, the presence of after-hours services and the response time in the case of urgent requests, although contractor performance on the question of response times to routine requests was better than that of the public hospitals. In the Xray and pharmacy clusters, on the other hand, the contractors show uniformly superior performance on function related criteria. In the former case, this superior performance relates to the delivery of additional services (such as fluoroscopy[175]), compliance with safety regulations and response times to urgent requests. In the case of pharmacy services, the contractors show superior performance on such issues as the clinical pharmacy role played by pharmacists, stock control and management, and outpatient packaging and dispensing. In the operating theatre cluster, the poorer contractor score is attributable to the smaller range of basic operations offered at these hospitals relative to public hospitals, while in the OPD cluster, the two groups show similar performance in terms of the organisation of patient flow, but the contractors perform worse on the question of availability of specialised outpatient services.

In the aggregated category covering availability of supplies, the contractors show similar performance to the public hospitals in the laboratory cluster, superior performance in the Xray cluster, and inferior performance in the pharmacy cluster, where the criterion relates to maintenance of appropriate stock levels. The picture is

[175] A specialised form of radiological investigation in which motion can be detected.

equally mixed in the case of availability and condition of hospital equipment. Here, the contractor group shows superior performance on a very limited range of criteria (age and maintenance of Xray machines, presence of diathermy equipment in the operating theatres, scrubbing up facilities in the maternity ward and bedscreens in the general wards), and inferior performance on a wider range of critical criteria. These latter criteria include the condition and maintenance of laboratory equipment, refrigeration equipment in the pharmacy, equipment in the recovery area, the availability of pulse oximeters in the operating theatres, some emergency resuscitation equipment in the OPD, maternity wards and general wards, specialised maternity ward equipment[176] and basic general ward equipment, such as baumanometers. The two hospital groups show similar performance on the criteria dealing with all remaining hospital equipment.

As would be expected from the previous data, analysis of the individual criteria within the aggregated buildings category indicates that the contractor group obtains the maximum possible score on almost all of the building related criteria, and demonstrates superior performance to the public hospitals in almost all cases.[177]

---

[176] This refers to the presence of functioning vacuum extractor and cardiotocograph machines.

[177] The contractor hospitals consistently fail to obtain the maximum possible score only in the case of the nursing stations in the ward clusters. The only instance in which the public hospital group outperforms the contractors is in the case of the criteria covering space and storage capacity in the pharmacies.

Table A21.4: Evaluation of structural quality of care: impact of mean values of criteria scores and cluster and category weights on category and cluster scores for individual hospitals and groups (% max. score)

	Contractor			Public			Private			Means		
	Matik.	Hewu	Shil.	Tlam.	Letsha	Bisho	St. Doms.	Piet.	Nels.	Con.	Public	Private
Admin./management												
Staff	50	77	65	50	50	84	92	50	92	64	61	78
Functions	73	87	73	73	65	60	92	78	73	78	66	81
MIS	24	24	24	100	24	24	100	100	100	24	49	100
Patient record system	89	99	76	78	82	96	81	73	80	88	85	78
Utilities/services	100	93	76	76	66	93	93	100	93	90	78	95
Total	63	75	62	74	56	69	92	77	87	67	66	85
Laboratory												
Staff	35	45	35	68	77	88	n/a	n/a	n/a	39	78	0
Functions	46	66	63	93	76	76	n/a	n/a	n/a	58	82	0
Supplies and equipment	100	100	100	73	53	100	n/a	n/a	n/a	100	76	0
Buildings	68	100	100	64	85	100	n/a	n/a	n/a	89	83	0
Total	57	72	68	78	72	87	n/a	n/a	n/a	65	79	0
Radiology Dept.												
Staff	59	59	59	72	72	72	n/a	n/a	n/a	59	72	0
Functions	88	82	94	70	82	75	n/a	n/a	n/a	88	76	0
Supplies and equipment	100	81	88	89	67	100	n/a	n/a	n/a	90	85	0
Buildings	100	100	100	52	65	100	n/a	n/a	n/a	100	73	0
Total	86	79	84	74	72	86	n/a	n/a	n/a	83	77	0
Pharmacy												
Staff	87	87	94	94	100	87	94	94	94	89	93	94
Functions	95	100	94	89	100	52	89	77	77	96	80	81
Supplies and equipment	83	83	42	100	100	100	100	82	100	69	100	94
Buildings	100	93	81	100	70	100	93	100	93	92	90	96
Total	89	89	74	96	95	85	95	86	92	84	92	91
Clinical Staff												
Medical staff	72	61	70	78	93	68	n/a	n/a	n/a	67	80	0
Nursing staff	81	72	85	100	90	94	94	100	100	79	95	98
Ancillary services	21	21	21	100	100	100	n/a	n/a	n/a	21	100	0
Total	68	59	69	90	93	84	94	100	100	65	89	98
Operating theatres												
Staff	100	100	100	100	100	100	100	57	57	100	100	71
Functions	83	50	50	100	83	50	100	100	100	61	78	100
Supplies and equipment	99	87	84	90	88	93	100	100	96	90	90	99
Buildings	100	100	100	100	70	100	100	100	100	100	90	100
Total	95	83	82	96	87	85	100	90	89	86	89	93
Outpatients Dept.												
Staff	100	100	48	48	100	100	n/a	0	0	83	83	0
Functions	85	100	85	100	100	100	n/a	70	70	90	100	70
Supplies and equipment	51	67	51	83	100	67	n/a	100	100	56	83	100
Buildings	100	100	100	100	88	100	n/a	100	100	100	96	100
Total	80	89	66	80	98	89	n/a	90	90	79	89	90
Maternity Ward												
Supplies and equipment	68	75	61	69	75	69	100	71	84	68	71	85
Buildings	93	100	93	93	87	100	100	100	100	95	93	100
Total	74	81	69	75	78	77	100	78	88	75	77	89
Other wards												
Supplies and equipment	63	70	52	58	63	76	62	91	73	62	65	75
Buildings	91	99	93	74	76	97	100	100	97	94	82	99
Total	70	77	62	62	66	81	71	93	79	70	70	81
All Wards	72	79	65	68	72	79	86	86	84	72	73	85
Grand Total	76	75	71	84	82	83	93	88	90	74	83	90

Notes: n/a - not applicable, since laboratory and radiology services not provided directly by private hospitals; clinical staff working in the private hospitals are self employed, and not regarded as part of the staff of these hospitals; no OPD at St. Dominics hospital.

Table A21.5. **Evaluation of structural quality of care: impact of mean values of criteria scores and cluster and category weights on aggregated category scores for individual hospitals and groups (% max. score)**

	Contractor			Public			Private			Means		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St. Doms.	Piet.	Nels.	Con.	Public	Pvte.
Staff	79	77	79	88	94	90	95	83	91	78	91	90
Supplies and equipment	82	81	67	83	81	89	89	91	91	76	84	91
Buildings	95	98	95	84	74	100	98	100	98	96	86	98
Functions/Services	73	75	68	87	74	66	93	86	85	72	76	88

Table A21.6: Evaluation of structural quality of care: impact of weighted sums vs. geometric mean on category and cluster scores for individual hospitals and groups (% max. score)

	Contractor			Public			Private			Means		
	Matik.	Hewa	Shil.	Tlatu.	Letaba	Bisho	St. Doms.	Piet.	Nels.	Con.	Public	Private
Admin./ management												
Staff	50	77	65	50	50	84	92	50	92	64	61	78
Functions	73	87	73	73	65	60	92	78	73	78	66	81
MIS	24	24	24	100	24	24	100	100	100	24	49	100
Patient record system	89	99	76	78	82	96	81	73	80	88	85	78
Utilities/services	100	93	76	76	66	93	93	100	93	90	78	95
Total	63	75	62	74	56	69	92	77	87	67	66	85
Laboratory												
Staff	35	45	35	68	77	88	n/a	n/a	n/a	39	78	0
Functions	46	66	63	93	76	76	n/a	n/a	n/a	58	82	0
Supplies/equipment	100	100	100	73	53	100	n/a	n/a	n/a	100	76	0
Buildings	68	100	100	64	85	100	n/a	n/a	n/a	89	83	0
Total	57	72	68	78	72	87	n/a	n/a	n/a	65	79	0
Radiology Dept												
Staff	59	59	59	72	72	72	n/a	n/a	n/a	59	72	0
Functions	88	82	94	70	82	75	n/a	n/a	n/a	88	76	0
Supplies/equipment	100	81	88	89	67	100	n/a	n/a	n/a	90	85	0
Buildings	100	100	100	52	65	100	n/a	n/a	n/a	100	73	0
Total	86	79	84	74	72	86	n/a	n/a	n/a	83	77	0
Pharmacy												
Staff	87	87	94	94	100	87	94	94	94	89	93	94
Functions	95	100	94	89	100	52	89	77	77	96	80	81
Supplies/ equipment	83	83	42	100	100	100	100	82	100	69	100	94
Buildings	100	93	81	100	70	100	93	100	93	92	90	96
Total	89	89	74	96	95	85	95	86	92	84	92	91
Clinical Staff												
Medical staff	72	61	70	78	93	68	n/a	n/a	n/a	67	80	0
Nursing staff	81	72	85	100	90	94	94	100	100	79	95	98
Ancillary services	21	21	21	100	100	100	n/a	n/a	n/a	21	100	0
Total	68	59	69	90	93	84	94	100	100	65	89	98
Operating theatres												
Staff	100	100	100	100	100	100	100	57	57	100	100	71
Functions	83	50	50	100	83	50	100	100	100	61	78	100
Supplies/ equipment	99	87	84	90	88	93	100	100	96	90	90	99
Buildings	100	100	100	100	70	100	100	100	100	100	90	100
Total	95	83	82	96	87	85	100	90	89	86	89	93
Outpatients Dept												
Staff	100	100	48	48	100	100	n/a	0	0	83	83	0
Functions	85	100	85	100	100	100	n/a	70	70	90	100	70
Supplies/ equipment	51	67	51	83	100	67	n/a	100	100	56	83	100
Buildings	100	100	100	100	88	100	n/a	100	100	100	96	100
Total	80	89	66	80	98	89	n/a	90	90	79	89	90
Maternity Ward												
Supplies/ equipment	68	75	61	69	75	69	100	71	84	68	71	85
Buildings	93	100	93	93	87	100	100	100	100	95	93	100
Total	74	81	69	75	78	77	100	78	88	75	77	89
Other wards												
Supplies/equipment	63	70	52	58	63	76	62	91	73	62	65	75
Buildings	91	99	93	74	76	97	100	100	97	94	82	99
Total	70	77	62	62	66	81	71	93	79	70	70	81
All Wards	72	79	65	68	72	79	86	86	84	72	73	85
Grand Total	76	75	71	84	82	83	93	88	90	74	83	90

Notes: n/a - not applicable, since laboratory and radiology services not provided directly by private hospitals; clinical staff working in the private hospitals are self employed, and not regarded as part of the staff of these hospitals; no OPD at St. Dominics hospital.

Table A21.7: Evaluation of structural quality of care: impact of weighted sums vs. geometric mean on aggregated category scores for individual hospitals and groups (% max. score)

	Contractor			Public			Private			Means		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St. Doms.	Piet.	Nels.	Con.	Public	Private
Staff	79	77	79	88	94	90	95	83	91	78	91	90
Supplies/equipment	82	81	67	83	81	89	89	91	91	76	84	91
Buildings	95	98	95	84	74	100	98	100	98	96	86	98
Functions/Services	73	75	68	87	74	66	93	86	85	72	76	88

APPENDIX 22: EVALUATION OF QUALITY OF NURSING CARE

Table A22.1: Evaluation of quality of nursing care: category and cluster scores for individual hospitals (% max. possible score)

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho[a]	St. Doms.	Piet.	Nels.
Nursing care: Maternity ward									
Nursing Assess/Diagnosis	79	50	79	22	17	n/a	100	79	79
Nursing care planning/monitoring /control	59	40	53	48	32	n/a	100	79	69
Equipment	46	24	46	29	19	n/a	100	65	100
Diet	100	17	100	100	42	n/a	100	100	100
Total	66	39	63	41	26	n/a	100	79	79
Nursing care: Medical/Surgical wards									
Nursing Assess/Diagnosis	37	50	23	43	29	23	100	63	79
Nursing care planning/monitoring /control	72	33	32	47	37	30	75	48	85
Equipment	29	24	73	24	27	24	100	74	100
Diet	100	17	100	100	21	17	100	100	100
Total	57	36	41	47	32	26	88	61	87
Nursing Care: All wards									
Nursing Assess/Diagnosis	58	50	51	32	23	23	100	71	79
Nursing care planning/monitoring /control	66	36	42	48	34	30	87	64	77
Equipment	37	24	60	27	23	24	100	70	100
Diet	100	17	100	100	32	17	100	100	100
Total	62	37	52	44	29	26	94	70	83
Nursing management	57	35	53	52	53	49	87	90	73
Overall Total	60	36	53	47	37	34	92	77	79

Notes: a. No data for the maternity ward at Bisho hospital, since access to that ward was denied.

Table A22.2: Evaluation of quality of nursing care: individual criteria scores for hospitals and groups (raw scores)

	Contractor			Public			Private			Means		
	Matlk.	Hewu	Shil.	Tints.	Letaba	Bisho	St. Doms.	Piet.	Nels.	Con.	Public	Private
Nursing care												
Maternity ward												
Assessment and diagnosis												
How are patients assessed?	1	0.5	1	1	0.5	0	1	1	1	0.83	0.50	1.00
Information collected	0.5	0.5	1	0.1	0.1	0	1	1	1	0.67	0.07	1.00
Nursing diagnosis	1	0.5	0.5	0.1	0.1	0	1	0.5	0.5	0.67	0.07	0.67
NCP and methods of control/monitoring												
Nursing care planning	0.5	0.1	1	0.5	0.1	0	1	0.5	0.5	0.53	0.20	0.67
Implementation of NCP	0.6	0.6	0.6	0.6	0.1	0	1	0.6	1	0.60	0.23	0.87
Records	0.5	0.1	0.1	0.5	0.1	0	1	1	0.1	0.23	0.20	0.70
Medicine charts	1	1	1	1	1	0	1	1	1	1.00	0.67	1.00
Input/output charts	0.2	1	0.2	0.2	0.2	0	1	1	1	0.47	0.13	1.00
Temperature charts	1	0.2	1	0.2	1	0	1	1	1	0.73	0.40	1.00
Dependence prod. drugs	1	1	1	1	1	0	1	1	1	1.00	0.67	1.00
NCP Upgraded	0.5	0.5	0.5	0.5	0.5	0	1	0.5	1	0.50	0.33	0.83
Equipment												
Linen	0.2	0.2	0.2	0.2	0.2	0	1	1	1	0.20	0.13	1.00
Trays and trolleys	0.6	0.6	0.6	0.1	0.1	0	1	0.6	1	0.60	0.07	0.87
Oxygen supply	0.6	0.1	0.6	0.6	0.1	0	1	1	1	0.43	0.23	1.00
Checking of tray/ emergency trolley	0.6	0.3	0.6	0.6	0.6	0	1	0.3	1	0.50	0.40	0.77
Diet												
Normal diet	1	0.3	1	1	0.3	0	1	1	1	0.77	0.43	1.00
Special diets	1	0.1	1	1	0.6	0	1	1	1	0.70	0.53	1.00
Medical/Surgical Wards												
Assessment and diagnosis												
How are patients assessed?	1	0.5	0.5	0.75	0.5	0.5	1	1	0.5	0.67	0.58	0.83
Information collected	0.5	0.5	0.3	0.5	0.1	0.3	1	0.5	1	0.43	0.30	0.83
Nursing diagnosis	0.1	0.5	0.1	0.3	0.5	0.1	1	0.5	1	0.23	0.30	0.83
NCP and methods of control/monitoring												
Nursing care planning	0.5	0.3	0.1	0.3	0.1	0.1	1	0.5	0.5	0.30	0.17	0.67
Implementation of NCP	0.6	0.6	0.35	0.6	0.1	0.35	1	0.6	0.8	0.52	0.35	0.80
Records	0.5	0.1	0.1	0.3	0.55	0.1	0.1	0.1	1	0.23	0.32	0.40
Medicine charts	1	1	1	0.6	1	0.6	1	1	1	1.00	0.73	1.00
Input/output charts	1	0.6	0.2	0.6	0.2	0.6	1	0.2	1	0.60	0.47	0.73
Temperature charts	1	0.2	1	0.6	1	0.6	1	1	1	0.73	0.73	1.00
Dependence prod. drugs	1	0.6	1	1	1	0.6	1	1	1	0.87	0.87	1.00
NCP Upgraded	0.5	0.3	0.3	0.75	0.5	0.5	1	0.5	0.75	0.37	0.58	0.75
Equipment												
Linen	0.2	0.2	0.6	0.2	0.2	0.2	1	1	1	0.33	0.20	1.00
Trays and trolleys	0.6	0.35	1	0.35	0.6	0.6	1	1	1	0.65	0.52	1.00
Oxygen supply	0.1	0.1	0.6	0.1	0.1	0.1	1	1	1	0.27	0.10	1.00
Checking of tray/ emergency trolley	0.6	0.6	1	0.6	0.45	0.3	1	0.3	1	0.73	0.45	0.77
Diet												
Normal diet	1	0.3	1	1	0.45	0.3	1	1	1	0.77	0.58	1.00
Special diets	1	0.1	1	1	0.1	0.1	0	1	1	0.70	0.40	0.67

Table A22.2: Evaluation of quality of nursing care: individual criteria scores for hospitals and groups (raw scores) (contd.)

	Contractor			Public			Private			Means		
	Matik.	Hewu	Shil.	Tlats.	Letsbe	Bisho	St Doms.	Piet.	Nels.	Con.	Public	Private
Human Resource Management												
Service conditions	1	0.3	0.3	0.3	0.5	0.5	1	1	1	0.53	0.43	1.00
Salary and benefits	0.3	0.3	1	0.3	0.3	0.3	1	1	1	0.53	0.30	1.00
Recruitment and placement	1	0.3	1	1	1	0.3	1	1	1	0.77	0.77	1.00
Occupational health services	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.50	0.50	0.50
Staff turnover	0.1	0.1	1	1	0.6	0.6	1	1	1	0.40	0.73	1.00
Absenteeism	1	0.1	1	1	0.6	0.1	0.6	1	0.6	0.70	0.57	0.73
In-service training	0.2	1	0.2	0.5	0.2	1	1	1	0.5	0.47	0.57	0.83
Procedure policy manuals	1	0.3	0.5	0.3	0.5	0.5	1	1	0.5	0.60	0.43	0.83
Staff patient ratio	0.6	0.6	0.1	0.1	0.6	1	0.6	1	0.6	0.43	0.57	0.73
Matron's role in management	0.6	0.6	0.6	1	0.6	0.6	1	1	1	0.60	0.73	1.00
Matron's meeting with staff	1	1	1	1	0.5	0.5	1	1	0.5	1.00	0.67	0.83
Staff career development process	1	0.2	0.6	0.6	1	1	1	0.6	1	0.60	0.87	0.87

Commentary on Table A22.2

Table A22.2 shows the raw scores achieved by each hospital (as well as mean values for each group), on the individual criteria in the survey instrument used to evaluate the quality of nursing care. Examining the differences between the contractor and public groups first, these data show that in the *assessment and diagnosis* category of the nursing care cluster, contractor scores exceed public scores for all criteria in the maternity ward, and for all besides the nursing diagnosis criterion in the medical/surgical wards. A similar pattern pertains for all criteria in the *nursing care planning/control category*, where the only exceptions to the pattern of higher contractor scores are the criteria related to records, and to the upgrading of the nursing care plan, again in the medical/surgical wards.[178] In the *equipment* and *diet* categories, contractor scores exceed those of the public hospitals for all criteria in both

[178] The contractor and public hospitals obtained the same score in the criteria concerned with recording of temperatures, and with the use of dependence producing drugs, again in the medical/surgical wards.

the maternity and the medical/surgical wards. The table also indicates that the margin between public and contractor scores is narrower in the medical/surgical wards than in the maternity wards in all categories and in almost all of the individual criteria. In the case of the *human resource management* cluster, these data show a more mixed picture. Contractor scores exceed public hospital scores in criteria concerned with service conditions, salaries/benefits, absenteeism, procedure policy manuals and communication between the nursing service management and nursing staff. This pattern is however reversed in the criteria dealing with staff turnover, in-service training, the staff career development process, the nursing service manager's role in management, and the nursing to staff patient ratios.

The table also shows that, as expected, the private hospital scores exceed those of both of the other groups across almost all of the individual criteria studied here. Exceptions to this occur only in the case of the contractor hospitals, where the private and contractor groups obtained equal scores in 5 criteria, and where contractor scores exceed private scores by small margins in 2 criteria.[179] These data also show that the private hospitals fulfilled the criteria for a 'good' score much more frequently than either of the other groups (private hospitals obtained a score of 1 in 46% of criteria, compared to 9% for contractors and 0% for the public hospitals).

---

[179] The private and contractor groups obtained equal scores in the criteria concerned with nursing diagnosis, completion of medicines charts, and recording of use of dependence producing drugs, all in the maternity ward, the completion of medicines charts in the medical/surgical ward, and occupational health services in the human resources cluster. Contractor scores exceeded those of the private hospitals in the criterion concerned with special diets in the maternity ward, and in the nursing service manager's meetings with nursing staff in the human resources cluster.

Table A22.3: Evaluation of quality of nursing care: effect of using weighted sums on category and cluster scores (% max. possible score)

	Contractor			Public			Private			Means		
	Matik.	Hewa	Shil.	Tints.	Letaba	Bisho	St. Doms.	Piet.	Nels.	Con.	Public	Private
Nursing care: Maternity ward												
Nursing Assess/Diagnosis	83	50	83	40	23	n/a	100	83	83	72	32	89
Nursing care planning/ monitoring/control	66	56	68	56	50	n/a	100	83	83	63	53	88
Equipment	50	30	50	38	25	n/a	100	73	100	43	31	91
Diet	100	20	100	100	45	n/a	100	100	100	73	73	100
Total	72	48	72	52	38	n/a	100	83	87	64	45	90
Nursing care: Medical/Surgical wards												
Nursing Assess/Diagnosis	53	50	30	52	37	30	100	67	79	44	39	82
Nursing care planning/ monitoring/control	76	46	51	59	56	43	89	61	85	58	53	78
Equipment	38	31	80	31	34	30	100	83	100	50	32	94
Diet	100	20	100	100	28	20	50	100	100	73	49	83
Total	65	43	53	56	44	35	91	69	87	54	45	82
Nursing Care: All wards												
Nursing Assess/Diagnosis	68	50	57	46	30	30	100	75	81	58	35	85
Nursing care planning/ monitoring/control	71	51	59	58	53	43	94	72	84	61	51	83
Equipment	44	31	65	34	29	30	100	78	100	46	31	93
Diet	100	20	100	100	36	20	75	100	100	73	52	92
Total	68	45	62	54	41	35	95	76	87	59	43	86
Nursing management	69	44	65	63	58	58	89	93	77	59	59	86
Overall Total	69	45	63	57	47	43	93	82	83	59	49	86

Notes: n/a - not applicable, since no data obtained on maternity ward at Bisho hospital, since access to that ward was denied.

APPENDIX 23: EVALUATION OF CLINICAL RECORD KEEPING AND EVALUATION OF OUTCOMES OF CARE IN TRACER CONDITIONS

Table A23.1: Evaluation of clinical record keeping, by hospital

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tints.	Letaba	Bisho	St. Doms.	Piet.	Nels.
N	32	32	32	32	32	32	32	32	32
Records disorganised	33% (11)	0.00	27% (9)	27% (9)	27% (9)	3% (1)	0.00	3% (1)	7% (2)
Inadequate description of diagnosis/treatment	80% (26)	31% (10)	70% (22)	50% (16)	57% (18)	77% (25)	40% (13)	100% (32)	33% (11)
Unable to interpret diagnosis/treatment	27% (9)	17% (5)	0	3% (1)	10% (3)	0	23% (7)	10% (3)	0
Laboratory results not recorded	0	0	17% (5)	7% (2)	20% (6)	0	0	0	0
No evidence of Dr visit last 48hrs	31% (10)	31% (10)	40% (13)	20% (6)	4% (1)	10% (3)	7% (2)	0	0

Table A23.2: Prevalence of indicators of potential poor outcomes, by hospital

	Contractor			Public			Private		
	Matik.	Hewu	Shil.	Tints	Letaba	Bisho	St. Doms.	Piet.	Nels.
Hernia Repair									
N	17	4	3	13	32	0	63	63	47
Delay admission to operation	17.7% (3)	0%	0%	0%	37.5% (12)	n/a	0%	0%	0%
Inadequate pre-op assessment	64.7% (11)	0%	66.7% (2)	76.9% (10)	28.1% (9)	n/a	28.6% (18)	7.9% (5)	59.6% (28)
Wound sepsis	0%	0%	0%	0%	3.1% (1)	n/a	0%	1.6% (1)	0%
Other complications	5.9% (1)	0	0	15.4% (2)	3.1% (1)	n/a	0	0	0
Mortality	0%	0%	0%	0%	0%	0%	0%	0%	0%
Appendectomy									
N	10	8	3	8	7	0	62	68	66
Delay presentation to operation	10% (1)	0%	66.7% (2)	0%	0%	n/a	0%	0%	0%
Delay admission to operation	0%	50% (4)	33.3% (1)	0%	0%	n/a	0%	0%	0%
Inadequate pre-op investigation	10% (1)	37.5% (3)	66.7% (2)	25% (2)	0%	n/a	98.4% (61)	41.2% (28)	92.4% (61)
Histology results absent	40% (4)	100% (8)	100% (3)	100% (8)	100% (7)	n/a	100% (62)	91.2% (62)	93.9% (62)
Negative histology[a]	50% (3)	n/a	n/a	n/a	n/a	n/a	n/a	50% (3)	25% (1)
Peritonitis	10% (1)	25% (2)	0%	0%	0%	n/a	0%	0%	0%
Wound sepsis	20% (2)	0%	0%	12.5% (1)	0%	n/a	0%	0%	0%
Other complications	0%	12.5% (1)	0%	0%	14.3% (1)	n/a	0%	2.9% (2)	1.5% (1)
Mortality	0%	0%	0%	0%	0%	0%	0%	0%	0%
NVD									
N	92	97	65	78	65	123	86	65	62
Third degree tears	0%	0%	1.5% (1)	2.6% (2)	0%	0.8% (1)	1.2% (1)	0%	0%
Failed assisted deliveries	0%	0%	0%	0%	0%	0%	0%	0%	0%
Puerperal sepsis	0%	1.0% (1)	0%	3.9% (3)	0%	1.6% (2)	0%	0%	0%
Other complications	1.1% (1)	1.0% (1)	0%	0%	4.6% (3)	1.6% (2)	0%	0%	1.6% (1)
Partograph absent or not completed	53.3% (49)	57.7% (56)	12.3% (8)	44.9% (35)	27.7% (18)	28.5% (35)	29.1% (25)	13.9% (9)	24.2% (15)
Caesarean sections									
N	48	87	56	66	63	76	85	91	71
Wound sepsis	6.3% (3)	8.0% (7)	10.7% (6)	13.6% (9)	1.6% (1)	0%	0%	0%	1.4% (1)
Anaesthetic complications	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other complications	0%	2.3% (2)	0%	3.0% (2)	7.9% (5)	1.3% (1)	0%	1.1% (1)	0%
Elective cases	33.3% (16)	26.4% (23)	19.6% (11)	16.7% (11)	31.8% (20)	14.5% (11)	60% (51)	74.7% (68)	70.4% (50)

Notes: a. Percentage of histology records on file which are negative. n/a - not applicable, since no appendectomy and hernia repair cases identified at Bisho hospital during study year.

Table A23.3: Description of cases involving 'other complications' and mortality

	Contractor	Public	Private
Hernia Repair	Matikwana: 1. Hernia relapsed prior to discharge. Patient re-admitted after 1 month for second repair.	Tintswalo: 1. Patient developed post-operative bowel obstruction. Required laparotomy and bowel resection 2. Patient developed testicular infarction, due to inguinal ring being made too tight at operation. Referred to tertiary level hospital for resection of infarcted testicle. Letaba: 1. Post operative respiratory complications - bronchopneumonia	
Appendectomy	Hewu: 1. 19 year old male, died on day 6 after operation. Possible pulmonary embolism.	Letaba: 1. Typhoid and post-operative pneumonia diagnosed 1 week post-operatively.	
NVD	Matikwana: 1. Massive splenomegaly noted, but patient discharged with no evidence of investigation or discharge Hewu: 1. Baby sustained injury to left shoulder during delivery Shiluvana: 1. Patient sustained severe, third degree vaginal and cervical tears, requiring repair under general anaesthetic.	Letaba: 1. Post partum haemorrhage 2. Post partum haemorrhage due to retained products. Uterus evacuated and patient transferred to another hospital. 3. Patient developed pyrexia of unknown origin following delivery. Bisho: 1. Post partum haemorrhage 2. Post partum haemorrhage	Nelspruit: 1. Post partum haemorrhage
Caesarean Section	Hewu: 1. Acute respiratory distress syndrome following surgery. 2. Post partum haemorrhage. Treated in intensive care unit and discharged well.	Tintswalo 1. Poor wound apposition, requiring secondary suturing 2. Wound dehiscence, requiring secondary suturing Letaba: 1. Wound dehiscence, requiring secondary suturing 2. Wound dehiscence, requiring secondary suturing 3. Wound dehiscence, requiring secondary suturing 4. Typhoid fever 5. Disseminated intravascular coagulation. Discharged well. Bisho: 1. Base of bladder torn during operation	Pietersburg 1. Chest infection in post-operative period

Table A23.4: Results of expert analysis of tracer conditions, by hospital

	Contractor			Public			Private		
	Matlh.	Hewu	Shil.	Tints.	Letaba	Bisho	St. Doms.	Pict.	Nels.
Hernia Repair									
Cases submitted	1	0	0	2	0	n/a	0	0	0
Not avoidable	0	n/a	n/a	1 (7.7%)	n/a	n/a	n/a	n/a	n/a
Possibly avoidable	1 (5.9%)	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
Clearly avoidable	0	n/a	n/a	1 (7.7%)	n/a	n/a	n/a	n/a	n/a
Insufficient data to assess case	0	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
Appendectomy									
Cases submitted	1	3	0	0	0	n/a	0	0	0
Not avoidable	1	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Possibly avoidable	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Clearly avoidable	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Insufficient data to assess case	n/a	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
NVD									
Cases submitted	1	2	1	5	3	5	1	0	1
Not avoidable	0	0	0	0	0	0	0	0	0
Possibly avoidable	1 (1.1%)	0	1 (1.0%)	2 (2.6%)	0	1 (0.8%)	1 (1.2%)	0	0
Clearly avoidable	0	0	0	0	0	1 (0.8%)	0	0	0
Insufficient data to assess case	0	2 (2.1%)	0	3 (3.8%)	3 (4.6%)	1 (0.8%)	0	0	0
No evidence to suggest poor outcome	0	0	0	0	0	2 (1.6%)	0	0	1 (1.6%)
Caesarean sections									
Cases submitted	0	2	0	2	5	1	0	1	0
Not avoidable	n/a	2 (2.3%)	n/a	0	2 (3.2%)	0	n/a	1 (1.2%)	n/a
Possibly avoidable	n/a	0	n/a	2 (3.0%)	3 (4.8%)	0	n/a	0	n/a
Clearly avoidable	n/a	0	n/a	0	0	1 (1.3%)	n/a	0	n/a
Insufficient data to assess case	n/a	0	n/a	0	0	0	n/a	0	n/a

Notes: n/a - not applicable

Table A23.5: Analysis of perinatal and maternal mortality, by hospital

	Contractor			Public			Private		
	Matik.	Hewa	Shil.	Tints.	Letaba	Blabe	St. Doms.	Piet.	Nels.
Births	2424	1407	1262	4392	2044	1205	1056	801	751
Peri-natal deaths	102	31	63	119	148	63	5	15	15
Maternal deaths	4	0	4	4	3	3	0	0	0
Peri-natal mortality rate (per 1000)	42.08	22.03	49.92	27.09	72.41	52.28	4.73	18.73	19.97
Maternal mortality rate (per 100 000)	165.02	0	316.96	91.07	146.77	248.96	0	0	0
Analysis of peri-natal mortality									
N	25	23	n/a	24	20	13	2	9	8
Poor notes	3	6	n/a	2	4	3	2	9	8
Avoidable factor/s	15 (68.2%)	14 (82.3%)	n/a	8 (36.4%)	8 (50%)	8 (80%)	n/a	n/a	n/a
Grade I	1	6	n/a	1	1	4	n/a	n/a	n/a
Grade II (% of total avoidable factors)	14 (93%)	8 (57.1%)	n/a	7 (87.5%)	7 (87.5%)	4 (50%)	n/a	n/a	n/a
Attributes of avoidable factors									
Total avoidable factors	18	20	n/a	11	12	13	n/a	n/a	n/a
Patient related	0	2 (10%)	n/a	0	1 (8.3%)	2 (15.4%)	n/a	n/a	n/a
Admin factors (hospital related)	6 (33.3%)	8 (40%)	n/a	3 (27.3%)	2 (16.7%)	0	n/a	n/a	n/a
Medical management	9 (50%)	8 (40%)	n/a	7 (63.6%)	9 (75%)	9 (69.2%)	n/a	n/a	n/a
Hospital total	15 (83.3%)	16 (80%)	n/a	10 (90.9%)	11 (91.7%)	9 (69.2%)	n/a	n/a	n/a
Admin factors (non hospital)	3 (16.7%)	2 (10%)	n/a	1 (9.1%)	0	2 (15.4%)	n/a	n/a	n/a

Notes: n/a - not applicable, since the data for Shiluvana and for the private hospitals are incomplete for the reasons outlines in Chapter 3.

APPENDIX 24: ASPECTS OF PRODUCTION EFFICIENCY IN THE PRIVATE HOSPITAL GROUP

Relative to the hypothetical model of efficient utilisation in acute care hospitals described in Chapter 8, the private hospitals demonstrated a more efficient utilisation pattern than the other two groups, with turnover rates being twice those of the public hospitals, and with much shorter LOS and higher average occupancy rates than the other two groups. This pattern is attributable to a combination of the very different patterns of care and incentive structures in place at the private hospitals compared to those observed in the other two hospital groups. With few exceptions, the users of these hospitals fall within the most affluent 17% of the population, are covered by private health insurance, and therefore have very different epidemiological, demographic and health service utilisation profiles than do the users of the public and contractor hospitals.

In addition, the production economics and payment mechanisms within the private hospitals provide strong incentives to maximise admissions and turnover, and to minimise LOS. More specifically, the use of a fee-for-service reimbursement method, and the structure of the fee system, ensure that operations or interventions which utilise expensive equipment enjoy far higher returns than simple medical treatments. This leads to an incentive to increase the amount of surgical and other procedure-based admissions. It also leads to a situation in which the first day or two of a patient stay are more profitable than subsequent days, leading to strong pressures to reduce LOS. These incentives hold true both for the hospital itself, and for the medical staff working at the hospital, with these incentives being further aligned by the fact that many of the doctors own shares in the hospitals. These strong incentives to shorten LOS are assisted by the fact that there are seldom any logistical or social obstacles to the early discharge of these patients. Together, these factors explain the very different

service-mix, case-mix and patterns of care in these hospitals, compared to those in the contractor and public hospitals.

The cost analysis showed that production costs in the private group were generally higher than those in the other two groups, with particularly large margins in costs per in-patient day, and per OPD visit. As might be expected, the very short LOS in the private group had the effect of reducing the margin in costs per admission, although these remained generally higher than in the other two groups. An exception to this pattern was noted in the operating theatres, where the very high throughput at the private hospitals resulted in substantially lower mean costs per surgical operation in the private group compared to the other two. Analysis of the composition of production costs demonstrated that the private hospitals had consistently higher unit costs than the other two groups across all fixed and variable cost categories, although drug costs and staff costs made the most important contributions to the observed margins. Analysis of staff costs showed that the higher unit staff costs in the private hospitals were due to a combination of higher nursing (and other) staff to output ratios, a more expensive staff mix, and higher average salaries than were observed in the other groups.

The efficient utilisation pattern in these hospitals, noted above, was reflected in some of the results of the tracer cost analysis and the DEA analyses, in which the short LOS, and high surgical throughput, were at times sufficient to override the higher costs per in-patient day, so that the private group emerged as either less costly than the other groups (in the tracer analysis), or as more efficient than the other groups (in the DEA). In the tracer analysis, for example, costs per appendectomy and hernia repair case were lower in the private than in both of the other groups, despite higher 'hotel' costs per day. Similarly, the private group demonstrated the best performance of all three groups when the DEA was applied to the whole hospital, which was almost

certainly attributable to the influence of the large numbers of operations in the output specifications for these analyses.

As with the hospital utilisation patterns, the production cost results reflect the very different patterns of care in the private hospitals compared to those in the other two groups. The high costs of drugs and related disposable equipment, for example, reflects the usage of a much more extensive and expensive range of these items than is the case in the other hospitals. In addition, the private hospitals acquire these items at private wholesale prices, which are substantially higher than the prices paid by the public sector, which purchases in bulk through a national procurement system. The greater intensity of nursing staff usage, and the more expensive staff mix are similarly attributable to several features of the production pattern in the private hospitals. These include the fact that these hospitals all have several operating theatres, as well as intensive care units, both of which require greater numbers of more highly skilled staff. The itemised billing procedures also necessitate the use of large numbers of skilled nurses in administrative functions in these hospitals. Finally, the staff allocation patterns in these hospitals also reflect the demands of the more affluent clientele of these hospitals for more skilled and personal attention from nursing and other hospital staff.

As reported in Chapter 5, the private hospital group was consistently superior to the other two groups in all of the analyses of quality of care. In the evaluation of SQOC, the private group was rated substantially higher than the other two groups in terms of the provision and condition of supplies and equipment, buildings and hospital functions and services, again reflecting the use of a more extensive and expensive range of inputs to the production process in these hospitals compared to those in the other two groups. The only exception to this pattern was in the staffing category, where the absence of key staff resources, including medical and paramedical staff,

resulted in a lower score for the private group, despite its higher nursing intensity and skill mix.

The private group was also judged to provide consistently and substantially superior nursing care to that of the other two groups, reflecting the finding of higher nurse to patient ratios, and the more skilled nursing staff mix in these hospitals.[180] Similarly, and for the same reasons, the private group demonstrated the best performance of all three groups in the evaluation of clinical record keeping, with superior performance in all but two of the categories evaluated, as well as in the quality of partograph recording.

In the evaluation of the outcomes of care, the prevalence rates of most of the indicators of poor outcome were lower in the private group than in the other two across all four samples, with statistically significant margins between the private rates and the pooled contractor/public rates in several instances. The expert analysis also failed to identify any instances of avoidable poor outcomes in the private hospital cases, although the very small sample sizes could partially account for this result. The peri-natal and maternal mortality rates were also lower in the private hospitals than in the other two groups, with this difference being statistically significant in the former case, but not so in the latter.[181] Note that of the 19 peri-natal mortality cases submitted for expert analysis from these hospitals, none could be assessed due to poor notes. This is explained by the fact that the medical staff attending the patients keep their own, more detailed records which were not available in the hospital, which retained only the less detailed nursing notes.

---

[180] The only exception to this general pattern was noted in the maternity ward of one of the hospitals, Nelspruit, where problems in record keeping and ward management were judged as sufficiently serious as to compromise quality of patient care.

[181] This result was due to the very small numbers of cases of maternal mortality in all of the study hospitals.

While the outcome evaluation thus also suggests superior quality of care in the private hospitals, these results were almost certainly influenced by the demographic profiles of patients using these hospitals. As noted above, patients able to afford private hospitals are, in general, far more affluent than the users of the public and contractor hospitals, suggesting that they have generally better underlying health status, are better educated and have greater awareness of health related issues, as well as better access to health services. The positive impact of these factors, both individually and collectively, on general health outcomes is well recognised, and it is not difficult to surmise their positive impact on the specific outcomes assessed here. In the surgical tracer conditions, for example, better education and better access to health care would lead to earlier presentation to providers, and thus to earlier intervention, eliminating some of the problems of delays in treatment identified in the public and contractor hospitals. Similarly, improved antenatal care and diagnosis of potential problems, as well as improved underlying health status, are almost certainly more important determinants of the outcomes of the maternity tracers, as well as of peri-natal and maternal mortality rates, than the quality of clinical care provided within the hospital.