

Costing of Health Care Services in Three Provinces of Cambodia

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Steffen Flessa, Bart Jacobs, Kelvin Hui, Michael Thiede, Bernd Appelt

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Registered offices

Bonn and Eschborn, Germany

Friedrich-Ebert-Allee 40
53113 Bonn, Germany
Phone: +49 228 44 60-0
Fax: +49 228 44 60-17 66

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
Phone: +49 61 96 79-0
Fax: +49 61 96 79-11 15

Email: info@giz.de
Internet: www.giz.de

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Cambodian - German Social Health Protection Programme

PO Box 1238, Phnom Penh, Cambodia

Phone: +855 23 884 476

Fax: +855 23 884 976

Email: giz-kambodscha@giz.de

Internet: www.giz-cambodia.com

Authors

Steffen Flessa¹, Bart Jacobs², Kelvin Hui², Michael Thiede³, Bernd Appelt²

¹ University of Griefswald, ² Deutsche Gesellschaft für Internationale Zusammenarbeit, ³ Scenarium

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Abstract

Background: Healthcare policy decisions must be based on economic and epidemiological evidence. While knowledge of the epidemiological situation in Cambodia is considerable, little is known about the cost of healthcare services in this country. Existing data is obsolete and frequently not based on a standard methodology.

Objective: This study has two objectives. First, to calculate the unit cost of public healthcare services in Cambodia (health centers, primary and secondary hospitals) as a foundation of evidence-based decision-making. Second, to demonstrate that costing of healthcare services in Cambodia is feasible and can develop into a routine system.

Methodology: This study was conducted by GIZ in partnership with the Cambodian Ministry of Health (MOH) in 2017, based on data from 2016. It follows a standard step-down micro costing methodology for 16 health centers without beds, four health centers with beds, two "complementary package of activities – level 3" (CPA3) hospitals, two CPA2 hospitals, and one CPA1 hospital. All facilities are public healthcare providers.

Results:

- The actual average full cost per visit to a health center is US\$3.24. The respective figures for general outpatient consultation and normal delivery are US\$3.88 and US\$107.29. For the CPA3 hospitals the cost for an outpatient consultation is US\$41.53, compared to US\$5.87 for a CPA2 hospital and US\$9.65 for a CPA1 hospital. One inpatient day costs US\$38.21 in the CPA3 hospitals, US\$27.61 in the CPA2 hospitals, and US\$55.87 in the CPA1 hospital.
- The cost per outpatient attendance and per delivery in health centers is lower than in hospitals; i.e., a strict referral system makes sense for outpatients and uncomplicated deliveries.
- The total costs and unit costs of different categories of hospitals are not significantly different; i.e., hospitals with higher levels of care are not necessarily more expensive than lower level hospitals. The utilisation rate is the most important determinant of unit costs, not the level of care.
- In comparison to many other studies, the costs of drugs and medical materials are rather high; higher than the costs of personnel in almost all cases.
- Within each level of health care, the unit costs vary strongly between facilities. This seems mainly to be a consequence of workload.
- The Cambodian government is still the main funder of public healthcare facilities, but this funding differs strongly in absolute and relative terms from institution to institution.
- Most facilities make a minor surplus; i.e., they could afford to increase the number of patients without running a loss.
- A comparison between the quality score (from the Level II Quality Assessment) and cost per service unit indicates very different degrees of cost effectiveness between facilities. This could become a foundation for benchmarking.

Conclusions: This study shows that costing of public healthcare services following a standard methodology is feasible in Cambodia. However, the sample must be broadened, and data collection must become routine practice in order to base policy- and healthcare decision-making on economic evidence. For this purpose, administrative standards in health facilities, operational districts and provincial health departments must be strengthened. MOH should lead the establishment of a routine costing system.

Costing of Health Care Services in Three Provinces of Cambodia

Keywords

- Cambodia
- Costing
- Economics
- Evidence-based health policy-making
- Health care financing
- Step-down methodology

Abbreviations

- ALOS = Average length of stay
- CPA = Complementary Package of Activities
- HEF = Health Equity Funds
- H-EQIP = Health Equity and Quality Improvement Programme
- HSP3 = Third Health Strategic Plan
- MOH = Ministry of Health
- NSPC = National Social Protection Council
- NSSF = National Social Security Fund
- SPPF = Social Protection Policy Framework
- UHC = Universal Health Coverage

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Costing of Healthcare Services in Cambodia

1. INTRODUCTION

Costing of healthcare services is a prerequisite for delivering these services effectively and efficiently [1]. Consequently, considerable effort has been invested in improving the knowledge of resources consumed to provide services at hospitals, health centers and other healthcare providers [2-23]. In Southeast Asian countries, a number of studies have calculated the costs of healthcare services; e.g., Vietnam [24-27], Myanmar [28, 29], Thailand [30, 31], Malaysia [32-34], Laos [35, 36] and Bangladesh [37, 38]. However, relatively little is known about the cost of healthcare services in Cambodia.

To our knowledge, the first analysis of these services was prepared by Fabricant, based on data from 2001 [39]. He analysed four provincial hospitals, eight district hospitals, two health centers with beds, and 16 health centers without beds. The study was never officially published. In 2009 (using 2007 data), Collins *et al.* used a normative costing approach based on a complementary package of activities for referral hospitals [40, 41]. However, these models made many assumptions without empirical evidence. Thus, the authors called for “a more detailed analysis of the operating costs” and concluded that the cost model “needs to be updated for the Cambodian adaptation”. Another empirical study [42]¹ analysed the

costs of three “complementary package of activities – level 1” (CPA1), three CPA2 and four CPA3 hospitals in 2011-2012, but the results were never published.

A number of studies have analysed the costs of specific health services or conditions in Cambodia: Beauté and Vong analysed the cost of dengue [43]; Flessa, Dietz & Weiderpass studied the cost of cervical cancer [44]; and, Collins, Lewis & Stenberg [45] looked at the cost of childhood survival. Other studies are methodologically interesting but focus only on one hospital or service; e.g. Gosselin and Heitto [46]. Consequently, very little is known about the real costs of healthcare services in Cambodia, and the existing studies are obsolete or have never been subjected to the methodological scrutiny of a peer-review process. Thus, there is a strong need to increase the knowledge of the costs of healthcare services in Cambodia by utilising a standardised methodology.

This paper contributes to the knowledge of costs of healthcare services in Cambodia by presenting the findings from a costing study based on a standardised methodology. In the next section, the methodology is presented, followed by the results of the costing exercise, while the last section discusses the findings.

¹ Only a final PowerPoint presentation is available; there is no written document. No publication was retrieved.

2. METHODS

2.1. Background

In recent years, Cambodia has made great steps towards universal health coverage (UHC) [47]. Although more can be done to expand the basic healthcare package and avoid high out-of-pocket payments, especially in the private sector, access of the general population to public health services has improved markedly [48]. The poorest households can access public health services without out-of-pocket payments at the point of delivery. By 2016, health equity funds (HEF) which cover people officially identified as poor under the IDPoor programme, or when presenting at the public hospital through post-identification, was expanded nationwide [49]. In late 2016, the National Social Security Fund (NSSF) commenced social health insurance for formal sector employees and expanded to civil servants in 2018. These schemes are supported and supervised by the Royal Government of Cambodia (RGC), which recently formulated its Social Protection Policy Framework (SPPF). The pooled funding arrangement under the Health Equity and Quality Improvement Program (H-EQIP) started in mid-2016 and emphasises health financing for UHC; an issue that is reinforced in the Third Health Strategic Plan 2016-2020 (HSP3).

These positive developments call for evidence-based decision-making in order to use available resources for health care most efficiently. Information on the costs of healthcare services is the foundation for evidence-based decision-making; for example, on issues such as the calculation of rebates, allocation of government resources for health, and the technical efficiency of healthcare providers.

In this context, the Ministry of Health (MOH) has called for reliable costing data of healthcare services, and transformation of

the costing methodology into a routine healthcare cost monitoring system.

2.2. Costing

The term “cost” is used for diverse purposes [50]. In this study, we define cost as the financial expression of the consumption of resources expressed in currency units (expressed as US dollars; US\$). Thus, this study calculates the provider costs and neglects other concepts of costs such as intangible costs (e.g., loss of quality of life) or household costs (e.g., transport of the patient to the provider) [51]. Consequently, we express total costs and costs per service unit at the provider perspective (e.g., per admission/discharge, per case, per inpatient-day, per attendance, and per patient) but not for other units (e.g., per household, per district).

The calculation of provider costs follows a standard methodology frequently applied in the costing of healthcare services [1, 24, 52, 53]. Three manuals (hospitals, health centers without beds, and health centers with beds) with detailed methods for data collection and analysis were prepared and are available from the authors.

As much as possible, full costs have been calculated; i.e., the total reduction of the value of resources of a healthcare provider within one year is calculated irrespective of the year and source of payment. These full costs are retrieved from the financial accounts and statements of the healthcare providers, districts, regions and national bodies (e.g., MOH) as well as by personal stock-taking of the researchers (e.g., personnel allocation, equipment, buildings). All costs are allocated to different cost centers according to where the respective resources are consumed. Table 1 exhibits direct cost centers rendering services to patients, and indirect (or service) cost centers supporting direct cost centers, for hospitals.

Respective tables were prepared for health centers with and without beds.

Table 1. Cost centers and costing units for hospitals

Service cost centers	Administration; Laundry; Kitchen; Pharmacy; Laboratory; Radiology
Final cost centers	Outpatient department (OPD); Inpatient services for: Surgery, General Medicine, Paediatrics, Maternity, and Other inpatient services; Other services
Costing units	Cost per OPD visit, cost per patient and cost per bed-day of the entire hospital; cost per patient and cost per bed-day of each inpatient department (surgery, general medicine, paediatrics, maternity, other inpatient services); cost per patient for other services (e.g. HIV counselling)

The methodology follows a “step-down allocation”, strictly distinguishing between direct costs (occurring only because a specific service is rendered; e.g., consumption of a tuberculosis drug for a tuberculosis patient) and indirect costs (overheads occurring for the general operations of the unit; e.g., administrative costs). Direct costs are allocated to the final

costing units while indirect costs are allocated to their cost centers; i.e., the department where they occur. The costs within service cost centers are allotted stepwise to the final cost centers. Finally, the total costs of the final cost centers are allocated to the respective cost unit. Figure 1 shows this process. Table 2 shows the cost categories and their respective allocation keys.

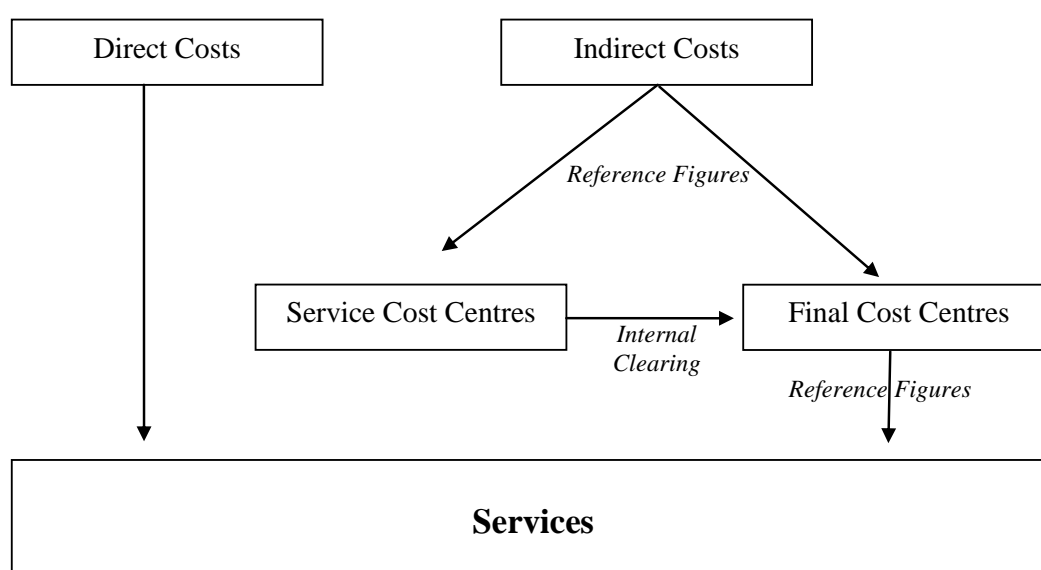


Figure 1. An overview of the allocation of direct and indirect costs

In order to compare the different workloads between inpatient and outpatient services, it is helpful to calculate the equivalent inpatient days for all services. This is the

quotient of cost per outpatient visit and cost per inpatient day; e.g., if the average cost per inpatient day is US\$20 and the cost per outpatient visit is US\$10, one outpatient visit is cost-equivalent to 0.5 inpatient days.

Table 2. Cost categories and allocation keys for hospitals

Cost category	Sub-category	Detailed categories	Allocation key
Labour cost	Ward staff	Doctors, Medical Assistants, Secondary Nurses/Midwives, Primary Nurses/Midwives, Untrained Nurses/Midwives, Other ward staff	Time spent in each cost center
		Paramedicals	Physiotherapy, Occupational therapy
	X-ray staff		X-ray department
	Laboratory staff		Laboratory
	Pharmacy staff		Pharmacy
	Support departments	Laundry staff	Laundry
		Kitchen staff	Kitchen
		Technicians	Service cost center “other”
	Administrative staff	Accounts, medical recording	Administration
	Other staff		Service cost center “other”
Other staff cost		Proportional to all staff costs allocated to respective cost centers	
Stores	Pharmacy	Drugs	Pharmacy
		Medical materials	Pharmacy
		Vaccine	OPD
		Other	Pharmacy
	Laboratory supplies	Laboratory	
	Domestic supplies	According to floor size	
Transport	Food supply	Kitchen	
	Linen and clothing	According to number of equivalent inpatient days	
	Vehicle running exp.	Administration	
	Cargo transport	Administration	
	Travel expenditure	Administration	
Equipment	Local, cheap		Location
	Fixed asset depreciation	Beds	Beds per department
		Medical equipment	Location
		Laundry	Laundry
	Maintenance and repair	Other equipment	Location
		Location	

Cost category	Sub-category	Detailed categories	Allocation key
Vehicles	Depreciation		Administration
Buildings	Depreciation		Location
	Maintenance and repair		Location
General expenditures	Electricity		According floor size
	Water supply		According floor size
	Postage and telephone		Administration
	Printing and stationery		Administration
	Other expenditures		Administration
Sundry expenses			Administration

2.3. Additional analysis

A major objective of this costing study is to produce results based on a standard methodology which enables comparison with other studies. As several authors do not include depreciation charges in their analysis, we will present results with and without depreciation.

Furthermore, we will use breakeven analyses distinguishing between fixed and variable costs, as shown in

Table 3. It should be noted that government grants are fixed incomes for the institutions and, in the case of Cambodia, the fixed

income is higher than the fixed cost, whereas the variable costs are higher than the variable income per service unit. As such, we cannot use the standard breakeven chart. Figure 2 demonstrates this principle. Assuming that I_f is the fixed income, E_f the fixed cost, v the variable cost per service unit, and p the patient fee per service unit, the breakeven point (BEP) is calculated as

$$BEP = \frac{I_f - E_f}{v - p}$$

In this special situation, the BEP indicates how many patients can be treated before the institution begins running at a loss.

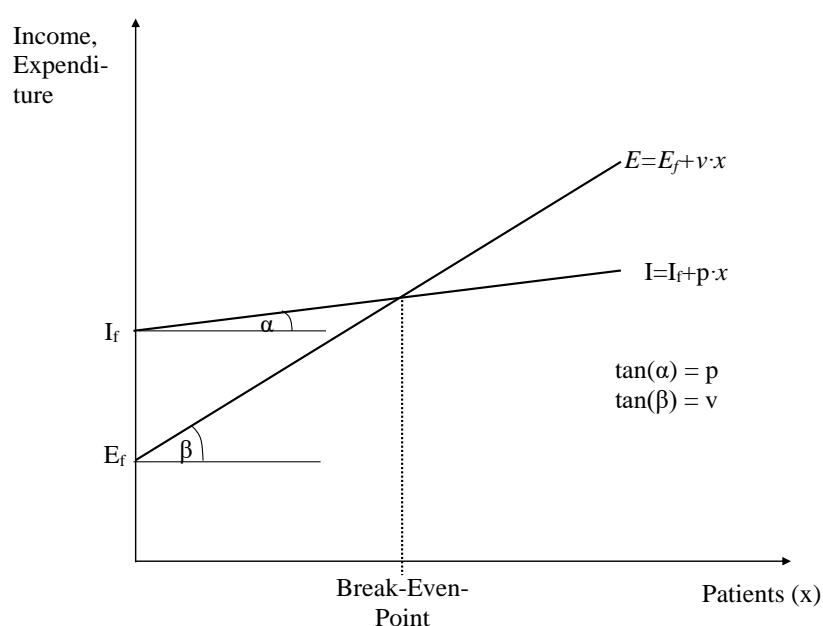


Figure 2 .Breakeven analysis

Table 3. Allocation of costs and income to variability category

Category	Variability	
	Variable	Fixed
Staff		X
Drugs and materials	X	
Food	X	
Electricity, water	X	
Other expenditures		X
Training		X
Maintenance		X
Depreciation		X
Patient fees	X	
Government grants		X
Other income		X

As a proxy of quality of care, we use outcomes from the Level II Quality Assessment of healthcare facilities. This procedure has been applied by MOH since 2010 at all public health facilities within the country to assess the quality of care. It includes determinants of structural quality (e.g., staffing patterns, buildings, equipment, and availability of electricity), process

quality (e.g., documentation), and result quality (e.g., infection rates, routine clinical procedures, and behaviour of staff toward patients).

2.4. Sample

Based on accessibility, three provinces were chosen: Kampong Thom, Kampot, and Kep. Table 4 shows the sample in each province.

Table 4. Sample and key

Province	Type	Name of health facility	Key	
Kampong Thom	CPA3 hospital	Kampong Thom Provincial Referral Hospital	A	
		Baray Santuk Referral Hospital	B	
	Health center (HC) without beds	Treal HC	1	
		Chong Dong HC	2	
		Taing Kok HC	3	
		Sankor HC	4	
		Chey HC	5	
		Trea HC	6	
		Chamna Leu HC	7	
		Kok Nguon HC	8	
		Health center (HC) with beds	Prey Pras HC	B1
			Taing Krasaing HC	B2
		Kampot	CPA3 hospital	Kampot Provincial Referral Hospital
Angkor Chey Referral Hospital	D			
Health center (HC) without beds	Dambok Khpos HC		9	
	Trapaing Sala HC		10	
	Praphnom HC		11	
	Tani HC		12	
	Kampong Trach HC		13	
	Noreay HC		14	
	Damnak Kantuot HC		15	
	Russei Srok HC		16	
	Health center (HC) with beds		Dang Tong HC	B3
			Touk Meas HC	B4
	Kep		CPA1 hospital	Kep Provincial Hospital

3. RESULTS

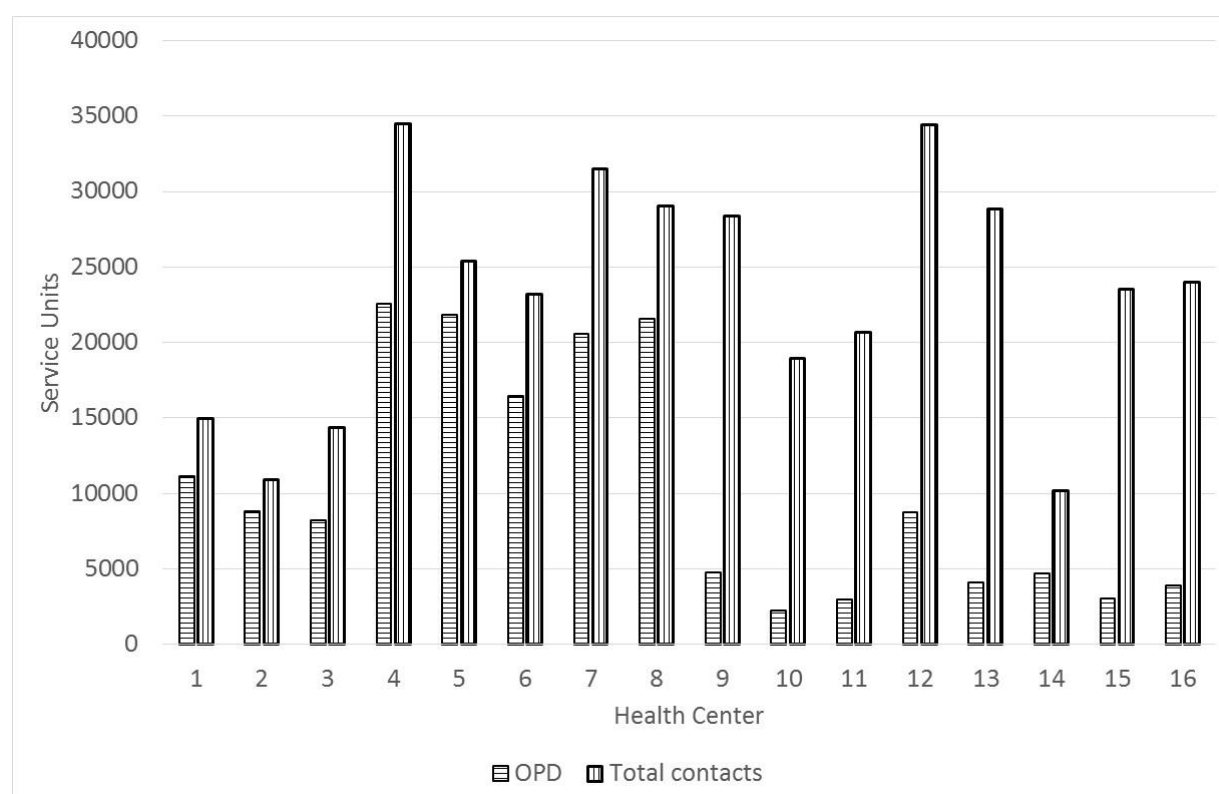
3.1. Services

The workload of the facilities differs strongly. As expected, CPA3 hospitals have the biggest workload, followed by CPA2 hospitals, whereas the CPA1 hospital's performance is not much more than a health center with beds. However, the occupancy rate and the average length of stay (ALOS) differ strongly as well. The occupancy rates are very low for one CPA2 hospital, the

CPA1 hospital and health centers with beds. Health center B3 officially has 15 beds, but had no admissions in 2016. Thus, the facility has the overhead of a health center with beds, while providing only the services of a health center without beds. Generally, the ALOS is rather low for each level of care, suggesting that the degree of complexity of services at the institutions is rather low (Table 5).

Table 5. Service units of hospitals and health centers with beds

	A	B	C	D	E	B1	B2	B3	B4
OPD	8,972	16,447	9,805	6,446	8,205	10,852	14,396	3,540	7,184
IPD patient	8,145	5,690	10,110	2,189	966	590	509	-	551
Inpatient day	35,686	26,623	44,229	8,123	5,039	1,382	1,157	-	2,075
Beds	120	55	133	52	28	32	31	15	30
Occupancy [%]	81	133	91	43	49	12	10	-	19
ALOS [days]	4.38	4.68	4.37	3.71	5.22	2.34	2.27	-	3.77

**Figure 3. Service units of health centers**

3.2. Actual cost

The main results of this costing analysis are the actual costs of running healthcare facilities in Kampong Thom, Kampot and Kep provinces for the year 2016. This section first presents the total costs and the respective cost components. The next section analyses the cost per service unit. Finally, costs are presented without depreciation.

3.3. Total cost

Figure 4 and 5 demonstrate the actual full costs of operating healthcare facilities in the three provinces. One would expect that the cost per hospital bed strongly depends on the level of care. Indeed, this is reflected in Kampot province, as the annual cost per bed is US\$13,215 for the provincial hospital (CPA3) and US\$6,038 for Angkor Chey District Hospital (CPA2). Contrary, in Kampong Thom province the respective

costs are US\$17,321 for the provincial hospital (CPA3) and US\$17,644 for Baray Santuk District Hospital (CPA2). For Kep Hospital, the costs per bed are US\$13,154 (CPA1); i.e., the cost per bed of the lowest level hospital almost equals that of the highest-level hospitals. However, it seems that the number of official beds and the real number of beds does not always match.

The deviation of total expenditures is lower for health centers than for hospitals, especially if health centers with beds are disregarded. The “standard health center” seems to operate with similar costs in almost all locations in these provinces.

The analysis of the relative share of costs indicates that the costs of drugs, medical materials, and other stores is high; on average 42% of the total costs, ranging from 15% (Angkor Chey Hospital) to 59% (Damnak Kantuot HC). In hospitals, the cost of stores is 40% (range: 15%-50%). In health centers without beds the respective figure is 43% (range: 23%-59%). For health centers with beds, it is 39% (range: 32%-45%). The high share of costs for drugs and medical materials as well as the differences between institutions indicate the need to further analyse prescription practices and purchasing prices.

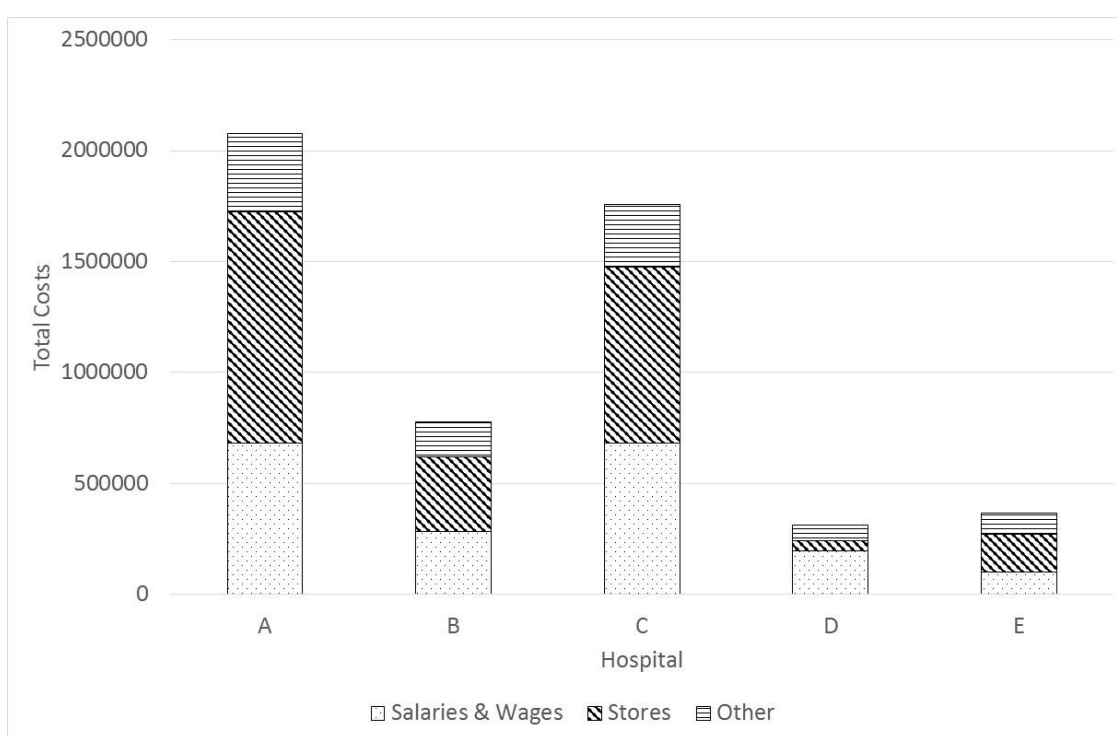


Figure 4. Hospital costs (absolute) [US\$]

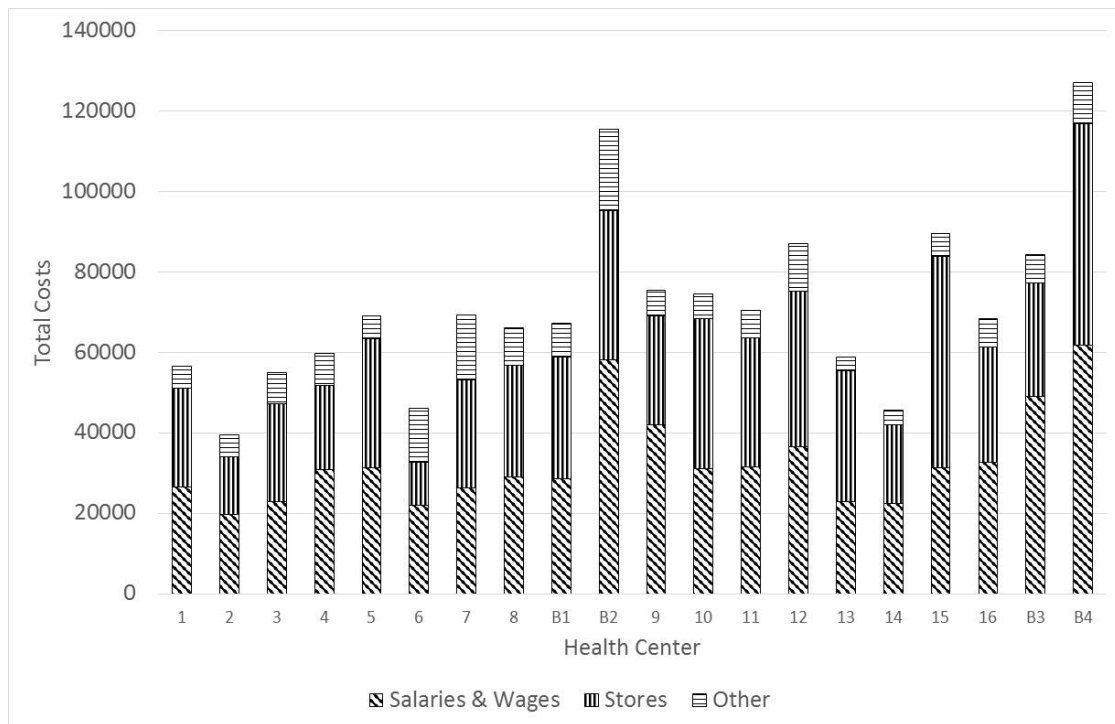


Figure 5. Health center costs (absolute) [US\$]

Figure 6 and 7 show the labour costs of hospitals and health centers. On average, labour costs account for 45% of total costs, ranging from a minimum of 28% to a maximum of 63%. For hospitals, the respective figures are 40% (range: 28%-63%); 45% for health centers without beds (range: 35%-56%); and 50% for health centers with beds (range: 42%-58%).

As expected, ward staff members (doctors, nurses, and midwives) constitute the highest proportion of staff members and have the highest costs. On average, 87% of staff fall

into this category, with a minimum of 63% and a maximum of 100% depending on the facility. For hospitals, the average is 79% (range: 63%-86%). For health centers without beds, it is 90% (range: 72%-100%); and for health centers with beds, it is 85% (range: 63%-100%). The second highest share of labour expenditures is for “other staff” (average: 7%). However, some institutions could not provide statistics that can be differentiated between staff categories. Nevertheless, at least in hospitals, the cost categories are rather similar.

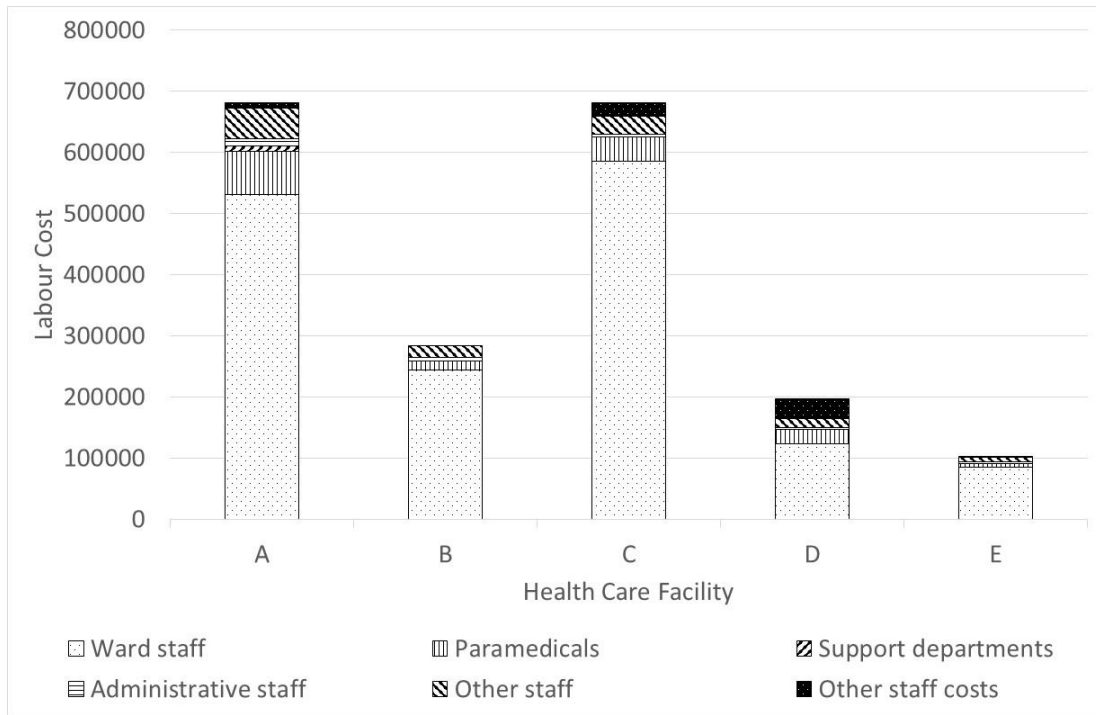


Figure 6. Labour costs in hospitals [US\$]

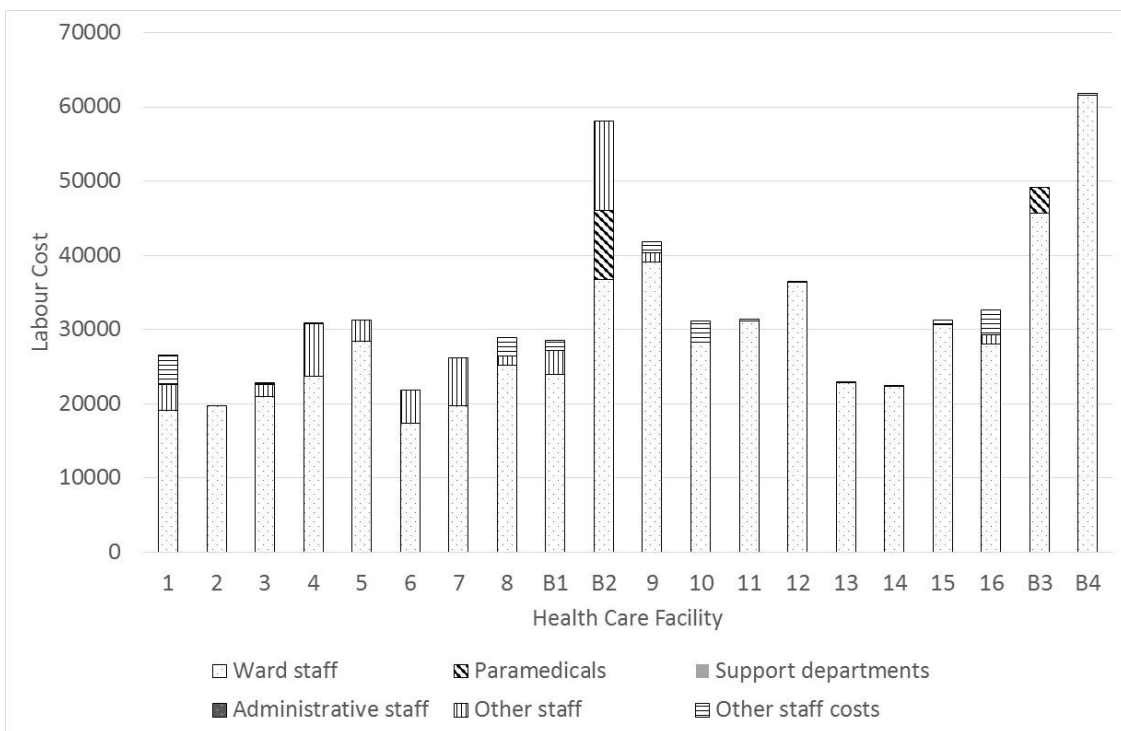


Figure 7. Labour costs in health centers [US\$]

Figure 8 and 9 show the costs of drugs, medical materials and other stores in hospitals and health centers. On average, 79% of the costs of stores are allocated to drugs (range: 46%-100%). For hospitals, the

average relative share of drug costs is 78% (range: 52%-100%). This is 77% for health centers without beds (range: 46%-95%); and 87% for health centers with beds (range: 82%-91%). Medical materials account for

the second highest share of these costs, with an average of 12% (range: 0%-43%) of total costs. Vaccine costs are primarily significant in health centers without beds, where they make up on average 12% of total store costs (range: 0%-38%).

These figures should be taken with caution. For instance, some healthcare facilities did not have separate accounts for drugs and medical materials, and some could not provide figures for vaccines. However, even with a degree of caution, costs strongly differ between facilities with the same level of care.

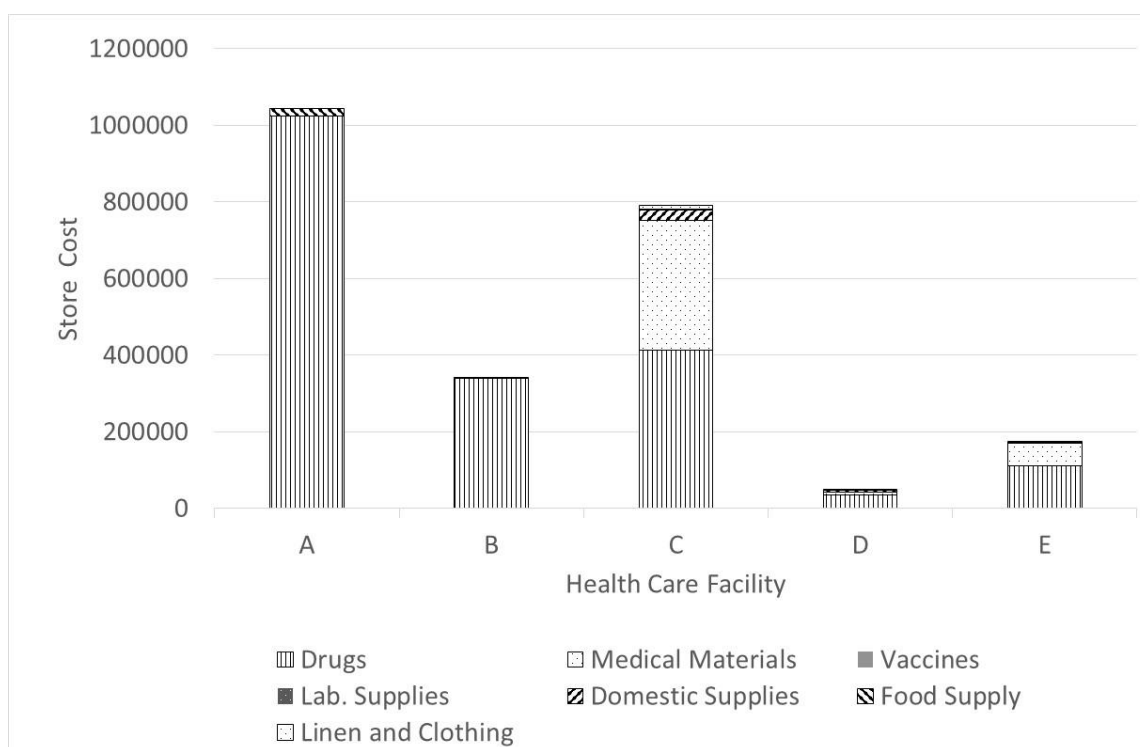


Figure 8. Cost of stores in hospitals [US\$]

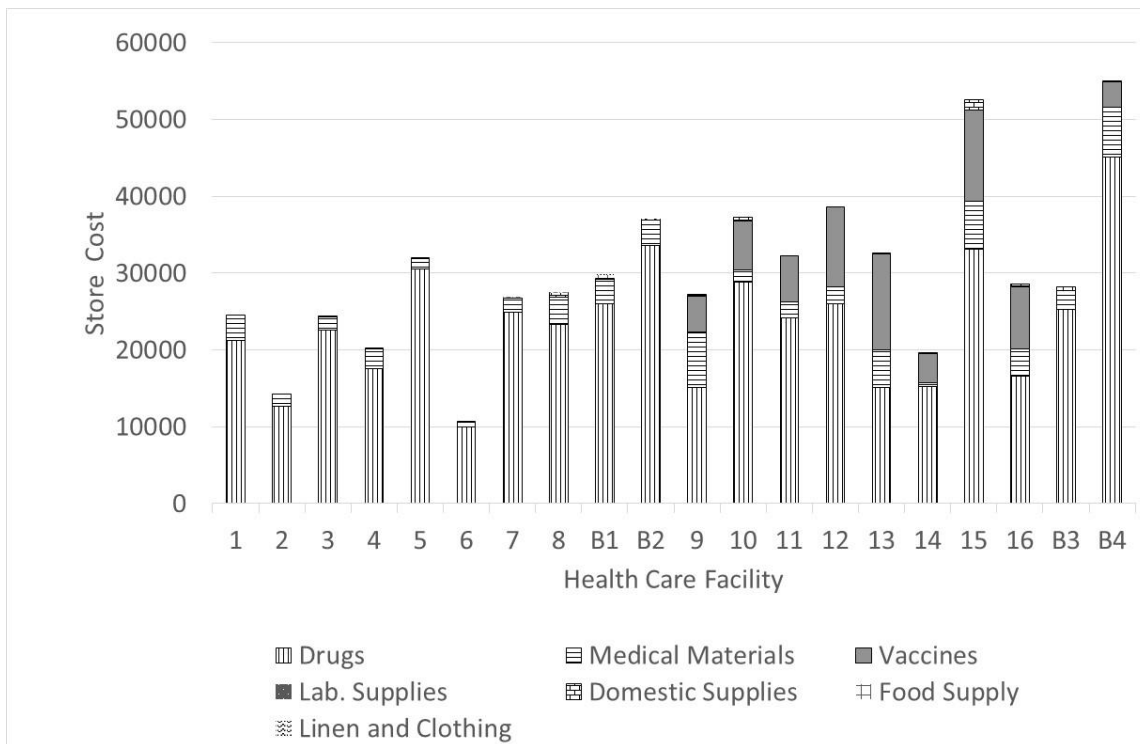


Figure 9. Cost of stores in health centers [US\$]

Figure 10 and 11 show the other costs of the concerned health facilities. Depreciation of equipment together with general expenditures (e.g., electricity, water, office

supplies) are the most costly items. Again, neither the total nor the relative share of costs is equally distributed. This suggests the need for further analysis, standardisation of documentation, and benchmarking.

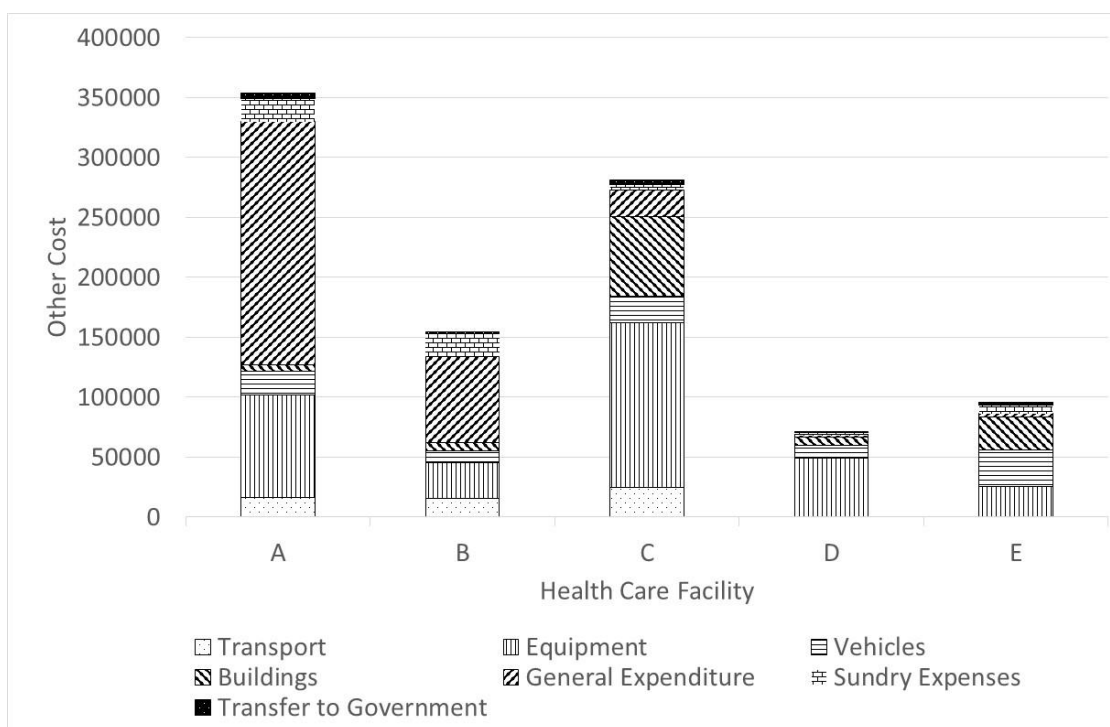


Figure 10. Other costs in hospitals [US\$]

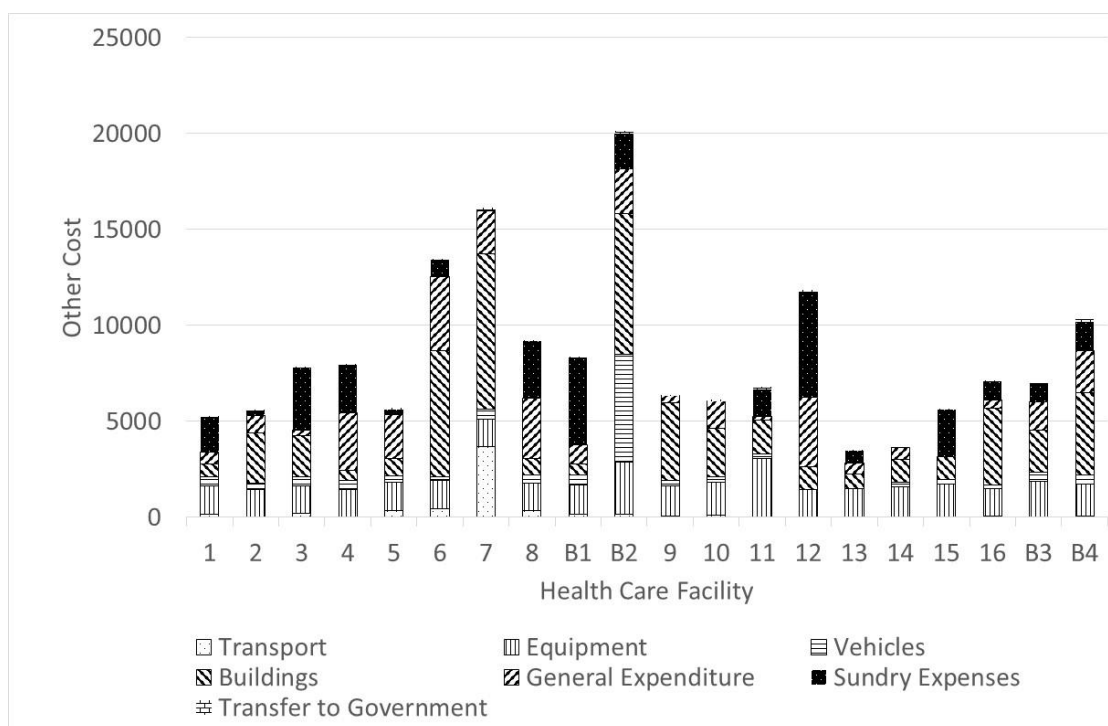


Figure 11. Other costs in health centers [US\$]

The depreciation charges for equipment, vehicles and buildings are included in Figure 10 and 11. However, since depreciation figures can be considerable, Figure 12 and 13 show the depreciation charges of health centers and hospitals in more detail. Depreciation makes up around 7% of total costs (range: 3%-22%). Obviously, studies that omit depreciation and focus only on

current expenditures will underestimate the real costs by a considerable margin.

For almost all hospitals, equipment depreciation is the main expense, which is partly due to the fact that most buildings are usually quite old and already written-off. On the other hand, some health centers are rather new, so their building depreciation amounts are much higher.

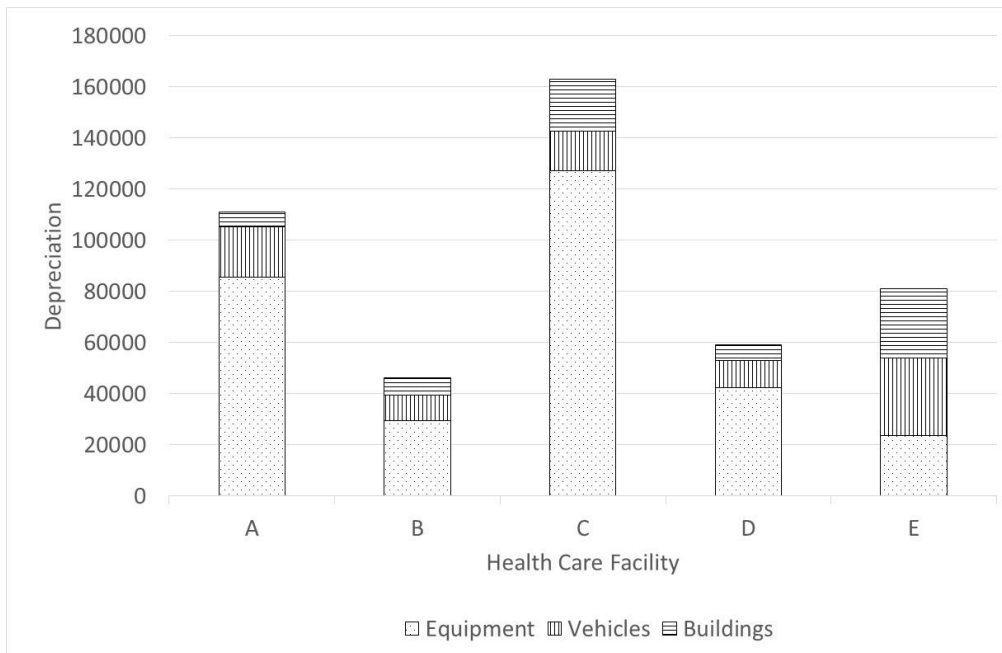


Figure 12. Depreciation in hospitals [US\$]

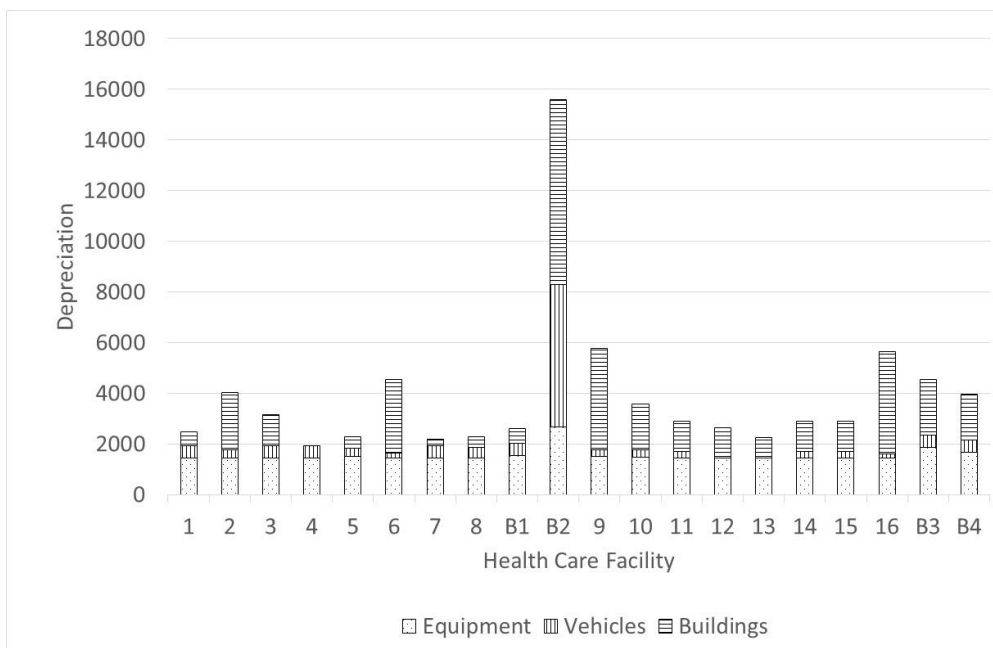


Figure 13. Depreciation in health centers [US\$]

The statistics are frequently of a poor quality and we cannot assure that the same patient will receive the same diagnosis and be treated in the same department within the same facility or across different facilities. This challenges the results of the cost analysis.

3.4. Unit cost

Figure 14-16 show the costs per service unit in different healthcare facilities. Obviously, the costs per OPD consultation and delivery in health centers are lower than in hospitals, reinforcing the need for a strict referral system. However, the costs per service unit in hospitals do not necessarily correlate with

the level of care; the workload (occupancy rate) seems to be a better determinant for this than the level of care. The CPA1 hospital in Kep especially has extraordinarily high unit costs.

Furthermore, costs per service unit in Kampot and Kep provinces tend to be higher than in Kampong Thom province. It was anticipated to be the opposite, as the documentation quality and completeness appeared best in Kampong Thom, whereby it

was expected that their unit costs would also be higher. However, this does not hold.

Similar to total costs, unit costs vary strongly within each level of health care. This seems due to the workload. As healthcare facilities have high fixed costs, an increasing workload leads to a disproportionate increase of total costs and a decrease of unit costs. Thus, there is room to improve efficiency by increasing the workload of institutions.

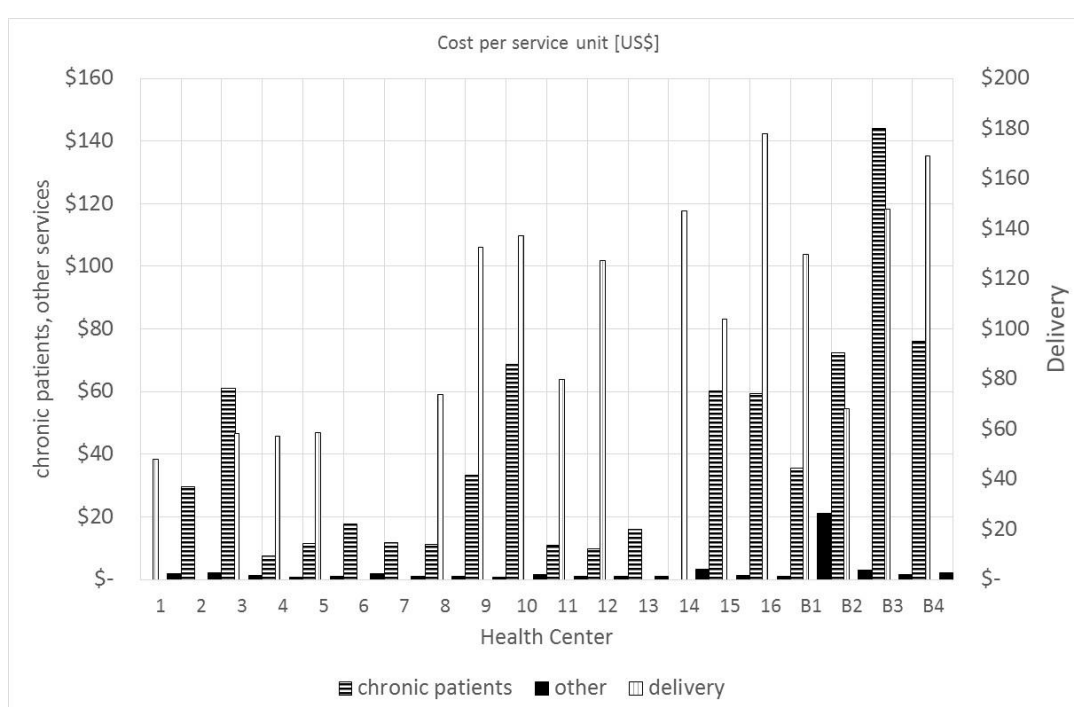


Figure 14. Cost of chronic patients, deliveries and other services in health centers²

² The graph ignores the maternity outliers in Chong Dong (US\$829.40), Trea (US\$3,673.47) and Chamma Leu (US\$501.26) due to low numbers of institutional deliveries. The health centre in Kampong Trach does not perform deliveries because it is attached to a hospital.

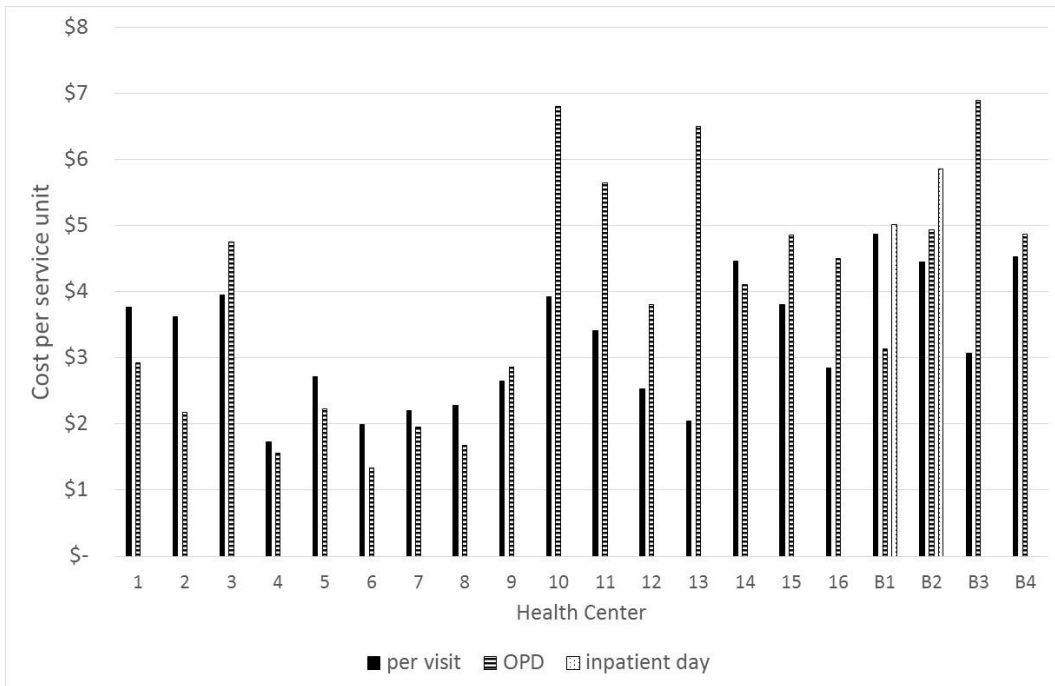


Figure 15. Cost per patient contact, per OPD consultation and per inpatient-day in health centers

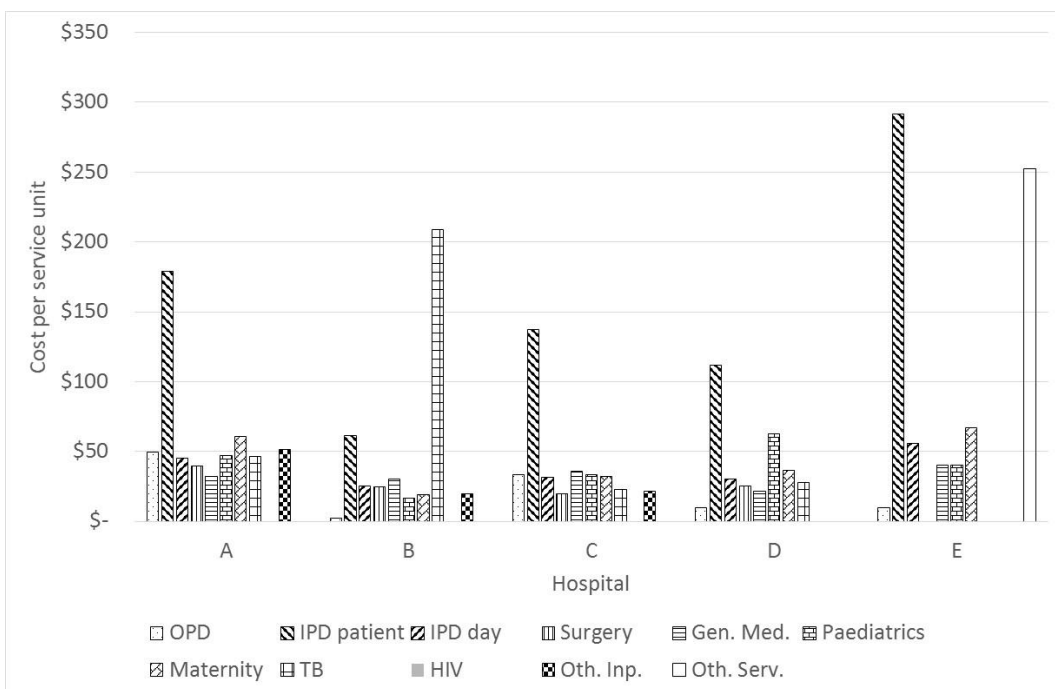


Figure 16. Cost per service unit in hospitals

Deliveries at health centers need some special attention. On average, there are 167.15 deliveries per health center per year, although this ranges from zero to 350. Health centers attached to a hospital do not provide institutional deliveries. The number of

deliveries per facility tends to be higher in Kampong Speu than in Kampong Thom province.

The health centers of Chong Dong HC, Trea HC and Chamna Leu HC have only 10, 2, and 24 deliveries per year, respectively, while allocating a significant number of staff

members to their maternity departments. Consequently, the cost per delivery is US\$829.40 at Chong Dong HC, US\$3673.47 at Trea HC, and US\$501.26 at Chamna Leu HC. Including these figures in the analysis will change the average cost per delivery to US\$353.13, with a range of US\$47.34 to US\$3673.47. If we exclude these three facilities from delivery cost analysis, the costs per delivery of the remaining institutions will be on average US\$106.58 (range: US\$47.34-US\$177.81) (Figure 17).

However, excluding maternity services for these outlier facilities from the delivery cost analysis requires the costs to be reallocated to the OPD department, with the assumption that the maternity staff members actually work there. This increases the average costs per service unit of OPD from US\$3.87 to US\$3.97 without changing the range (US\$1.34-US\$6.90). Figure 18 shows the consequences.

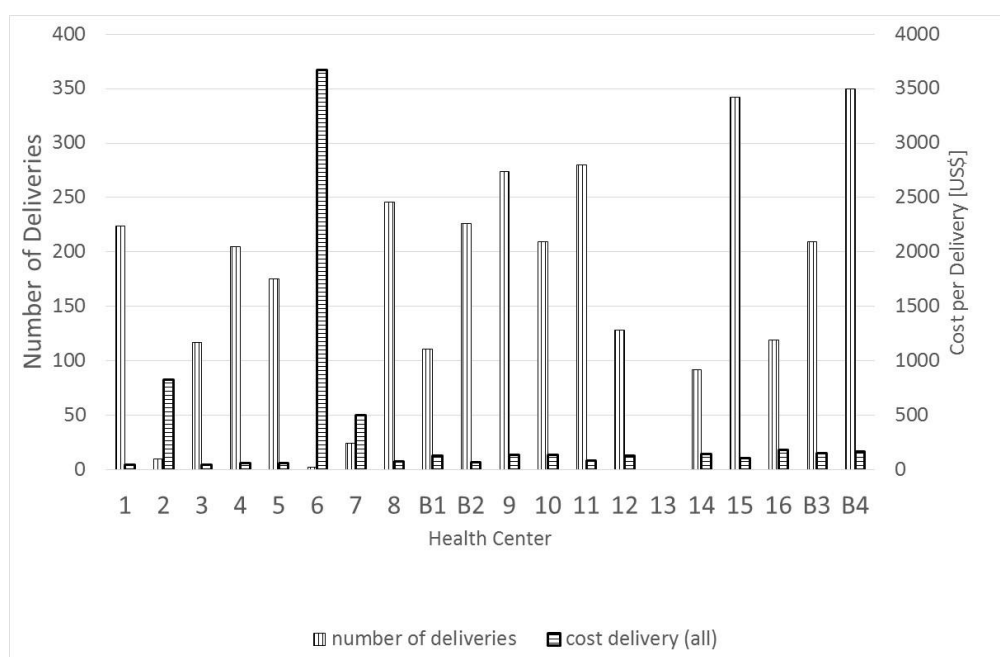


Figure 17. Number of deliveries and cost per delivery (before adjustment) [US\$]

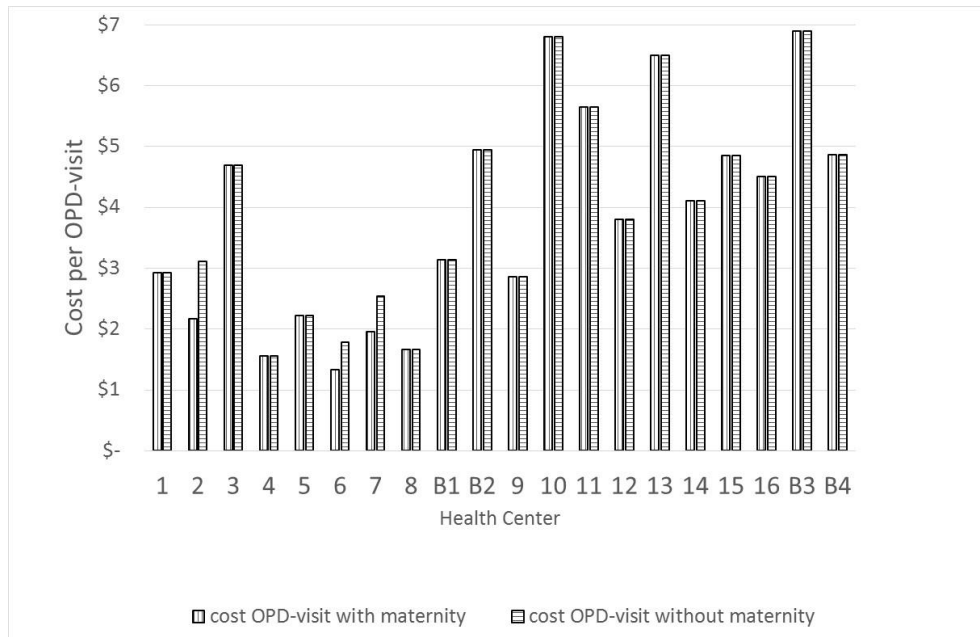


Figure 18. Cost per OPD visit, with and without maternity, of low performing maternity departments [US\$]

Lastly, Figure 19 shows the costs and income per service unit. As expected, hospitals have higher costs per service unit. However, higher level hospitals do not necessarily consume more resources to produce one service unit than lower level hospitals. Kep Provincial Hospital has tremendously high costs for drugs and medical materials per equivalent inpatient-day, whereby the costs per case are higher at this CPA1 hospital than at the CPA3 hospitals in the study.

The costs per service unit do not vary greatly among health centers. Labour costs per service unit are on average US\$1.34 (range: US\$0.79-US\$2.19), whereas the respective figures for stores are US\$1.30 (range: US\$0.47-US\$2.24). For health centers, the maximum of all cost categories is always less than three times the minimum, whereas for hospitals the maximum can be up to six times the minimum.

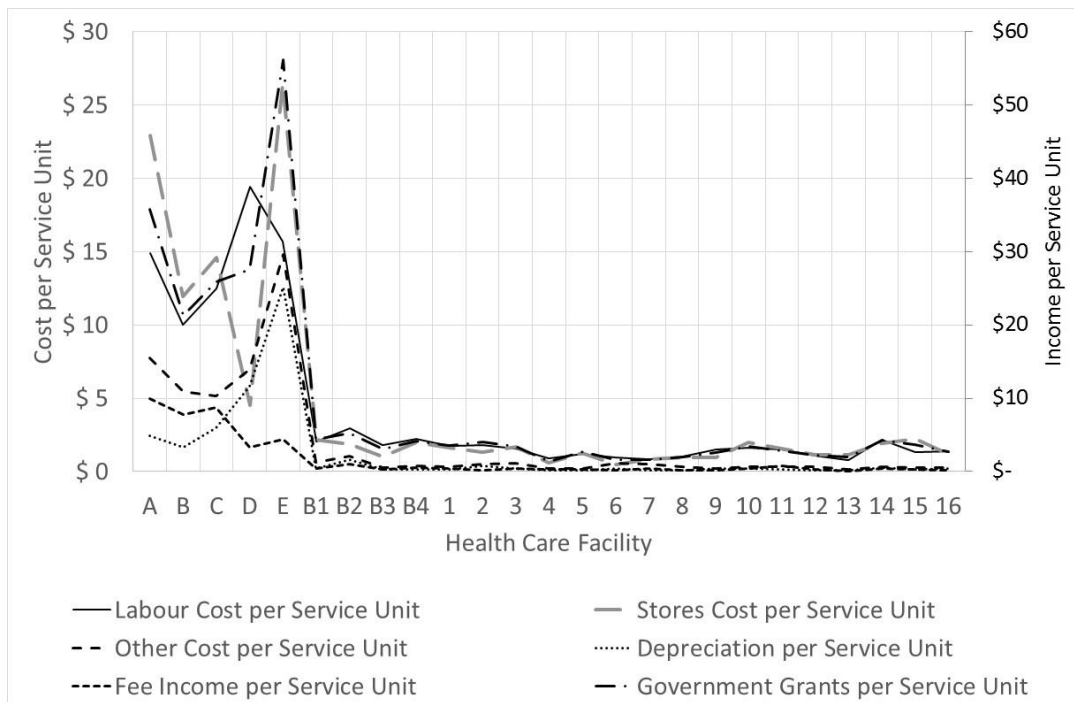


Figure 19. Cost and income per service unit [US\$]

3.5. Costs without depreciation

Figure 12 and Figure 13, above, present the total depreciation per health facility. As mentioned, the costs per service unit decline on average by 7% (range: 3%-26%) if we disregard depreciation charges. For hospitals, the average decline is 12% (range: 5%-22%); while it is 5% for health centers without beds (range: 3%-10%); and 10% for health centers with beds (range: 3%-26%). As some buildings and equipment are already written off, these figures tend to underestimate the necessary capital input requirements to maintain the facilities at the existing level. At least 10% of the current budget should be added for capital costs.

The relevance of depreciation also depends on the cost center. Departments with a high reliance on equipment and buildings will have a stronger reduction of unit costs if we disregard depreciation. For instance, the average costs of Kampong Thom Provincial Hospital decrease by 5% if we neglect

depreciation charges. However, these figures are different for the outpatient department (8%), the surgical department (10%), general medicine (5%), and paediatrics and maternity (3%).

3.6. Actual Income

Figure 20 and Figure 21 show the income of the healthcare facilities. The government is still the main funder of these institutions, but their share of income depends on the level of the healthcare provider. On average, 88% of the income of all healthcare institutions comes from the government (range: 73%-96%). For hospitals, the average is 82% (range: 74%-93%); while it is 89% for health centers without beds (range: 78%-96%); and 88% for health centers with beds (range: 73%-96%). Generally, the higher the level of care, the greater the proportion of user fee revenue.

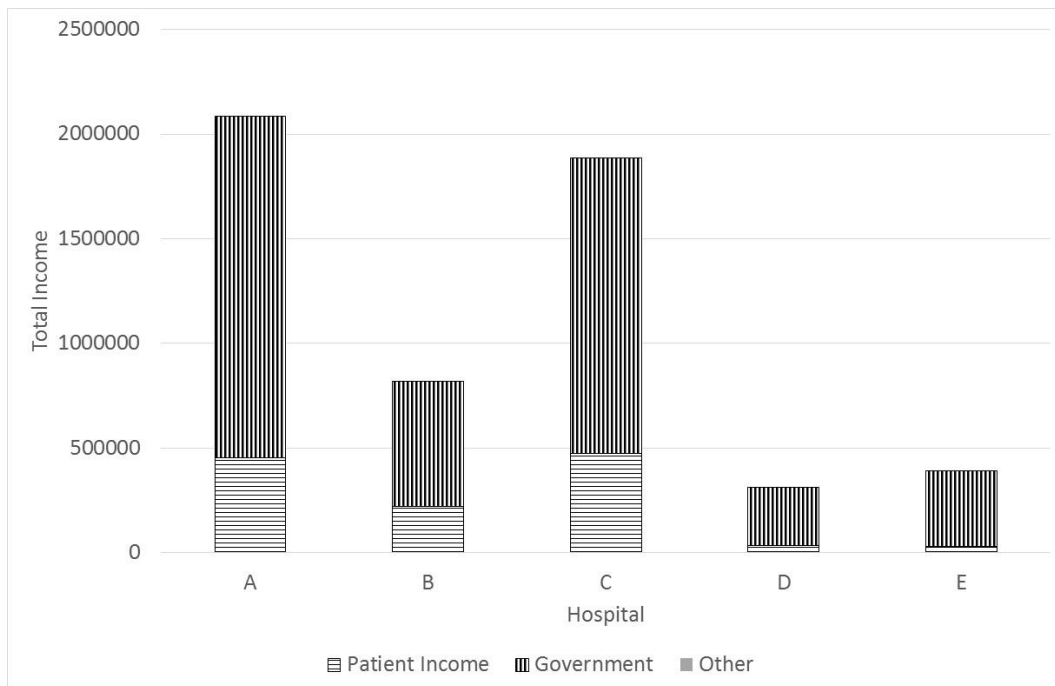


Figure 20. Hospital income (absolute) [US\$]

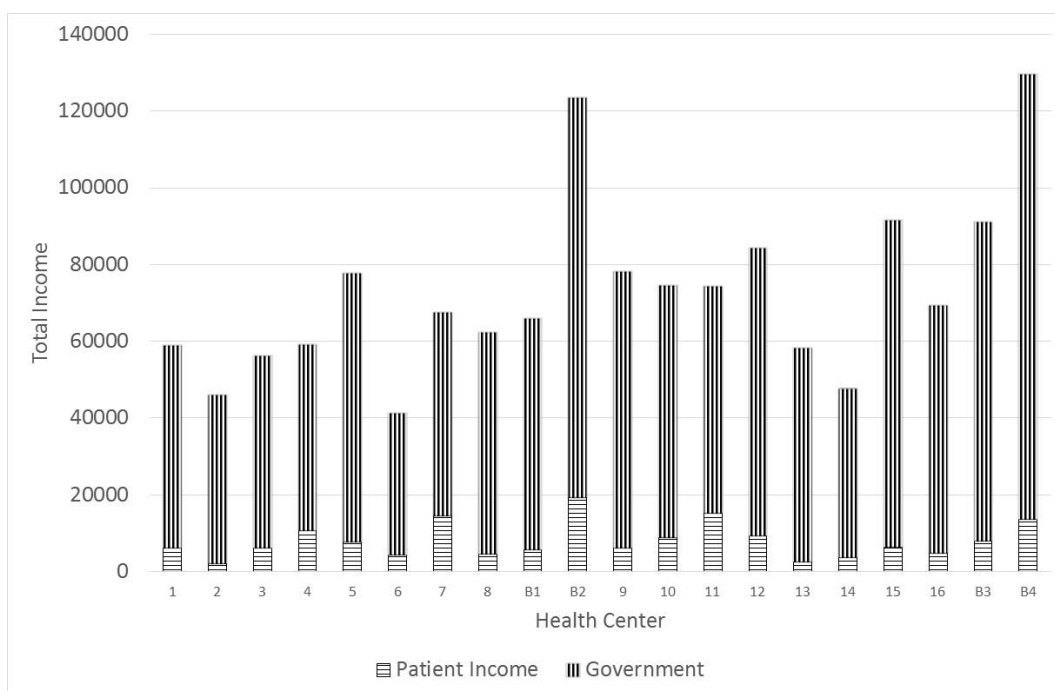


Figure 21. Health center income (absolute) [US\$]

The income from patient fees varies strongly between institutions. On average, 12% of income comes from fees (range: 4%-27%). For hospitals, the average is 18% (range: 7%-27%); while it is 11% for health centers without beds (range: 4%-22%); and 11% for health centers with beds (range: 9%-16%). Direct patient fees dominate fee income,

with an average of 58% (range: 21%-98%) of all income coming from patient fees. For hospitals, the respective average is 66% (range: 42%-79%); for health centers without beds it is 57% (range: 21%-98%), and for health centers with beds it is 54% (range: 40%-62%). An exemption is Trapaing Sala HC, where 98% of patient fees

come directly from patients and only 2% from HEFs. Otherwise, HEFs contribute 24% to the fee income (range: 2%-59%). NSSF contributions were not relevant in 2016. “Other insurances” were mainly

community-based health funds, which contributed 11% to total fee income. For some health centers this source of income was quite significant, constituting up to 50% of fee income.

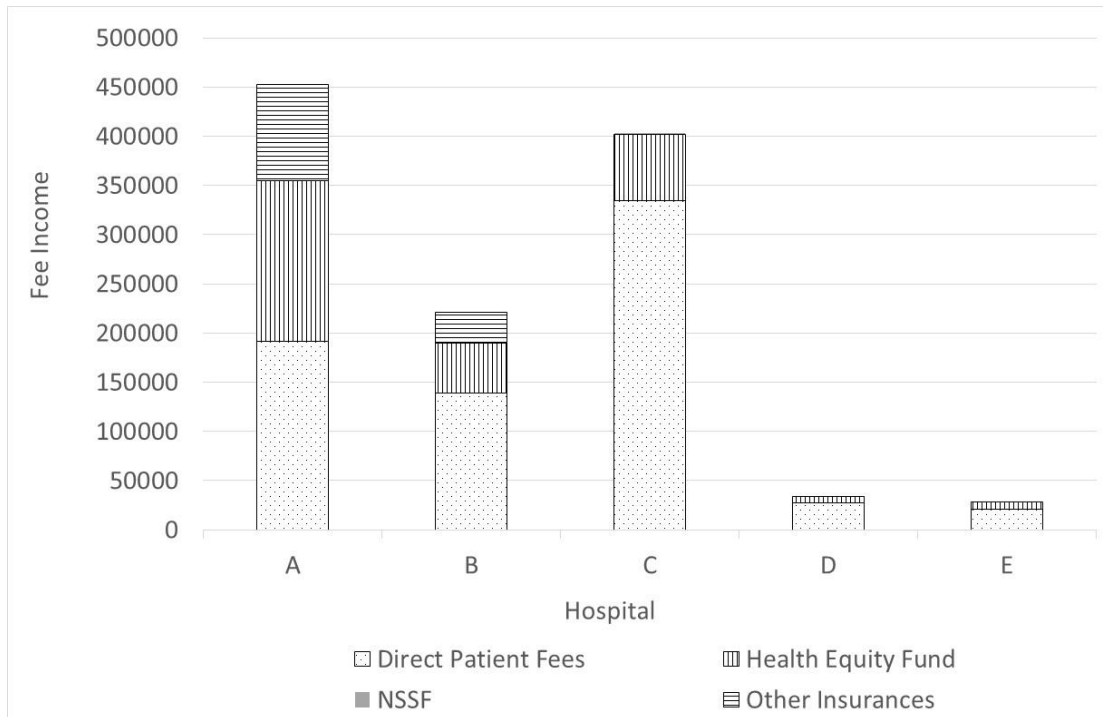


Figure 22. Fee income of hospitals [US\$]

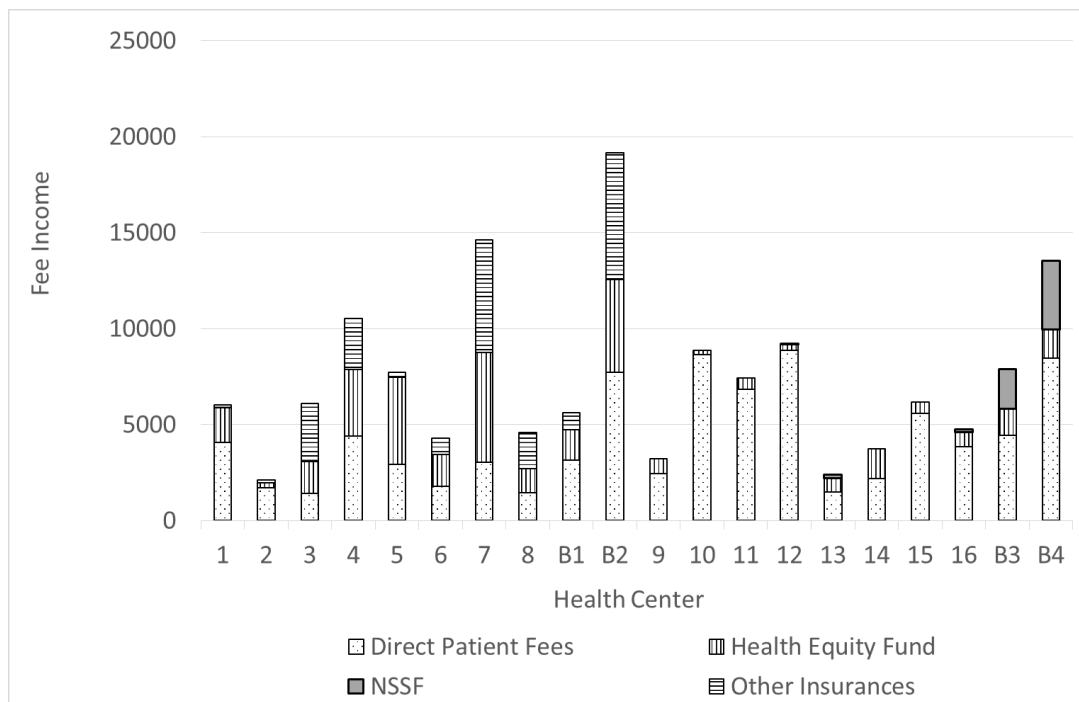


Figure 23. Fee income of health centers [US\$]

As mentioned, government contributions make up 88% of total income for the sample of healthcare facilities. The biggest share of these contributions is for staff and drugs and medical materials. Salaries and wages make up 36% of total government contributions (range: 24%-62%). For hospitals, the average is 32% (range: 24%-62%). For health centers without beds it is 36% (range: 24%-47%); and for health centers with beds the average is 43% (range: 37%-49%).

Drugs and medical materials amount to 44% of all government income, ranging from 15% to 60%. For hospitals the respective average is 45% (range: 15%-58%); for health centers without beds the average is 45% (range: 29%-60%); and for health centers with beds it is 40% (range: 32%-48%). The shares of cash (4%), compensation of depreciation (7%) and midwife incentive schemes (6%) are low in comparison. Service delivery grants played no role in these institutions in 2016.

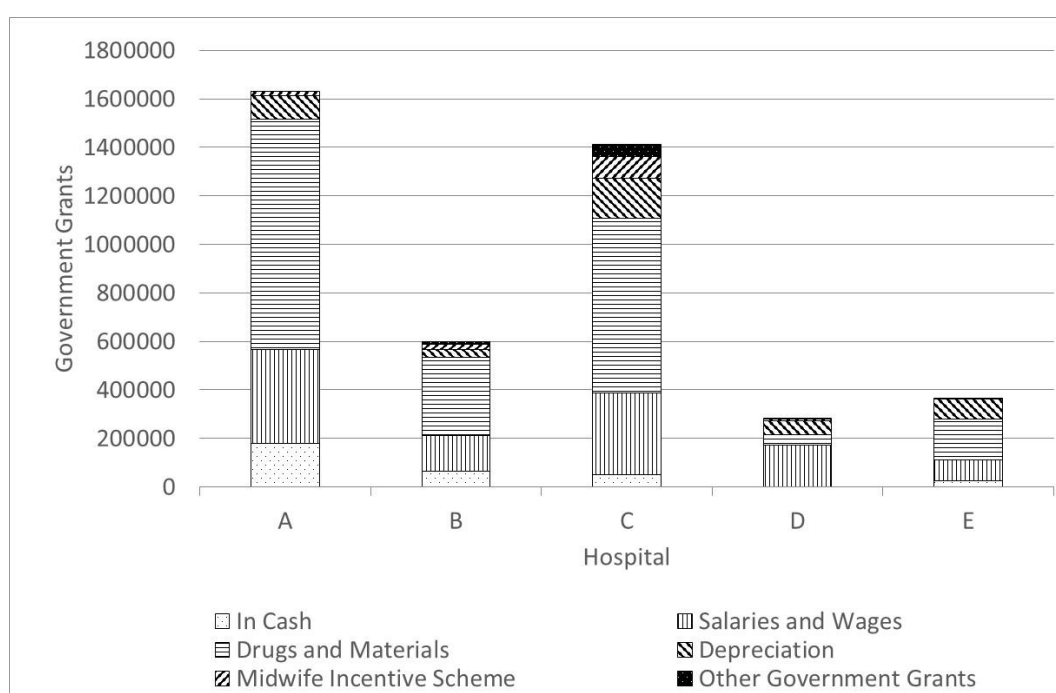


Figure 24. Government income of hospitals [US\$]

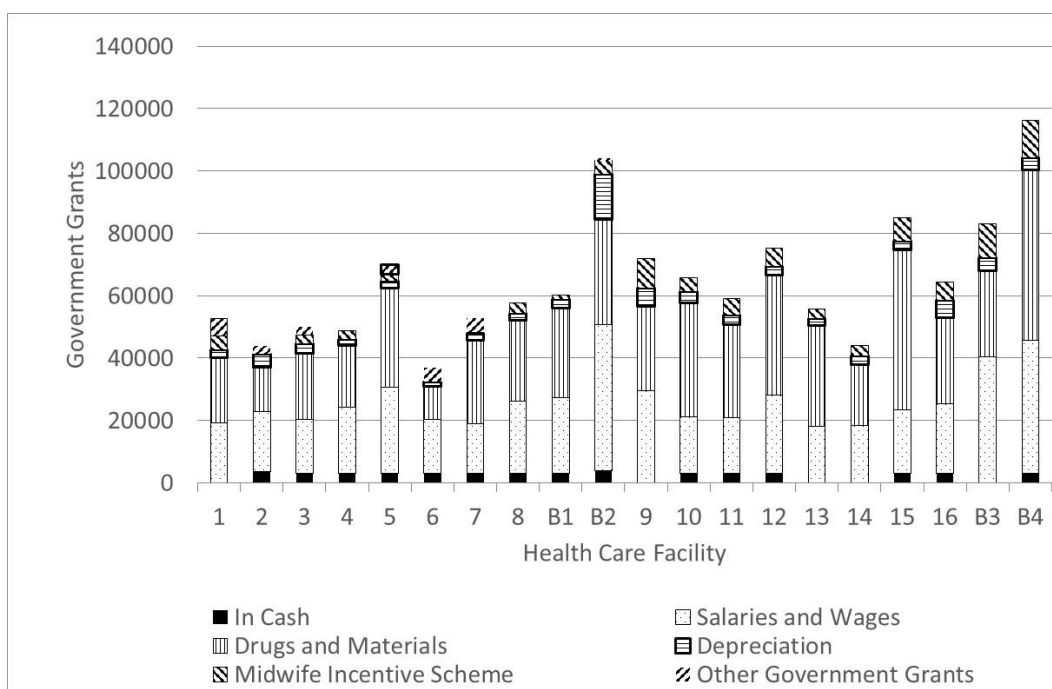


Figure 25. Government income of health centers [US\$]

4. DISCUSSION

In this section, the most important results are analysed and discussed.

4.1. Feasibility

The first and most important result is that the costing of public healthcare services in Cambodia is feasible and produces relevant results.

Table 6 summarises the results by type of health facility. As discussed later, there is

quite some variation between facilities, whereby considering only the average might be misleading. However, the process of costing indicated that the standard instruments of step-down costing can be applied; i.e., that the use of data available at the institutions, operational districts and provincial health departments, as well as the cooperation of the respective managers, would be sufficient.

Table 6. Costs per outpatient visit and inpatient-day [US\$]

	CPAIII	CPAII	CPAI	Health center with beds	Health center without beds
OPD	41.53	5.87	9.65	4.96	3.00
Inpatient-day	38.21	27.61	55.87	4.46	-

4.2. Heterogeneity of findings

There is a strong variation of costs per service unit between institutions, levels of

care and provinces. Further analysis should determine the causes for these differences. One reason might be the diverse standards of

financial recording and the resulting differences in data quality between institutions and provinces. Table 7 and 8 show that the average costs per visit at a health center,³ OPD attendance, and chronic patient care are significantly lower in health centers in Kampong Thom than in Kampot. The costs per delivery in Kampong Thom exclude the three health centers with few

institutional deliveries. After re-allocating these costs to the OPD department and ignoring maternity in these three health centers, the costs per OPD attendance and per delivery are lower in Kampong Thom than in Kampot province. There is no obvious explanation for this cost difference, which warrants further research.

Table 7. Average costs of health centers [US\$]

Average cost	Total	Kampong Thom	Kampot
Visit	3.24	3.16	3.33
OPD	3.88	2.67	5.09
Delivery	107.29	70.55	135.87
Chronic care	40.95	28.73	53.17

Table 8. Standard deviation and variation coefficient

Average cost	Standard deviation			Variation coefficient		
	Total	Kampong Thom	Kampot	Total	Kampong Thom	Kampot
Visit	0.96	1.06	0.80	0.30	0.33	0.24
OPD	1.79	1.21	1.29	0.46	0.45	0.25
Delivery	43.72	25.32	30.34	0.41	0.36	0.22
Chronic care	35.99	22.28	40.25	0.88	0.78	0.76

Even within each province, the variation of costs per service unit is high. For instance, the variation coefficient (standard deviation/arithmetic mean) is 0.33 for the cost per visit in Kampong Thom, and 0.24 in Kampot. For OPD attendance it is 0.45 and 0.25, respectively. As will be shown in section 4.6 the efficiency differs greatly between institutions, with more health centers in Kampong Thom on the efficiency envelopment than from Kampot province. Again, workload seems to be the most crucial determinant of the costs per service unit.

4.3. Timeliness of costing data

Another relevant finding of this study is that the costing data currently used by NSSF and the MOH (e.g., for HEF) and other institutions is outdated and misleading, even when accounting for inflation. Table 9 shows different cost estimates for Cambodian health services based on the literature reviewed in section 1. Table 10 refers to the same studies and adjusts for inflation; i.e., all values are appreciated to June 2016 to compare to the study results presented in this paper.

³ Health centres with and without beds are combined for this analysis.

Table 9. Health service costs in Cambodia (original values)

Cost		WHO-CHOICE	Fabricant	Collins	Martin	Flessa et al.
		2005 (Int\$)	2001 (US\$)	2007 (US\$)	2012 (US\$)	2016 (US\$)
Per inpatient-day	Primary hospital	22.92	6.57	13.19	CPA1: 12-16 CPA2: 17-25	CPA1: 55.87 CPA2: 27.61
	Secondary hospital	29.9	7.57	17.53	CPA3: 24-29	CPA3: 38.21
	Tertiary hospital	40.84				
	Health center		2.52			4.46
Per outpatient visit	Primary hospital	6.66			CPA1: 8-15 CPA2: 5-14	CPA1: 9.65 CPA2: 5.87
	Secondary hospital	9.44			CPA3: 13-28	CPA3: 41.53
	Tertiary hospital	13.97				
	Health center	8.36	1.33	2.46		W/o beds: 3.00 W beds: 4.96

Table 10. Health service costs in Cambodia (US\$, adjusted to June 2016 values)⁴

Cost		WHO-CHOICE	Fabricant	Collins	Martin	Flessa et al.
Per inpatient-day	Primary hospital	28.87	9.04	15.51	CPA1: 12.81-17.08 CPA2: 18.15-26.69	CPA1: 55.87 CPA2: 27.61
	Secondary hospital	37.66	10.42	20.61	CPA3: 25.62-30.96	CPA3: 38.21
	Tertiary hospital	51.43				
	Health center		3.47			4.46
Per outpatient visit	Primary hospital	8.39			CPA1: 8.54-16.01 CPA2: 5.34-14.94	CPA1: 9.65 CPA2: 5.87
	Secondary hospital	11.89			CPA3: 13.88-29.89	CPA3: 41.53
	Tertiary hospital	17.59				
	Health center	10.53	1.83	2.46		W/o beds: 3.00 W beds: 4.96

The costs per service unit mentioned by the five references differs strongly, even after adjusting to the same base year. The older the study, the higher the difference. This can be partly explained by the fact that the current study includes capital costs (depreciation) while the others do not. On average, our costs would be 7% lower if we disregard

depreciation; but these costs would still be higher than the findings of the other studies. A plausible explanation is that the costs of inputs of health care production have increased faster than the average cost of living, while the amount of resources per service unit has increased as well. Both appear to be the case in Cambodia. Salaries

⁴ Inflated to 30th June 2016 with: <https://data.bls.gov/cgi-bin/cpicalc.pl>.

of civil servants have increased faster than the inflation rate, in line with the government's objectives, which has led to higher costs of providing healthcare services. At the same time, the quality of services has improved compared to the times when the other studies were conducted. For instance, most hospitals have ultrasounds now, which was not the case in 2001.

These findings also indicate that basing health policies and rebates calculations on old figures might be misleading. This can be avoided by developing a routine health service costing system that provides regular updates. Without such a system there is a risk of underestimating the real costs, which has impacts for both policymaking and rebate calculations.

Table 11 shows the costs per service unit in other countries of the region. These values are appreciated to mid-2016 to allow for

comparison of the results. Health service delivery in most neighbouring countries is more expensive than the findings for Cambodia in the current study. Again, older studies show lower costs per service unit, even after standardising the costs to mid-2016. The higher costs of service in neighbouring countries may have led the WHO's CHOosing Interventions that are Cost-Effective (WHO-CHOICE) project to overestimate the costs for Cambodia. This evidence should strengthen calls for a routine data collection process in each country.

At the same time, it is not clear whether the service quality is identical throughout the countries included in the sample. We estimate that the service quality in Malaysia, Thailand and Vietnam is higher than in Cambodia. This might be the main reason for the higher costs per service unit.

Table 11. Health service costs in neighbouring countries (US\$, adjusted to June 2016 values)

Country	Reference	Year of data	Cost per inpatient-day [US\$ 2016]	Cost per outpatient visit [US\$ 2016]
Cambodia	Flessa et al.	2016	Primary hospital: ⁵ 41.74 Secondary hospital: 38.21	Primary hospital: 7.76 Secondary hospital: 41.53 Health center: 3.00
Bangladesh	[37]	1995	21.12	
Bangladesh	[38]	2014 ⁶	Public hospital: 3.82 Private hospital: 3.69	
Bangladesh	[54]	2005	Primary hospital: 24.28 Secondary hospital: 31.69 Tertiary hospital: 43.29	Primary hospital: 6.85 Secondary hospital: 9.71 Tertiary hospital: 14.37 Health center: 9.12
Laos	[35]	2010	Delivery care services: 303.43 Vaginal delivery: 66.31	
Laos	[54]	2005	Primary hospital: 25.07 Secondary hospital: 32.70 Tertiary hospital: 44.66	Primary hospital: 6.80 Secondary hospital: 10.07 Tertiary hospital: 14.91 Health center: 9.96
Malaysia	[32]	2010	General ward: 222.25 Surgical ward: 376.19	82.86
Malaysia	[34]	2014	315.59	481.30
Malaysia	[54]	2005	Primary hospital: 86.20 Secondary hospital: 112.46 Tertiary hospital: 153.61	Primary hospital: 30.18 Secondary hospital: 42.80 Tertiary hospital: 63.31 Health center: 41.74
Myanmar	[29]	2003	299.61 [90.93-1090.14]	
		-		
		2004		
Myanmar	[54]	2005	Primary hospital: 21.34 Secondary hospital: 27.84 Tertiary hospital: 38.03	Primary hospital: 5.88 Secondary hospital: 8.35 Tertiary hospital: 12.36 Health center: 9.34
Thailand	[31]	2002	12.17	5.99
Thailand	[54]	2017	Primary hospital: 75.84 Secondary hospital: 98.95 Tertiary hospital: 135.15	Primary hospital: 19.25 Secondary hospital: 27.30 Tertiary hospital: 40.38 Health center: 14.88
Vietnam	[24]	2000	1.17-19.04	0.38-1.22
Vietnam	[54]	2005	Primary hospital: 37.47 Secondary hospital: 48.88 Tertiary hospital: 65.51	Primary hospital: 11.37 Secondary hospital: 16.13 Tertiary hospital: 23.87 Health center: 11.65

4.4. Budgeting

In section 2.3, costs were assigned to fixed and variable categories. Based on that assumption, we can estimate cost functions

as the foundation of budgeting which, using this sample, is calculated as:

$$C_l = F_l + c_l \cdot x \text{ where:}$$

C_l Total cost of an institution of level l , $l \in \{\text{CPA1, CPA2, CPA3, health center with beds, health center without beds}\}$

⁵ Unweighted average of CPA1 and CPA2 hospitals.

⁶ The paper does not give the year of the data. As it was published in 2016, we assume data is from 2014.

F_l	Fixed costs of an institution of level l
c_l	Variable costs of an institution of level l per service unit
x	Number of service units; i.e., contacts (health centers without beds) or equivalent inpatient-days (all others)

Table 12. Cost function

	CPA3	CPA2	CPA1	HC without beds	HC with beds
Fixed cost (F_l) [US\$]	998,112.98	352,981.30	197,166.05	36,286.35	60,844.32
Variable cost (c_l) [US\$]	18.73	8.26	26.51	1.30	1.77
Average workload (x) [US\$]	50,115	19,200	6,456	23,311	22,235
Average total cost (C_l) [US\$]	1,936,819.78	511,567.22	368,306.21	66,686.36	100,151.36

In this case, c_l also provides information on how much it could cost to increase the service units in a certain level of care. For instance, accepting one additional patient for one night in a CPA2 hospital would cost US\$8.26.

This information can also be utilised to budget for a facility with a certain workload. For instance, if a health center without beds has a catchment population of 10,000 inhabitants with a contact rate of 1.9 (all visits), the total costs of this institution would be US\$61,064.43 or US\$6.11 per capita. For further analysis, it would be worthwhile to separate certain costing units (e.g., general outpatient consultations, deliveries, etc.) which would require a deeper analysis. For the time being, this analysis should be considered as proof of principle.

4.5. Pricing

The user fees for public health facilities are relatively arbitrary, whereby fees are not a function of costs. The NSSF and HEF rebates are based on these user fees, and thus

also do not correlate with costs. However, if fees differ strongly from costs, negative incentives for under-provision or overutilisation are induced.⁷

Thus, the fees charged by a healthcare provider should relate to the cost of the service, but do not have to be identical for the same services. Private providers, for instance, will add a mark-up to allow for a profit margin. Public health institutions, however, will calculate a price for their services with consideration that a substantial proportion of the costs is already paid for by the government.

Figure 26 demonstrates the principle of costing and pricing. The costing system proposed in the methodology calculates the unit costs per cost center, and is neutral concerning the utilisation of its results, whereas a price must be fixed per service unit. For health centers and all types of hospitals, it is assumed that the cost per case of a certain diagnosis is proportional to the length of stay.⁸ The average cost of a case with diagnosis j treated in cost center i is consequently calculated as:

⁷ For instance, an incorrect ratio between reimbursement for vaginal and cesarean delivery strongly increases the risk of an irrationally high cesarean section rate.

⁸ This is an assumption which might be wrong for an individual case, but there is evidence that it is correct over all patients. It has been used successfully in many countries.

$d_j = (1 - r) \cdot c_i \cdot l_j$ where:

d_j average cost of a case with diagnosis j ; diagnosis j is treated in department i ($j \rightarrow i$), $j=1..m$, $i=1..n$

l_j average length of a patient with diagnosis j , $j=1..m$, health center: $l_j=1$

c_i average cost per inpatient day in department i , $j \rightarrow i$, $i=1..n$

r subsidy rate

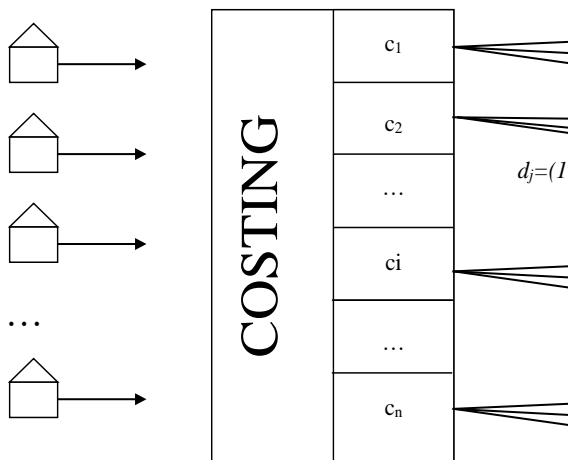


Figure 26. Costing and pricing

In this equation, the variable d_j is the average cost; i.e., the minimum fee or rebate for services which covers costs. Thus, pricing of services first requires determining the average length of stay in healthcare institutions. Currently, this data is not available from routine information systems. However, the information can be achieved through a small-scale study of a few hospitals, which calculates the average length of stay of the top ten conditions in each department.

Next, the ratio of government subsidies to the respective facility is determined. Finally, the cost of the specific cost center is retrieved. Both can be taken from the analysis of the actual full costs.

As an example:

- Cost per inpatient-day of the surgery department of Kampong Thom Provincial Hospital: US\$39.79.
- Average length of stay of a patient with appendectomy: 5 days.
- Government subsidy to Kampong Thom Provincial Hospital: 78%.
- Fair fee for an appendectomy at Kampong Thom Provincial Hospital: US\$43.16 (US\$39.79/day * 5 days * 0.22).

Table 13 shows some examples of fair fees based on the average subsidy rate and average cost per service unit for the different levels of care. This information should be taken with caution for a few reasons. First, the average length of stay (ALOS) of the respective services was estimated. Second, these figures are based on a very small sample (two CPA3, two CPA2 and one CPA1 hospital, and 20 health centers). Third, fees and rebates could be higher if NSSF or the government want to encourage delivery of certain services. For instance, if they want to foster safe deliveries, the variable income of the healthcare provider should be higher than the amount given below. Lastly, the share of user fees devoted to salary supplementation is not taken into account.

Figure 27 compares the minimum price and full costs and the minimum price for specific services among the different levels of healthcare providers in Cambodia. Due to high subsidies, the range is quite wide. For instance, the minimum price of an outpatient consultation in a CPA3 hospital is US\$9.73, while the real cost is US\$41.53. For CPA2 hospitals, the respective figures are US\$1.11 and US\$5.87. For CPA1 hospitals they are US\$0.70 and US\$9.65, and for health centers they are US\$0.40 and US\$3.88, respectively. Every amount between the minimum and the maximum value for each level of providers is possible.

Table 13 and Figure 11 should be seen as a clarification of the methodology and not as a source of real-life pricing. In particular,

basing prices on actual costs might promote inefficiency, as suboptimal use of resources would lead to higher prices. Instead, prices

should be based on standard costs and reflect the quality of services. Thus, Table 13 should be seen only as a demonstration.

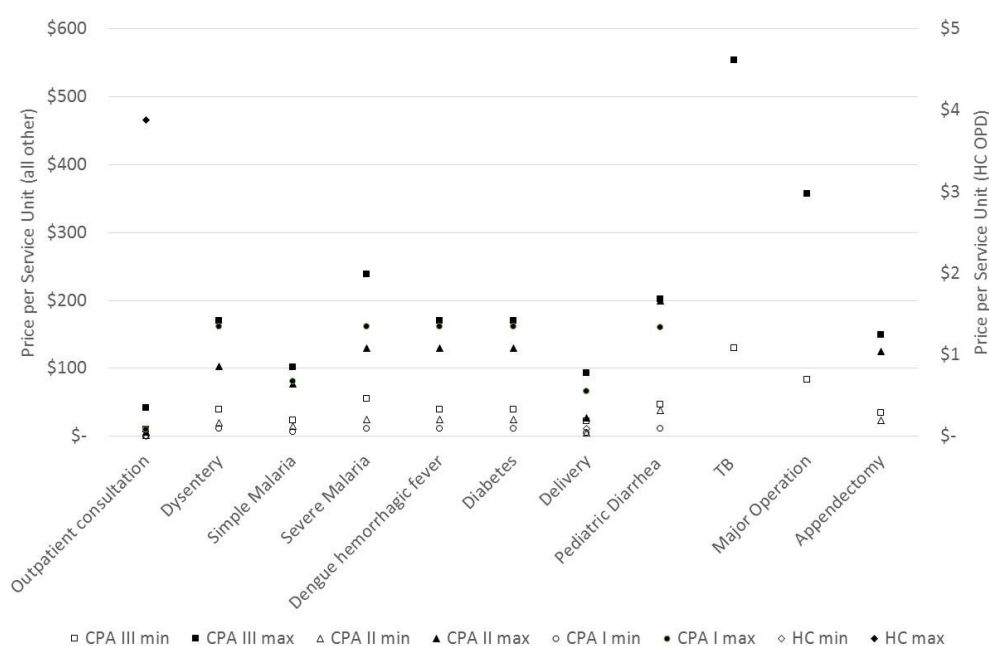


Figure 27. Full cost and minimum prices of selected services

Table 13. Pricing of selected services [US\$]

Service	CPA3			CPA2			CPA1			Health center	
	A L O S	Subsidy rate	Case cost [US\$]	A L O S	Subsidy rate	Case cost [US\$]	A L O S	Subsidy rate	Case cost [US\$]	Subsidy rate	Case cost [US\$]
Outpatient consultation	1	77%	9.73	1	81%	1.11	1	93%	0.70	89%	0.41
Dysentery	5	77%	39.87	4	81%	19.53	4	93%	11.71		
Simple malaria	3	77%	23.92	3	81%	14.65	2	93%	5.85		
Severe malaria	7	77%	55.82	5	81%	24.42	4	93%	11.71		
Dengue fever	5	77%	39.87	5	81%	24.42	4	93%	11.71		
Diabetes	5	77%	39.87	5	81%	24.42	4	93%	11.71		
Delivery	2	77%	21.82	1	81%	5.24	1	93%	4.83	89%	11.35
Paediatric diarrhoea	5	77%	47.25	5	81%	37.62	4	93%	11.61		
Tuberculosis	16	77%	129.62		81%	-		93%	-		
Major operation	12	77%	83.76		81%	-		93%	-		
Appendectomy	5	77%	34.90	5	81%	23.48		93%	-		

4.6. Utilisation

The results of this costing clearly indicate that utilisation is the most important determinant of the unit costs within this sample of facilities. A breakeven analysis

can give a first insight into whether the facilities could increase their workload without running into a deficit. Figure 28 demonstrates this principle for Baray Santuk

Referral Hospital. The hospital produced the equivalent of 28,253 inpatient-days in 2016, and made a surplus of US\$44,467.26. Therefore, it could have produced up to

38,966 inpatient-days without incurring a loss; a potential increase of 38% of inpatient-days.

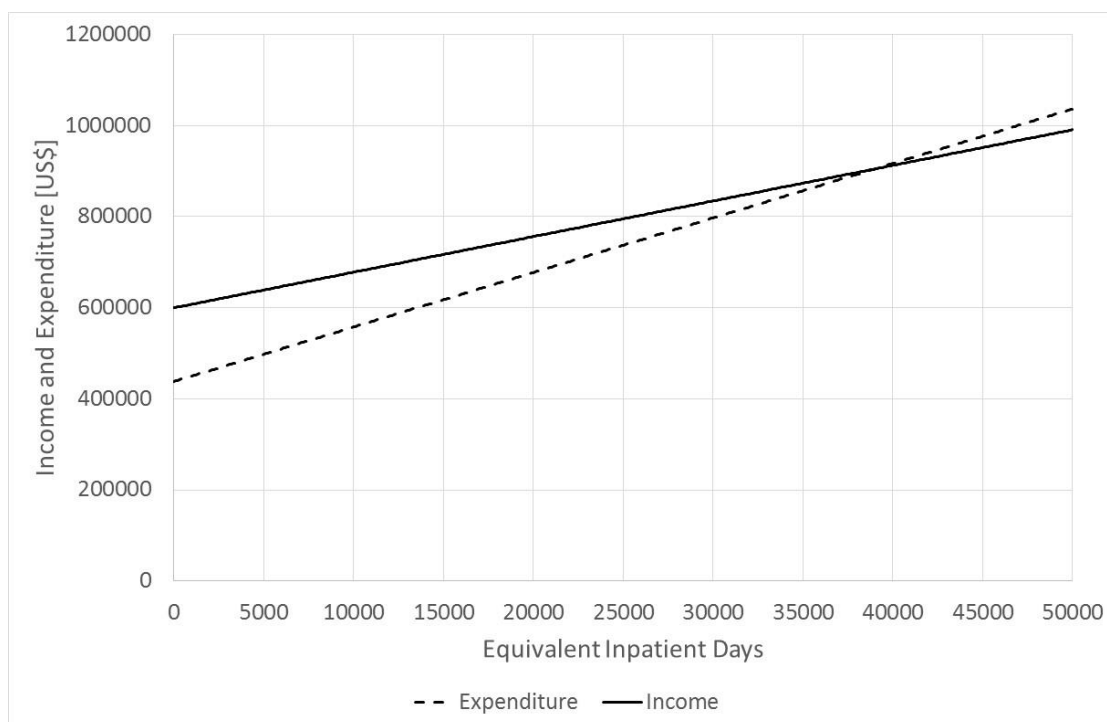


Figure 28. Breakeven analysis of Baray Santuk Referral Hospital

Figure 29 shows that the majority of facilities were rather close to their breakeven point. However, Sankor HC, Treal Stong HC, Chamna Leu and Tani HC could accommodate a moderate increase of

workload without risking financial problems. This would also reduce their unit costs. A detailed analysis of reasons for the different funding situations would be justified by this initial research.

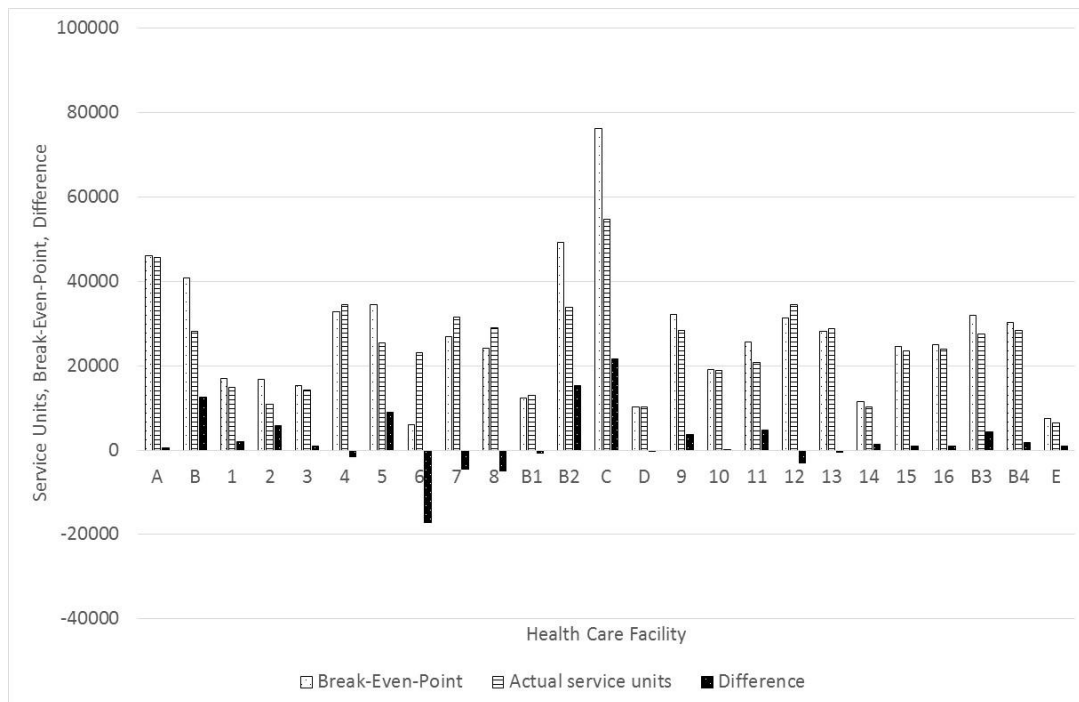


Figure 29. Actual service units and breakeven points

4.7. Efficiency

An analysis of the efficiency of the system should consider the quantity and quality of the services, and compare these with the costs. A simple measure of the quantitative aspects of efficiency are the cost per patient contact. The average costs per contact in health centers are US\$3.24. For the hospitals, the average costs per equivalent inpatient-day are US\$38.87 (CPA3), US\$29.21 (CPA2) and US\$57.04 (CPA1). Although the sample size does not allow firm conclusions to be made about hospital efficiency, the findings do challenge the functionality of CPA1 hospitals.

The following analysis will concentrate on health centers, as the sample size allows a thorough analysis. The cost per service unit

can be related to the qualitative dimension by forming the quotient between the quality score (derived from the Level II Quality Assessment) and the cost per service unit of a certain health facility. Figure 30 shows the respective results for health centers. The top left corner of the graph is where the highest efficiencies are located. It is obvious that these health centers provide very different degrees of quality.

Based on this analysis, institutions with the numbers 4 (Sankor HC), 6 (Trea Stong HC), 8 (Kok Nguon HC), and 12 (Tani HC) are benchmarks for the others, while 10 (Trapaing Sala HC) might be considered as efficient as well.

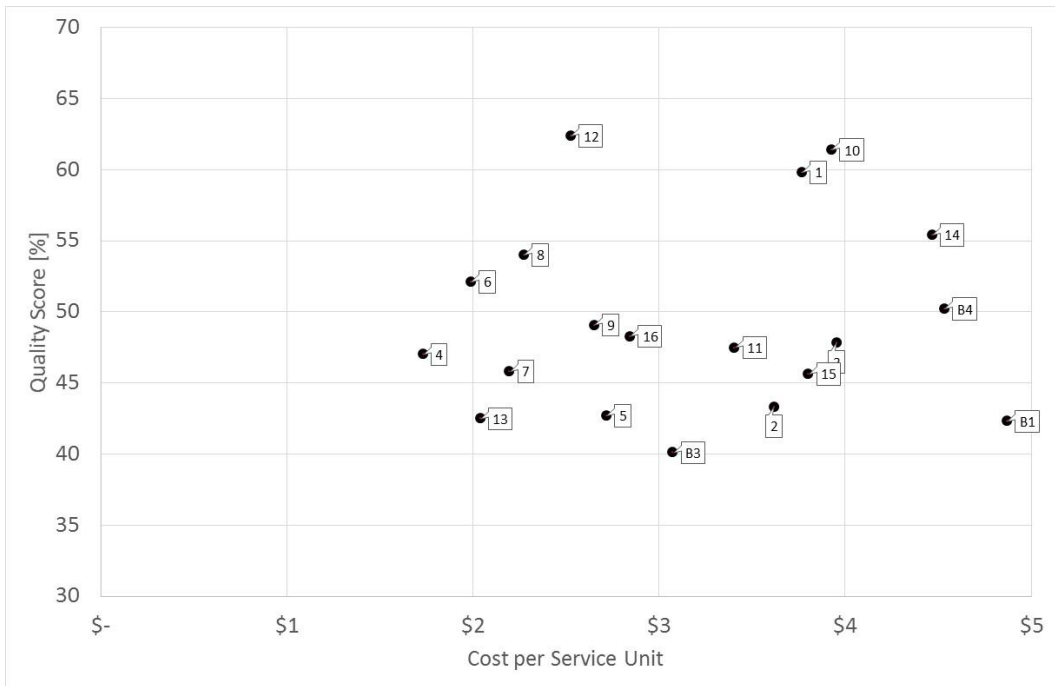


Figure 30. Efficiency diagram of health center costs and quality scores (per patient contact)

Figure 31 shows the same graph per OPD attendance. Although there are some changes, the principle result remains constant; facility 10 (Treal HC) which was

almost efficient before becomes an efficient institution, whereas facility 4 (Sankor HC) appears to be less efficient but remains rather close to the efficiency line.

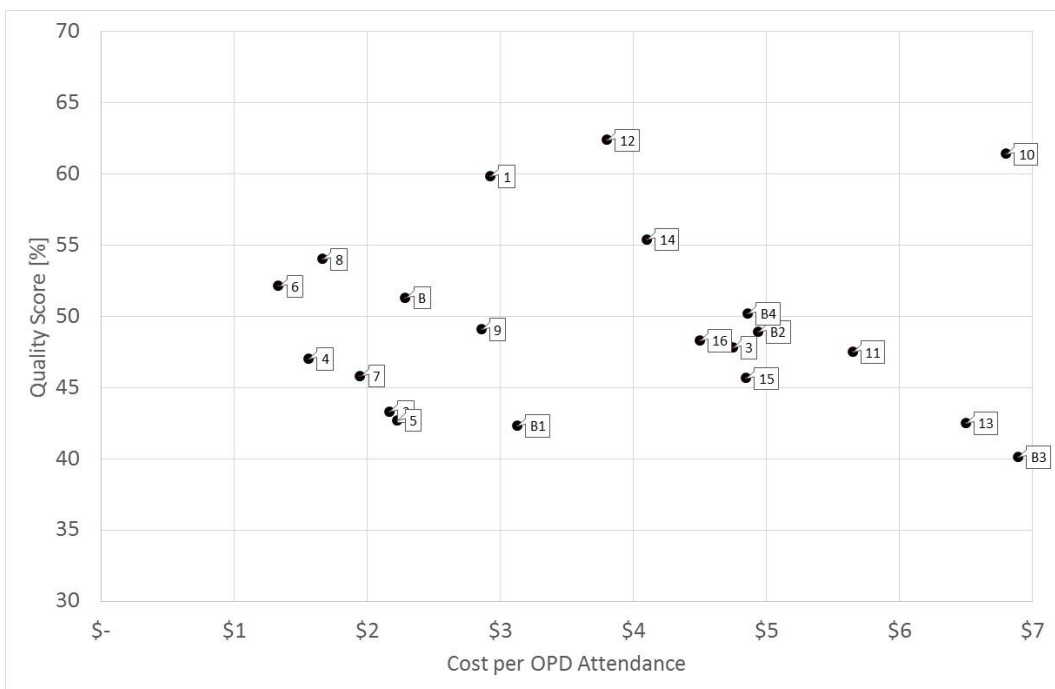


Figure 31 . Efficiency diagram of health center costs and quality scores (per OPD attendance)

Working with more precise quality scores will improve this metric; i.e., once the new

quality monitoring tool is implemented through H-EQIP, a statistic like Figure 30

will become a meaningful tool for benchmarking and coaching.

4.8. Revisiting the public healthcare system

At the primary care level, Cambodia's existing public healthcare system provides services mainly for the rural population: around 1,000 health centers (and health posts) each cover a population of 10,000 to 20,000 people. In principle, primary care services should include initial consultations and diagnosis, emergency first aid, immunisation services and some chronic disease care, as well as mother and child care which includes normal deliveries.

The public healthcare system distinguishes national, provincial and district referral hospitals. These can be distinguished by their levels of equipment and types of services provided. They are classified by the complementary package of activities (CPA) they offer. Depending on the level, they are also supposed to support primary care. CPA1 hospitals do not have major surgery (and no general anaesthesia). While they also have no blood bank, they are required to offer basic obstetric services. The higher level hospitals (CPA2) additionally offer emergency care and major surgery, including intensive care. They are also expected to offer ear, nose and throat, ophthalmology, and orthodontic services. All national hospitals and the majority of provincial hospitals are labelled CPA3, with large-scale services and an additional number of specialised departments [55, 56].

Between 2008 and 2015, the number of health centers increased significantly, particularly in remote areas, while many facilities across the country were upgraded. Still, the referral system generally does not work as intended. Patients seek care from multiple sources and primary care facilities are regularly bypassed due to a lack of key personnel, stock-outs of essential drugs and

substandard quality of care. The findings of this costing study indicate the economic implications of the realities of care seeking in public-sector institutions. Apart from addressing some of the root causes, a revision of the care packages assigned to the respective levels of care, and a corresponding redesign of the referral system, could be recommended. This might even lead to a reduction of provider levels through increased efficiencies.

HSP3 acknowledges these problems, spells out the need for reforms, and proposes strategic interventions [57]. The plan also outlines the need to revisit and expand the minimum prescribed activities among both primary care providers and referral hospitals.

4.9. Limitations

Costing data and costing studies must be interpreted with care. The first challenge is the reliability of data. It is obvious that the quality of the output of a costing depends on the quality of input data. The "GIGO principle" ("garbage in, garbage out") applies to all analyses; i.e., the results of a costing study might look very convincing and scientific, but they are inherently flawed if data and assumptions are wrong. Frequently, accounting and medical recording, as well as other documentation procedures, are not fully reliable. Consequently, data might not be available. In addition, data might be scattered around many locations; e.g., healthcare facilities, district health offices, provincial health offices, MOH, Ministry of Economy and Finance, etc. Collecting the data from different sources might challenge its reliability. Furthermore, if the data is not produced automatically within a routine electronic reporting system, managers have a tendency to comply with the order to complete forms, irrespective of the data correctness, as they tend to be overwhelmed by such procedures and just want to please their superiors. Consequently, data input

might be of poor quality and negatively impact the costing results.

Second, costing data might be misleading because the methodology is not sound. In particular, the step-down approach uses somewhat arbitrary allocation categories. Moreover, it does not distinguish between fixed and variable costs, so cost behaviours for increased or decreased workloads cannot be forecasted. Even very complex costing studies might lead to completely erroneous results.

Third, costing data has a short lifespan; i.e., a few years after collecting data it becomes obsolete. Since most studies are snapshots of a situation in a specific year, and not derived from a routine reporting system, decision-makers have no alternative than to base decisions on obsolete data – with a high potential of losing the evidence.

Consequently, decision-makers should invest in ensuring the validity and reliability of data and its quality, as well as a routine costing system. Investing in a one-time complex costing exercise might not be as informative for routine decisions as an institutionalised simple costing system that is done annually or bi-annually.

In summary, the methodology of costing healthcare services is well established and grounded in economic theory. What is needed is not a new methodology, but a workable and reliable system for Cambodia, which can be implemented and provide valid and reliable information for evidence-based decision-making in the health sector.

5. CONCLUSIONS

Healthcare policymaking must be based on economic facts, including a comprehensive knowledge of the costs of healthcare services at the facility level. The methodology of costing healthcare services in Cambodia applied in this study indicated its feasibility for application in both rural and urban

settings. However, there is a risk that the findings of this study will be treated as previous costing studies in Cambodia, and become the standard for many years, after which another cross-sectional costing exercise will be produced. Most likely, this future study will face the same problems as the ones encountered during this exercise. To avoid this situation, we recommend the following:

First, the documentation in healthcare facilities must be considerably improved. This is especially necessary for financial accounting and reporting. The health financing reports should be standardised and enforced by the government, with the accuracy of data verified regularly at all levels.

Second, there is a need for a training program on healthcare facility management which includes financial accounting. Currently, only a few managers of healthcare facilities have any training in these subjects, and their workloads are too high to produce meaningful reports.

There are efforts to improve data reporting across the structures of Cambodia's social protection system in general, and the health system in particular. As the governance structure is being developed to respond to the government's vision of achieving universal health coverage with a single-payer system [58], there is a need to ensure the availability of reliable and valid data in the appropriate format across all levels. Correct cost data is one of the core requirements for the key functions of a social health protection system, including the design of provider payments and benefit packages.

Apart from the generation of reliable and valid cost data, the ways that this data is communicated and used need to be addressed. Currently, the health insurance schemes for each target group are governed separately by different regulations and procedures, which complicates the flow of

information. Where information systems exist, they are highly fragmented and data exchange between systems is hardly possible.

Planning the flow and use of cost information needs to be carefully aligned with the future governance structure and corresponding processes within the single-payer social health protection system. NSSF is envisaged to assume the role as the single operator of this system. The newly established National Social Protection Council (NSPC), where the respective line ministries are represented, has declared health insurance one of their initial priorities.

In their coordinating role, due consideration should be given to the alignment and harmonisation of their communication systems. This could be achieved through simultaneous planning of documentation, financial accounting and reporting skills on the one hand, and the design and implementation of the respective information systems addressing the needs of both the service providers and the operator on the other hand. These steps should be exercised by applying a systemic view towards integration into the overarching communication architecture, and with the objective of ensuring efficient processes.

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