

# Estimating the Cost of Hospital Services in a Small Island State

## A Case Study of the Milton Cato Memorial Hospital in St Vincent and the Grenadines

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### ABSTRACT

*Cost estimates are derived for services provided at the Milton Cato Memorial Hospital (previously known as the Kingstown General Hospital) using the step-down accounting method. Both total and average unit cost estimates are provided. Among the findings of note is that the cost per patient per day spent on the Maternity Ward is 57.4% higher than for the Surgical Ward. Even with the 1995 increase in user fees, the levels of subsidization for inpatient services remains relatively high at 78%–96% for public patients and 43%–72% for private patients. Ancillary services were found to have lower levels of subsidization and in most cases the full costs were recovered from private patients. Laboratory services are not subsidized.*

## Estimación del Costo de los Servicios Hospitalarios en un Pequeño Estado Insular

### Estudio de Caso del Milton Cato Memorial Hospital en San Vicente y las Granadinas

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### RESUMEN

*Se deducen los costos estimados para los servicios que se brindan en el Milton Cato Memorial Hospital (previamente conocido como Kingstown General Hospital) usando el método de etapas en contabilidad. Se ofrecen los estimados del costo total y el costo promedio por unidad. Entre los resultados a resaltar se halla que el costo por paciente por día en la sala de maternidad es 57.4% más alto que en la sala de cirugía. Incluso con el aumento llevado a cabo en 1995 en relación con el pago de honorarios por parte del usuario, los niveles de subvención de los servicios a pacientes hospitalizados permanecen relativamente altos, llegando a ser de un 78%–96% para los pacientes públicos y 43%–72% para los pacientes privados. Se halló que los servicios suplementarios presentaban niveles de subsidio más bajos, y que en la mayor parte de los casos se recuperaba la totalidad de los costos de los pacientes privados. Los servicios de laboratorio no se subvencionan.*

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### INTRODUCTION

The Milton Cato Memorial Hospital (MCMH) is the only general hospital in St Vincent and the Grenadines and is the main referral healthcare facility in the country. It accounts for over 75% of the 272 acute care hospital beds in the public health sector (1) and the largest share of the resources devoted to operating the sector – 43% of EC\$33 million in 1997 and 42% of EC\$41 million in 2002 (2, 3).

The MCMH offers a range of inpatient and outpatient services that include, general medicine, surgery, obstetrics

and gynaecology and paediatrics. Ancillary departments provide operations, laboratory, radiology, pharmaceutical, and physiotherapy services. In addition to the Accident and Emergency/Casualty Department, there is also speciality treatment in ophthalmology, orthopaedics, otorhinolaryngology and internal medicine. The hospital (includes a nursing school) and is managed by a team comprising two senior nursing officers, a medical director, chief pharmacist, hospital administrator, medical storekeeper and a nutrition officer.

Like many hospitals throughout the Caribbean region over the last two decades, the MCMH implemented reforms aimed at improving the quality and cost efficiency of its services. Cost recovery policies became an important part of such reforms with the introduction of fees where there were none or the increase in existing fees to align them with the

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cost of providing the services. It follows that the effectiveness of the implementation of these fees would, to some extent, depend on how close they were to the unit costs of providing the services for which the fees were charged. Calculation or estimation of unit costs then becomes crucial.

When used in conjunction with other data such as utilization of services and the socio-economic profiles of those accessing services, information on cost may be employed to evaluate and monitor equity in access and efficiency and cost-effectiveness in the deployment of resources. Knowledge of the unit or average costs also helps policy makers and administrators to better understand the relationship between throughput and the level of expenditure on a particular activity/service. Where average costs appear to be high, this may point to either a very low level of utilization relative to the expenditure on the service or an inordinately high level of expenditure or both. In any case, such a result serves to alert administrators to high-cost activities that may require more careful monitoring. When such cost monitoring is effected over time, it becomes possible to determine whether a given level of expenditure on an activity is justified, given the observed utilization of this service. To the staff of the hospital – clinicians and others – relative cost information may also serve as pointers to areas that may benefit from potential improvements in the allocation of labour and capital resources to their day-to-day duties, provided of course, that systems are in place that facilitate the timely exchange of information between staff and management.

In all cases, however, it is important that the concept of an “average” be borne in mind. As with any mathematical average, these estimates incorporate values at both ends of the spectrum. For example, some inpatients would generate much higher costs than the average while others would generate costs that are much lower than the estimated average. The same would hold for other service areas such as the pharmacy, laboratory and radiology departments.

#### Activity at the MCMH

The data from the medical records department indicate that between 1985 and 1990 the Maternity Unit recorded

relatively high rates of utilization peaking at 87% of capacity in 1985. From 1991, however, there was a decline in utilized capacity in this Unit (except for 1992 which recorded a rate of 85%), and by 1997, the rate stood at 56% (Table 1). The Male Surgical Ward registered the highest average utilized capacity over the 1985 to 1997 period (85.4%), with a period high of 90.9% in 1996.

The Accident and Emergency/Casualty Department dealt with 25 012 visits for the year 1997. Total visits to outpatient clinics amounted to 20 145 with shares of 20, 15.5, 15.4 and 13 per cent respectively, for General Medicine, Ophthalmology, General Surgical and Obstetrics and Gynaecology (Table 2).

Ancillary services are also routinely demanded of the MCMH (Table 2). For 1997, the Radiology Department processed 16 034 X-rays. Of this amount, 29% were done for private patients. The Accident and Emergency Department accounted for 25% while 6% were for outpatients. The Physiotherapy Department saw 1 724 patients and made 3 180 treatments. The Laboratory performed 191 294 tests during the year 1997, most of which (41%) were for biochemistry.

For the year 1997, inpatient days at the MCMH numbered 48 423 (1). Of this total, the Male Surgical Ward accounted for the highest share – 20% – followed by the Maternity Ward, the Female Medical and the Male Medical Wards in that order. Of the 2 523 surgeries performed, Obstetrics and Gynaecology and General Surgery represent 39% and 33% respectively.

#### METHODOLOGY

The step-down cost accounting approach is applied to derive cost estimates of selected services provided by the MCMH. The step-down approach is akin to activity-based costing where activities are identified and costs are estimated by activity (4, 5). It is essentially a process whereby intermediate cost categories are allocated in a stepwise manner to all departments (cost centres) and to the final cost centres using an iterative process (5). The method has been popularized in developing countries where the paucity of relevant data poses special problems to economists and other pro-

Table 1: Admissions, and average length of stay and bed occupancy rates, by service (1985–1997)

Service	No of admissions			Average length of stay (days)			Bed occupancy (%)		
	1985	1997	Period average	1985	1997	Period average	1985	1997	Period average
Female medical	782	977	830	8.7	7.8	8.6	73	85.7	74.5
Male medical	639	892	791	10.2	7.6	9.5	63	71.1	72.4
Female surgical	771	1013	942	9.4	6.9	7.9	85	69.3	76.7
Male surgical	872	1122	1102	11.5	8.4	9.0	86	89.9	85.4
Maternity	2880	2773	2907	4.3	2.9	3.5	87	56.0	69.9
Paediatric	1148	1375	1379	7.4	4.5	6.1	42	37.1	42.2
Overall	7092	8152	7950.6	7.2	6.3	6.4	69	63.5	66.3

Source: Medical Records Department, Milton Cato Memorial Hospital.

Table 2: Details of selected utilization data (1997)

Patient Category	X-rays		Lab Tests		
	No of X-rays	%	No of tests	%	
Private	4599	28.68	Haematology	51358	26.85
A&E	4044	25.22	Blood bank	13617	7.12
Outpatient district	3914	24.41	Microbiology	44948	23.50
Outpatient hospital	983	6.13	Biochemistry	77763	40.65
Ward patient	2494	15.55	Cytology	3608	1.89
	<b>16034</b>	<b>100</b>		<b>191294</b>	<b>100</b>

Clinic	Visits to outpatient clinics		Operations		
	No of Visits	%	Procedure Surgeries	No. of	%
General medicine	3978	19.75	OB/GYN	980	38.84
OB/GYN	2689	13.35	Eye	151	5.98
Paediatrics	1362	6.76	ENT	200	7.93
Ophthalmology	3114	15.46	General surgery	823	32.62
ENT	664	3.30	Orthopaedic	369	14.63
Orthopaedic	1826	9.06		2523	100
General surgical	3106	15.42			
Dermatology	783	3.89	A&E: Total casualties	25 012	
Psychiatry	1648	8.18			
Family planning	839	4.16			
Urology	136	0.68			
	<b>20145</b>	<b>100</b>			

\*: Based on discussions with the Pharmacist, the number of prescriptions allocated to the hospital amounted to 1/3 of the total

Source: Radiology Department; Laboratory; Pharmacy; Medical Records Department; Milton Cato Memorial Hospital

professionals conducting costing studies (4, 6–8). The strength of the step-down methodology in activity-based costing, however, lies in its ability to replicate the production process, and as such, the cost generation process of individual delivery entities.

In applying the step-down approach, the hospital is conceived as a multi-product firm (9) that is in the business of producing different types of health goods and services and which is part of a broader national health-production network. The health-production network is further envisioned as comprising a number of direct or final and indirect or intermediate cost centres (10). Intermediate cost centres possess the characteristics such that they provide services/inputs to enable the delivery of final outputs by the direct cost centres. Examples of intermediate cost centres may include the administration, laundry, cleaning and portering, and maintenance. Final cost centres provide services directly to the clients and include departments such as the surgical, medical and paediatrics units. All indirect costs were reassigned to direct cost centres. The figure gives a schematic of the approach. Average unit costs for service provision were obtained by dividing the estimated full costs by the activity levels for each cost centre.

The estimation was done using 1997 cost and utilization data for the MCMH. The data for 1997 were used since this year represents a typical year within the last decade. There is some concern that although nominal aggregate expenditure levels at the hospital have not changed significantly between 1997 and 2001, the impact of HIV/AIDS on the structure of expenditures would be sufficient to cause a deviation from the normal pattern. For later cost investigations, 1997 will therefore be a useful benchmark, facilitating a clearer picture of the role that HIV/AIDS has played within the more recent past.

## RESULTS

Table 3 reports the estimates of the total or full costs of providing services at the MCMH through its thirteen final cost centres. Activities at the Maternity Ward generated the largest share of 15% of total cost, equivalent to EC\$2.15M. The Operating Theatre and Paediatric Ward follow with 10.8% and 10% respectively. The other four wards show almost similar cost shares, ranging from 8.3% for the female surgical to 9.5% for the female medical. Primary care through the Outpatient Clinics accounted for only 2.7% of the total cost incurred at the hospital in 1997. The pharmacy incurred 2.5% of total cost while the physiotherapy department accounted for only 1%.

The estimates of the average per unit cost of services through the final cost centres are also shown in Table 3. A comparison of these costs with the fees charged to patients and the implicit subsidies are also provided. Among the wards, the maternity unit generated the highest average cost per patient day with an estimate of EC\$262.73. This is followed by paediatric, estimated at EC\$191.84. The cost per patient day on the other wards lies within close range, with the male surgical at the lower end with an estimate of EC\$132.25. When these costs are compared with the flat rate of EC\$10 per day charged by all wards to public patients, the implicit subsidy amounts range from 92% to 96% of costs. Compared to the EC\$75 charged to private patients, subsidization of costs ranges from 43% on the male surgical ward to 71% on the maternity ward.

Surgical procedures done through the operating theatre were the highest unit cost service offered at the hospital in 1997, estimated at EC\$613.98 per procedure. This represents a subsidy of 88% over the average charge of a surgery done for public patients and 71% for private patients. Prescriptions, radiology examinations and outpatient visits were subsidized to public patients but not to private ones. Laboratory tests were the only service that had an estimated average cost below what is charged for the service.

Compensation to employees is the major cost factor that accounts for differences in the distribution of cost shares across final cost centres. This cost item had a 78% influence on recurrent cost at the MCMH in 1997 with nursing services amounting to 46.7% of its value. Combining the cost of compensation to nurses with the activity levels of the

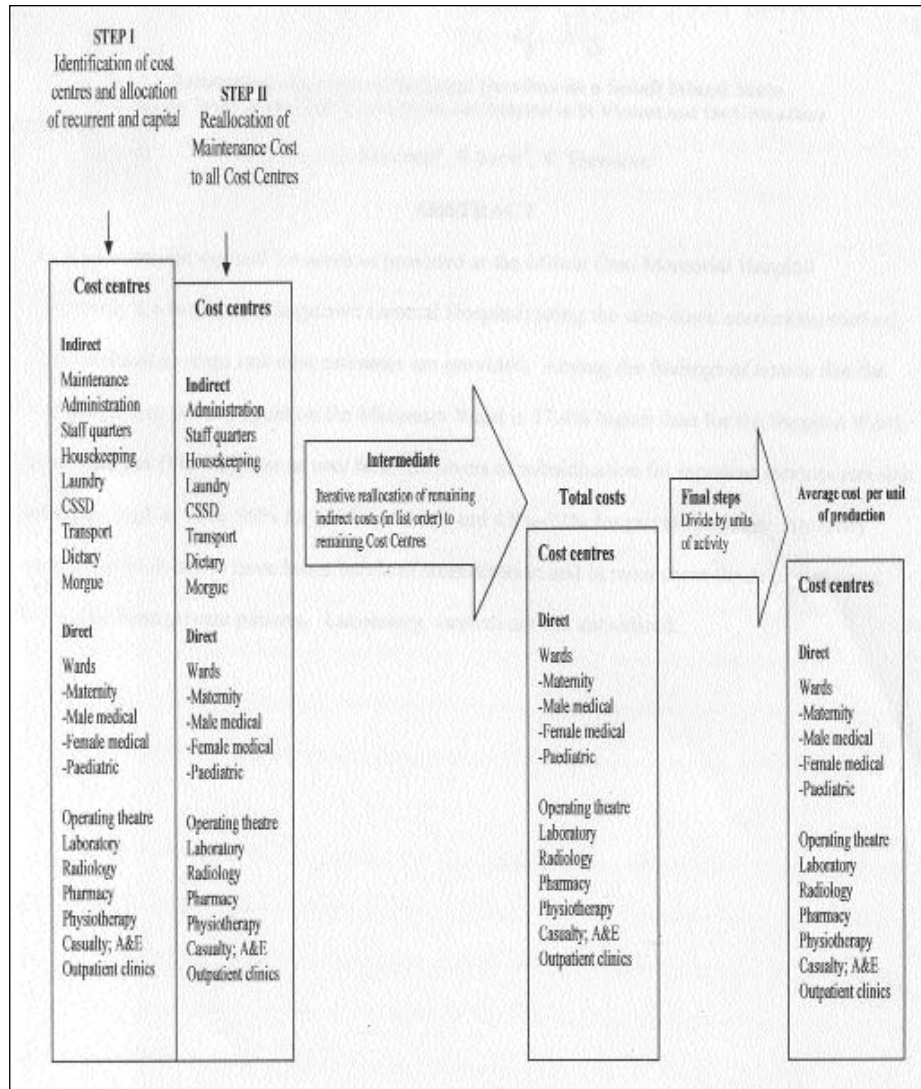


Fig: Schematic of step-down methodology

services provided through the cost centres, an evaluation could be made of the relative efficiency with which nurses are employed. Table 4 gives the distribution of the cost of nursing across final cost centres along with the estimated average cost of this resource embodied in the services provided. Table 5 gives a further breakdown of the components of average costs by cost centres.

The Maternity Ward is a high consumption area in so far as nursing resources are concerned – 19% of the value of nursing resources is deployed to the maternity ward. The Operating Theatre and the Casualty/A&E area follow close behind with 12.5% and 12.3% respectively. Nursing cost was the highest cost component in the average cost per patient day on wards, and also per visit to Casualty/A&E. This cost component amounted to 44% of the average cost per patient seen in the Casualty/A&E and 36.6% of the average cost per patient day in the Maternity ward.

Not surprisingly, overheads-capital consumption-featured significantly in the average cost of production in the Operating Theatre, Laboratory and Radiology (Table 5).

**DISCUSSION**

There is need for caution when using average cost to inform policy and planning. One has to be clear on what the estimates say and what they do not say and by extension, the inferences that can and cannot be made. For example, a strict comparison of cost of an ICU patient *versus* an uncomplicated maternity patient may amount to a comparison of two different things. With this said, the results reinforce the importance of cost information to policy makers, and administrators, and other stakeholders in the health sector. This can be illustrated by drawing on the St Vincent and the Grenadines experience with user fees and by closer examination of the various components/categories that comprise the total and average cost of services.

Table 3: Estimated total and average unit costs of services at the Milton Cato Memorial hospital with a comparison to fees charged (1997)

Cost Centre	Estimated total cost		Estimated average cost Unit of measure	Average fees		Estimated subsidy (%)		
	EC\$	% Distribution		Average cost (EC\$)	Private patients (EC\$)	Public patients (EC\$)	Public patients	Private patients
<b>Wards</b>								
Maternity Ward <sup>a</sup>	2 147 023.00	15.03	Per Patient Day	262.73	10.00	75.00	96.19	71.45
Male Medical Ward	1 324 729.98	9.27	"	170.25	10.00	75.00	94.13	55.95
Female Medical Ward	1 362 116.51	9.53	"	167.77	10.00	75.00	94.04	55.30
Male Surgical Ward	1 300 720.24	9.10	"	132.25	10.00	75.00	92.44	43.29
Female Surgical Ward	1 180 790.69	8.26	"	166.94	10.00	75.00	94.01	55.07
Paediatric Ward	1 427 ,889.77	9.99	"	191.84	10.00	75.00	94.79	60.90
<b>Ancillary Departments</b>								
Operating Theatre*	1 549 074.20	10.84		613.98	71.67 High 20.00	175.00 High 40.00	88.33	71.50
Laboratory	1 092 751.83	7.65	Per Test	5.71			-118.9	-337.8
					Low 5.00 High 50.00	Low 10.00 High 110.00		
Radiology	819 219.99	5.73	Per Exam	51.09	Low 10.00	Low 10.00	41.3	-17.4
Pharmacy	358 718.41	2.51	Per Prescription	22.27	5.00 <sup>b</sup>		77.55	NA
Physiotherapy	152 662.63	1.07	Per Patient Seen	48.01				
<b>Casualty &amp; Accident and Emergency</b>	1 143 271.87	8.00		45.71				
<b>Outpatient Clinics</b>	384 375.28	2.69		19.08	15.00	30.00	21.38	-57.23
Other; Unallocated (morgue)	43 985.32	0.31						
	14 287 329.73	100.00						

Notes: hospital charges for wards refer to "Maintenance and Nursing" which corresponds to the cost estimates.

a: There is also a charge for use of the labour room in the MCMH as follows: (i) normal – public patients(EC\$30.) private patients (EC\$ 80.);

Episiotomy – public patents (EC\$ 40.), private patients (EC\$100.).

b: public outpatients are charged EC\$5. for prescription (per visit).

c: additional charges may apply in some cases eg. if a Caesarean section is required the rate is higher.

\* Fees charged vary from \$100 for a major surgery to \$40 for a minor surgery for public patients and \$100 to \$250 for private patients.

Table 4: Per cent distribution and per unit cost of nursing resources at the MCMH (1997)

Cost centre	% Distribution of nursing costs	Estimated cost of nursing per unit of output	
		(EC\$)	Unit
Maternity ward	19.22%	96.02	Patient day
Male medical ward	9.68%	50.79	"
Female medical ward	9.68%	48.68	"
Male surgical ward	9.68%	40.19	"
Female surgical ward	9.68%	55.88	"
Paediatric ward	10.32%	56.60	"
Operating theatre	12.49%	202.06	Operation
Radiology	0.65%	1.67	Exam
Casualty and A&E	12.32%	20.11	Visit
Outpatient clinics	2.50%	4.40	"

A new schedule of fees was introduced in St Vincent and the Grenadines in February 1995 for public sector hospital services and pharmaceuticals. Prior to the introduction of the new user fees, public patients were charged a nominal fee of one dollar per day for accommodation and nursing on the wards, while emergency, ambulatory and outpatient referral services were free. Fees were increased on a spectrum of services including nursing, accommodation and the use of the operating theatre and labour room. The main aims of the revision were: (i) to increase the financial contribution of users in order to supplement government expenditure; (ii) to better align public sector and private sector fees; (iii) to recoup a greater proportion of the real cost of providing these services; and (iv) to establish a separate fee structure for private patients so that such persons pay appreciably more for utilizing the resources of the public hospital.

Table 5: Cost components per unit of output<sup>a</sup>

Costs	EC\$ (%)												
	Maternity	Wards				Paed	Ancillary departments						
		Medical M	Medical F	Surgical M	Surgical F		Op. Theatre	Lab	Rad	Phar	Physio	Casualty/A&E	Out-patient
Personnel	145.46 (55.36)	82.46 (48.44)	79.03 (47.11)	63.23 (47.81)	87.93 (52.67)	100.41 (52.34)	320.35 (52.18)	2.35 (41.12)	18.00 (35.23)	3.97 (17.82)	23.21 (48.35)	28.24 (61.79)	10.57 (55.38)
– Nursing	96.02 (36.55)	50.79 (29.83)	48.68 (29.02)	40.19 (30.39)	55.88 (33.47)	56.60 (29.51)	202.06 (32.91)	– (0.00)	1.67 (3.26)	– (0.00)	– (0.00)	20.11 (43.99)	4.40 (23.04)
– Other <sup>b</sup>	49.44 (18.82)	31.67 (18.60)	30.35 (18.09)	23.05 (17.43)	32.05 (19.20)	43.81 (22.84)	118.29 (19.27)	2.35 (41.12)	16.34 (31.97)	3.97 (17.82)	23.21 (48.35)	8.13 (17.80)	6.17 (32.35)
Overheads <sup>c</sup>	36.45 (13.87)	20.97 (12.32)	22.71 (13.54)	14.24 (10.76)	21.70 (13.00)	22.17 (11.56)	140.23 (22.84)	1.91 (33.52)	26.22 (51.31)	0.93 (4.18)	13.46 (28.05)	4.97 (10.88)	1.57 (8.21)
Maintenance and Housekeeping	17.48 (6.65)	17.32 (10.17)	17.59 (10.48)	13.70 (10.36)	9.55 (5.72)	18.11 (9.44)	36.54 (5.95)	0.47 (8.29)	1.52 (2.98)	1.10 (4.94)	5.05 (10.51)	1.47 (3.22)	0.71 (3.74)
Administration	39.30 (14.96)	22.28 (13.09)	21.35 (12.73)	17.09 (12.92)	23.76 (14.23)	86.56 (14.14)	27.13 (14.10)	0.63 (11.11)	4.86 (9.52)	1.07 (4.82)	6.27 (13.06)	7.63 (16.70)	2.86 (14.97)
Other <sup>b</sup>	24.05 (9.15)	27.22 (15.99)	27.08 (16.14)	23.99 (18.14)	24.01 (14.38)	24.02 (12.52)	30.31 (4.94)	3.39 (5.96)	0.34 (0.96)	0.49 (68.24)	15.20 (0.03)	0.01 (7.41)	3.38 (17.70)
<b>Average Cost</b>	<b>262.73</b>	<b>170.25</b>	<b>167.77</b>	<b>132.25</b>	<b>166.94</b>	<b>191.84</b>	<b>613.98</b>	<b>5.71</b>	<b>51.09</b>	<b>22.27</b>	<b>48.01</b>	<b>45.71</b>	<b>19.08</b>

M = Male; F = Female; Paed = Paediatric; Op = operating; Rad = Radiology; Phar = Pharmacy; Physio = physiotherapy

a: Output units are given in the previous table.  
d: including transport, laundry, dietary and other

b: all staff excluding nursing staff.

c: capital including medical equipment and vehicles

Total revenue collected increased by 65% in 1995 – from EC\$0.49 M in 1994 to EC\$0.81 M in 1995. By 1997, revenue from user fees was still covering less than 10% of recurrent cost at the hospital, having increased from 5.8% of recurrent cost in 1994 to 7.4% in 1997. When considered in context of the avowed objectives, this is a relatively poor performance and is consistent with the current thinking that user-fees should not be looked to as a significant contributor to financing.

Moreover, although the increase in the rates charged would have undoubtedly resulted in increased cost recovery, the level of ‘subsidization’ is somewhat high (Table 3). This is especially true in relation to inpatient services. An exception is the outpatient service where charges exceed cost for private patients. If we exclude the outpatient services, state subsidies ranged from 78% – 96% for public patients and 43% – 72% for private patients.

Examination of the cost components also allows for analysis of efficiency of specific resources employed at the hospital. It seems reasonable that any consideration/concern for the effective and efficient use of resources at the MCMH should pay special attention to the human resource component in general and nursing in particular. This is important because while it is accepted that some level of state subsi-

dization of health services is warranted in a small island developing state with poverty head count upwards of 35% in 2003, there are instances where lower subsidizations may be both desirable and appropriate given the meagre public purse. This can only be achieved through a fairer match between user fees and the cost of providing the services.

The findings highlight the importance of capital in the production function of the laboratory and the radiology department. In the case of the radiology department where capital consumption accounts for 51.3% of the cost of production, there may be negative repercussions if budgetary allocations fail to channel sufficient financing to capital maintenance and replacement. Similar issues arise for the laboratory where capital consumption features as 33.5% of average cost per unit of output.

In so far as bed capacity is concerned, the MCMH operated with excess capacity of approximately 37% of its plant size in 1997. This may suggest an inefficient match between the size of the facility and the effective demand for services being offered. This finding warrants further investigation as it signals possible adverse implications for the economic efficiency of the hospital due to idle capacity and under-employment of staff, which may significantly increase the unit cost of service delivery.

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