INTERNATIONAL JOURNAL OF HEALTH PLANNING AND MANAGEMENT
Int J Health Plann Mgmt 2003; **18**: 3–22.
Published online in Wiley InterScience (www.interscience.wiley.com). **DOI**: 10.1002/hpm.690

Costs of maternal health care services in three anglophone African countries

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SUMMARY

This paper is a synthesis of a case study of provider and consumer costs, along with selected quality indicators, for six maternal health services provided at one public hospital, one mission hospital, one public health centre and one mission centre, in Uganda, Malawi and Ghana. The study examines the costs of providing the services in a selected number of facilities in order to examine the reasons behind cost differences, assess the efficiency of service delivery, and determine whether management improvements might achieve cost savings without hurting quality. This assessment is important to African countries with ambitious goals for improving maternal health but scarce public health resources and limited government budgets. The study also evaluates the costs that consumers pay to use the maternal health services, along with the contribution that revenues from fees for services make to recovering health facility costs.

The authors find that costs differ between hospitals and health centres as well as among mission and public facilities in the study sample. The variation is explained by differences in the role of the facility, use and availability of materials and equipment, number and level of personnel delivering services, and utilization levels of services. The report concludes with several policy implications for improvements in efficiency, financing options and consumer costs. Copyright © 2003 John Wiley & Sons, Ltd.

KEY WORDS: maternal health; antenatal care; costs; Uganda; Malawi; Ghana

INTRODUCTION

The challenge for many African countries is to improve access to and availability of quality maternal health services and to make better use of ministries of health's limited resources. This study estimates the costs of key maternal health services in

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Contract/grant sponsors: Partnerships for Health Reform Project; USAID Bureau for Africa; USAID Bureau for Global Programs.

order to understand better the structure of services in a select number of facilities in three sub-Saharan countries, determine the factors that affect costs and how variations in some of these factors can lead to variations in costs.

BACKGROUND

Maternal morbidity and mortality is a major health problem in sub-Saharan African countries. Maternal mortality ratios are high and range from 300 to as high as 1050 women per 100 000 live births. Many women also suffer from maternal morbidity because of pregnancy-related disabilities due to complications of childbirth such as infections, eclampsia, slow labour and ruptured uteri (Favin *et al.*, 1984). Pregnant women also have a higher susceptibility to infectious or metabolic disorders such as malaria or diabetes, and nutritional deficiencies such as anaemia (Tinker and Koblinsky, 1992) than nonpregnant women.

The reasons for this high mortality and morbidity include a number of factors: inadequate nutritional consumption, lack of safe water and sanitation, and limited access to quality maternal health services. Barriers to access to services are particularly important and include lack of transport, maldistribution of health facilities and limited cash resources for clients.

This study reports on the findings of three case studies conducted in Uganda, Malawi and Ghana (Levin, 1999b; Levin, 1999c; Levin, 1999d). Although improvements in maternal health care have taken place, maternal mortality continues to be high in these countries: 504, 620 and 720 per 100 000 live births, respectively, in Uganda, Malawi and Ghana. Despite low per capita income in each of the three countries ($330 in Uganda, $220 in Malawi, $370 in Ghana), the governments have traditionally been providing funding for personnel and operating costs at public institutions; in addition, they have been subsidizing mission facilities. However, their role is changing as health reform is introduced in these countries. With the introduction of such changes as decentralization, cost recovery and hospital autonomy, a larger share of service costs are being paid by district governments and consumers.

The reasons for conducting cross-country comparisons of maternal health costs are the following: (1) having data from more than one country allows researchers to comment on the widespread belief that the provision of emergency obstetric care is expensive; (2) having more data points provides a wider range of explanatory variables for similarities and differences of costs of services in public and private facilities; (3) allows investigations of similarities and differences across countries; and (4) having cost data on maternal health services from more than one country makes the study more generalizable.

Only a small number of studies have been conducted on the costs of maternal health services in developing countries, and very few have been done in sub-Saharan Africa. A range of methods have been employed in these studies to measure labour time inputs, use of drugs and supplies, and allocation of joint costs. Some studies (Rosenthal, 1991; FHI, 1996; Levin, 1999a; Dmytrazcenko *et al.*, 1998) have costed maternal health services in facilities through the 'ingredient' approach. Using this approach, the costs of all of the inputs used in the delivery of a given service were

added up and averaged to determine the unit cost of providing that service. In these studies, total cost per service ranges from $3.35 to $24.69 for antenatal care, $27.91 for vaginal delivery, and from $55.83 to $118.44 for caesarean delivery. However, only a few studies (Levin, 1999a; FHI, 1996) conducted personnel observation to determine their time allocation among activities. The advantage to this method is that it provides accurate measurement of both personnel contact time and noncontact time to determine efficiencies in time use.

Another study of maternal health service costs in developing countries was conducted in Uganda using the WHO Mother-Baby Package Costing Model (Weissman *et al.*, 1999). This model estimates costs based on the use of a costing model and estimates both actual costs and 'ideal' costs if WHO standards were in place. The methodology is a type of 'ingredients' approach, but bases some of its cost estimations on data obtained internationally. For example, it uses data collected on use of drugs and supplies, national prices of commodities, and demographic, epidemiological and infrastructure rates, but makes assumptions on utilization of services and administrative costs.

This study synthesizing case studies of sub-Saharan African countries will attempt to fill part of the gap through a careful investigation of costs of a package of maternal health services using provider observation methods.

CONCEPTUAL FRAMEWORK

In this study, two types of costs of maternal health care are examined from the societal perspective. That is, the cost of both supplying services and those of the consumer are examined. The inputs that are used to provide (or supply) maternal health services are the following:

$$C_{ij} = L_{ij} + M_{ij} + U_{ij} + E_{ij} + O_{ij}$$

where C_{ij} is for total supply cost of providing maternal health service i in facility j, L_{ij} is for the personnel cost of providing service i in facility j, M_{ij} is for the cost of materials, or drugs and supplies, of service i in facility j, U_{ij} is for the cost of utilities and maintenance of service i in facility j, E_{ij} is for the cost of equipment of service i in facility j, and O_{ij} is for the cost of other inputs of service i in facility j.

Supply costs, or provider costs, such as those of antenatal care services, can be disaggregated into direct and indirect. Direct costs are those that are attributed to the provision of a specific health service such as employee contact time spent, drugs and medical supplies. Indirect costs are the costs of inputs that support services and are often jointly involved in the provision of several services, such as utilities and maintenance. Joint costs are divided among services using one of several types of allocation methods.

The second set of maternal health costs are those incurred by the client. These costs are modelled as the following:

$$CC_{ij} = TT_{ij} + WT_{ij} + TR_{ij} + F_{ij} + O_{ij}$$

where CC_{ij} is for cost to the consumer for service i at facility j, TT_{ij} is for travel time, WT_{ij} is for the cost of waiting time, TR_{ij} is for the cost of transport, F_{ij} is for user fees and O_{ij} is for other expenditures such as purchase of drugs and supplies by the consumer.

STUDY METHODOLOGY

Clinical interventions that are evaluated in this study include routine high volume services such as antenatal care and vaginal delivery as well as interventions that address complications and emergencies that may arise during pregnancy, childbirth and the postpartum period. These complications and emergencies occur infrequently, but are life-threatening and need to be treated. A panel of African medical personnel chose interventions that are considered important due to their contribution to maternal mortality and morbidity and high costs of care, i.e. two interventions for complications, caesarean section and post-abortion care, and two complications, postpartum haemorrhage and eclampsia.[†]

Estimated costs, as opposed to expenditures, are used as a basis for the analysis. This allows for estimation of the value of the resources used for the maternal health services, rather than amounts that are allocated for the services, and also permits the inclusion of in-kind costs such as travel and waiting time.

Data were collected on direct costs of providing maternal services such as personnel time and materials (drugs, laboratory tests and other supplies) used during the intervention as well as indirect costs of service delivery such as administration overhead, utilities, transport maintenance and supervision.[‡] Personnel were observed for 1 week in each facility to determine contact time on maternal services of interest and related non-contact time, such as preparation, recordkeeping and administration.[§] The percentage of total time expended for each service for each kind of maternal health personnel was calculated (by dividing observations of personnel for each services by total number of observations) and multiplied by their salary and benefits to estimate the cost of personnel time.

The methodology for estimating direct material costs was to interview health providers to ascertain which lines of treatments are followed in the course of a given intervention, and the percentage of clients that receive each line of treatment. The cost of each line of treatment was calculated by multiplying the cost of a single dosage by the number of dosages prescribed in a day and then again by the number of days required to treat a given ailment. Prices were obtained from national medical stores or pharmacies, depending on whether the facility in case was public or non-governmental.

Indirect costs include the costs of labour and other inputs that support the maternal health service such as utilities and maintenance but were not directly involved in

[†]While treatment of another complication, sepsis, was not costed, the treatment of sepsis as a post-abortion complication was estimated.

[‡]Because insufficient data were available on capital costs, these were not calculated in the study.

[§]The observation technique that was used to determine the distribution of employees' time among activities is known as randomized intermittent instantaneous observation (Reinke, 1988).

service provision. Indirect labour costs are divided into those of personnel directly involved in maternal health care, and other personnel that provide support services for maternal health care. Non-labour indirect costs that were considered include recurrent costs such as expenditures on maintenance, utilities and food. Information on recurrent indirect costs was abstracted from facility records. While some data on equipment and capital investments were collected, this information was insufficient to calculate actual costs. In order to generate annualized capital costs, a more detailed inventory of existing equipment would be required. Nonetheless, these data are useful as an indicator of structural differences between facilities. Therefore, a qualitative description of the data is presented in the section on service quality.

Other information collected included indicators of service quality and efficiency. Service quality measures were included in the study so that cost differences between facilities could be explained. Measures of quality in the study include a combination of structural and process indicators.[‖] Indicators of efficiency were included in order to assess how well resources were being used. The two measures of efficiency included (1) the number of deliveries per midwife per year, and (2) the percentage of personnel time spent on administrative activities and personal (unoccupied) time.

Using facility-based client exit interviews administered over the course of 1 week, the authors estimated the average cost to the client for maternal health services. The costs that were included in client costs included user fees, travel costs, and the costs of food and other supplies related to the visit. Waiting and travel time were not calculated due to the difficulty of determining the shadow wage of clients. In order to compare client costs to satisfaction, clients were asked to rate the service they received in terms of privacy/confidentiality, attitude of health workers and overall impression with the visit.

Information on service volume in each facility was collected for the 12 months of 1997. The data were disaggregated by type of service and included maternal health services as well as other health services provided at the facility.

Some sensitivity analysis was undertaken on the cost of drugs since this estimation was based on recall data and may have a bias associated with it.

DATA COLLECTION AND SAMPLE

Costing of maternal interventions was undertaken in one district in each country.[¶] In each country, a district was chosen that had a public and mission hospital, a public and mission health centre and numerous community practitioners. In addition, these districts had to have relatively high utilization, acceptable quality of maternal services offered, and availability of good financial records. The districts where facilities were surveyed include Masaka District, located approximately 60 miles southwest of Kampala, Uganda; Blantyre District in the south of Malawi; and South

[‖]Outcome indicators of quality were not assessed because this information is not readily available in facilities.

[¶]Data collection took place in only one district in each country due to financial constraints.

Kwahu District in the Eastern Region of Ghana. Data were collected during April–October 1998.

LIMITATIONS OF THE STUDY

In each of the three countries, data were collected in one public and one mission hospital, one public and one mission health centre, and from 128–192 clients (see Table 1). Because the study is part of a three-country cost comparison and there

Table 1. Study sample size

Facility/Service	Uganda		Malawi		Ghana	
	Services observed	Average services per month	Services observed	Average services per month	Services observed	Average services per month
Public hospital						
Antenatal care	2 sess. w/20+	458.0	595	2945	5 sess	257.8
Vaginal delivery	10	83.0	100	1006	w/63	51.3
Caesarean section	3	46.0	20	109	4	13.6
Post-abortion complications	4	20.5	16	13	2	5.1
Postpartum haemorrhage	0	4.4	6	4	0	0.3
Eclampsia	0	0.4	7	6	0	0.2
Mission hospital					0	
Antenatal care	2 sess. W/18	138.5	398	1555	159	928.25
Vaginal delivery	8	40.0	13	213	23	146.3
Caesarean section	1	17.0	2	12	6	21.7
Post-abortion complications	4	13.0	0	0.6	0	0.3
Postpartum haemorrhage	0	1.2	0	2	0	3.8
Eclampsia	0	0.1	0	0.6	0	0.4
Public health centre						
Antenatal care	4 days w/27	136.0	212	448	9	29.6
Vaginal delivery	1.0	14.7	5	50	0	8.3
Post-abortion complications	0.0	0.0	0	0	0	0
Mission health centre						
Antenatal care	3 days w/10	19.0	57	123	29	75.3
Vaginal delivery	0	7.5	5	27	2	11.4
Post-abortion complications	1	1.0				
Private midwives						
Antenatal care	NA	49.0[a]	NA		NA	21.4
Vaginal delivery	NA	17.0[a]	NA			7.4
TBAs						
Antenatal care	NA	16.2[a]	NA	29	NA	0.1
Vaginal delivery	NA	5.4[a]	NA	20	NA	3.6

[a]Services provided per midwife or TBA.

were funding constraints, the sample was taken from only one district in each country. It is a case study rather than a representative sample that would have data from more than one region of the country.

RESULTS

In the following sections, the findings of the case study will be discussed in some detail, beginning with the unit costs of services. Since purchasing power parities[#] are shown to be similar, comparisons of variations in costs are made for the three countries. In addition, the patterns of differences in unit costs of maternal health services between levels and public and private providers are compared.

Unit costs of services

The unit cost of antenatal services range from $2.20 to $6.40 in Uganda, $3.20 to $5.80 in Malawi, and from $3.00 to $5.50 in Ghana (see Table 2). Costs are higher for vaginal delivery services and are $2.70–$33.90 in Uganda, $10.20–$24.00 in Malawi, and $7.70–$14.60 in Ghana. Treatment of obstetric complications is costlier (Table 3) than other services due to the greater use of drugs and supplies and higher indirect costs, attributable to longer stays in hospitals.

Materials (drugs and supplies) are the most costly component of most of the six maternal health services. Materials comprise on average 51.1%[††] of total unit costs of routine services and 68% of obstetric complication services.

Indirect costs comprising non-patient contact time of personnel, support staff time, and pro-rated shares of maintenance and utilities make up a significant portion as well (16%–62%) of total costs as well.

The costs of routine services are greater at hospitals than health centres in the study sample, with the exception of ANC services at mission hospitals (see Table 4). Material costs are higher in hospitals since more comprehensive lines of treatment are provided at these facilities than at lower-level facilities.

The unit cost of routine maternal health services is generally higher at mission than public facilities, due to a larger percentage of total costs spent on materials. Delivery services at public hospitals were more costly at mission hospitals, however, because of their larger number of personnel.

For obstetric complications, costs are higher at public than at mission facilities in Malawi and Ghana since the percentage of total costs that are indirect costs is greater. For caesarean section, for example, the percentage of unit cost that are indirect are on average higher in public than private by 24% and 8% in Malawi and Ghana, respectively. However, in Uganda, unit costs are higher at the mission hospital due to the usage of more materials and labour.

[#]It should be noted, however, that purchasing power parities are not very different between the three countries according to the 1998 World Bank rating of ppps (World Bank, 2000) and ranged from 3.6 to 4.1.

[††]In Ugandan facilities, however, materials make up less than 40% of costs in the public hospital, mission health centre, and for vaginal delivery at the mission hospital.

Table 2. Unit costs of routine services by type of facility and country

	Hospitals		Health centres	
	Public hospital	Mission hospital	Public health centre	Mission health centre
Uganda				
ANC				
Labour	0.82 (19.6)	0.20 (3.8)	0.53 (24.0)	2.03 (31.6)
Materials	1.48 (35.4)	4.10 (78.8)	1.03 (46.6)	1.60 (24.9)
Indirect costs	1.88 (45.0)	0.90 (17.3)	0.64 (29.0)	2.80 (43.5)
Total	4.18	5.20	2.21	6.43
Vaginal delivery				
Labour	13.25 (39.1)	9.55 (29.0)	0.56 (20.7)	4.82[a] (35.1)
Materials	4.31 (12.7)	5.28 (16.1)	1.18 (43.5)	4.48 (29.3)
Indirect costs	16.34 (48.2)	18.06 (54.9)	0.97 (35.8)	6.01 (39.3)
Total	33.90	32.89	2.71	15.31
Malawi				
ANC				
Labour	0.26 (4.7)	0.15 (2.6)	0.32 (9.9)	0.42 (10.0)
Materials	4.44 (81.0)	5.08 (88.0)	2.18 (67.5)	2.94 (70.3)
Indirect costs	0.78 (14.2)	0.54 (9.4)	0.73 (22.6)	0.82 (19.6)
Total	5.48	5.77	3.23	4.18
Vaginal delivery				
Labour	1.17 (4.9)	1.24 (10.5)	1.26 (12.3)	0.62 (5.6)
Materials	11.34 (47.2)	6.49 (55.2)	4.63 (45.3)	4.65 (41.7)
Indirect costs	11.52 (47.9)	4.03 (34.3)	4.33 (42.4)	5.87 (52.7)
Total	24.03	11.76	10.22	11.14
Ghana				
ANC				
Labour	0.77 (14.1)	0.40 (13.5)	0.52 (16.4)	0.60 (14.9)
Materials	2.59 (47.5)	2.09 (70.4)	1.94 (61.2)	2.37 (58.8)
Indirect costs	2.09 (38.3)	0.48 (16.2)	0.71 (22.4)	1.06 (26.3)
Total	5.45	2.97	3.17	4.03
Vaginal delivery				
Labour	2.02 (13.8)	1.88 (15.8)	1.03[a] (13.4)	1.40[a] (14.4)
Materials	7.57 (51.8)	7.26 (61.0)	2.76 (36.0)	5.40 (55.4)
Indirect costs	5.01 (34.3)	2.75 (23.1)	3.87 (50.5)	2.94 (30.2)
Total	14.60	11.89	7.66	9.74

[a]Estimated based on recall rather than observation.

Indicators of service quality

In most cases, facilities have over 75% of key drugs and equipment (Figure 1). As would be expected, the six hospitals have better structural quality than the six health centres and often score higher on process indicators. That is, clients are more likely to receive prescribed drugs and key procedures are carried out more frequently in hospitals than at health centres.

Table 3. Unit costs of obstetric complications by type of hospital and country (US$)

	Uganda (2 facilities)		Malawi (2 facilities)		Ghana (2 facilities)	
	Public hospital	Mission hospital	Public hospital	Mission hospital	Public hospital	Mission hospital
Caesarean section						
Labour	12.12 (17%)	10.68 (12%)	2.00 (2%)	4.67[a] (8%)	12.55[a] (14%)	8.65[a] (16%)
Materials	38.39 (53%)	53.15 (61%)	54.72 (53%)	44.12 (72%)	51.20 (58%)	38.02 (68%)
Indirect costs	22.60 (31%)	22.64 (26%)	45.66 (45%)	12.60 (21%)	25.08 (28%)	8.93 (16%)
Total	$73.10	$86.48	$102.38	$61.39	$88.83	$55.60
Post-abortion complications						
Labour	8.60 (24%)	10.65 (19%)	11.29 (27%)	1.12[a] (4%)	5.00[a] (8%)	2.40[a] (4%)
Materials	19.43 (55%)	36.72 (64%)	12.87 (31%)	18.49 (62%)	43.55 (66%)	41.80 (65%)
Indirect costs	7.40 (21%)	10.23 (18%)	17.61 (42%)	10.34 (35%)	17.91 (27%)	19.68 (31%)
Total	$35.43	$57.60	$41.77	$29.95	$66.46	$63.88
Postpartum haemorrhage						
Labour	10.18[a] (20%)	46.25[a] (40%)	11.79 (14%)	5.74 (9%)	29.69[a] (32%)	3.35[a] (9%)
Materials	25.76 (51%)	52.26 (46%)	51.29 (63%)	46.31 (69%)	36.48 (39%)	25.78 (69%)
Indirect costs	14.69 (29%)	16.32 (14%)	18.43 (23%)	15.08 (22%)	26.77 (29%)	8.44 (22%)
Total	$50.63	$114.83	$81.51	$67.13	$92.94	$37.57
Eclampsia						
Labour	38.58[a] (47%)	111.15[a] (70%)	21.02 (20%)	9.43[a] (18%)	NA	NA
Materials	13.33 (16%)	19.50 (21%)	19.50 (18%)	21.07 (40%)		
Indirect costs	30.46 (37%)	29.01 (18%)	66.06 (62%)	22.16 (42%)		
Total	$82.37	$159.66	$106.58	$52.66		

NA, no data provided; [a]Estimated on the basis of recall rather than observation.

Table 4. Differences between hospitals and health centres for routine services

	Public (3 hospitals, 3 health centres)	Mission (3 hospitals, 3 health centres)
ANC		
Unit cost	Higher unit cost in the hospital than health centre in three countries	Higher unit cost in health centres than hospital in two countries
User fees	Higher service fees in hospital than health centre in three countries	Higher user fees in health centre than hospital in two countries
Cost recovery	Cost recovery higher in hospital than health centre in three countries	Cost recovery higher in health centre than hospital in two countries
Vaginal delivery		
Unit cost	Higher unit cost in hospital than health centre in three countries	Higher unit cost in hospitals than health centres in three countries
User fees	Higher user fees in hospital than health centre in two countries observed[a]	Higher user fees in hospital than health centre in country with observation[a]

[a]No deliveries took place in three out of six health centres in period of observation.
Note: Results are reported for 12 facilities: a public hospital, a public health centre, a mission hospital, and a mission hospital in each of the three countries.

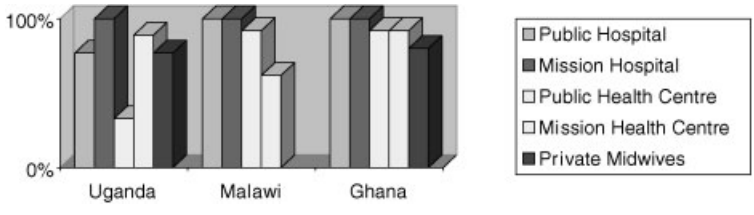

Figure 1. Availability of key drugs in facilities by country. *Note*: Key drugs for ANC are designated as tetanus toxoid, ferrous sulphate and folic acid; vaginal delivery drugs are paracetamol or aspirin, dextrose and lidocaine; caesarean section drugs are antibiotics, dextrose, oxytocin and diazepam; and other obstetric complication drugs were oxytocin, diazepam and hydralazine

While the availability of drugs and equipment is not very different among public and mission hospitals, the availability of equipment is higher at mission health centres than public health centres in two out of the three countries. The six mission facilities generally score higher on process indicators (see Annex Table 5) and client satisfaction than did the six public facilities, however. For example, clients are more likely to have received prescribed drugs at mission facilities than at public facilities. The latter finding is likely to be related to management factors that resulted in better use of resources.

Indicators of efficiency

The first measure of efficient use of resources in facilities examines whether the number of midwives is appropriate for the number of the facilities' services volume. The findings reveal that the number of staff providing maternal health care is too high in the public hospitals in Uganda and Ghana at the public hospitals in the

Table 5. Process indicators by facility and country

	Uganda		Malawi		Ghana	
Hospital	Public	Mission	Public	Mission	Public	Mission
Prescribed drugs received at exit by clients						
All drugs	51%	100%	48%/54%[a]	96%	87%	100%
Some drugs	20%	0%	43%/43%[a]	4%	8%	0%
None	4%	0%	10%/3%[a]	0%	3%	0%
Standard procedures followed						
ANC: Lab tests	No	Yes	Yes	Yes	Yes	Yes
Pelvic/Phys. assessment	Yes	Yes	Yes	Yes	Yes	Yes
Delivery: Use labour graph	Yes	Yes	Yes	Yes	Yes	Yes
Health centres	Public	Mission	Public	Mission	Public	Mission
Prescribed drugs received at exit by clients						
All drugs	43%	100%	96%	86%	84%	85%
Some drugs	57%	0%	4%	13%	16%	15%
None	0%	0%	0%	0%	0%	0%
Standard procedures followed						
ANC: Lab tests	No	Yes	No	No	Yes	Yes
Pelvic assessment	Yes	Yes	Yes	Yes	No	Yes
Delivery: Use labour graph	Yes	NA[b]	Yes	No	NA[b]	Yes

[a]Includes percent for paying and non-paying wards.
[b]Procedure was not observed.

study sample, using an assumption that midwives could provide 150 deliveries per year in a hospital setting[‡‡] (Figure 2). On the other hand, the number of personnel in the hospitals in Malawi is too low given the high service volume at these facilities.

When the use of personnel time for non-contact activities, i.e. administrative and unoccupied time, is assessed, the time spent on administrative activities range from 11% to 53% and from 11% to 38% for supervisory nurses/midwives and enrolled nurses, respectively, and is higher in facilities with low service volume. The amount of time that personnel spend on unoccupied or on personal activities is relatively low ($<$11% for supervisory nurse/midwives and $<$17% for enrolled nurse/midwives).

Consumer costs

Table 6 shows the costs incurred by consumers for routine services and includes user fees, travel costs and other costs such as food.[§] The costs for antenatal care range from $1.00 to $2.80 in Uganda, $0.20–$8.70 in Malawi, and $0.60–$3.20 in Ghana. For vaginal delivery, the costs range from $2.30 to $22.80 in Uganda, $0.40–$7.90 in Malawi, and $12.60–$20.70 in Ghana.

The costs are greater for obstetric clients, particularly for caesarean sections. Clients pay $13–$59 in Uganda and $68–$140 in Ghana. All three types of costs—user

[‡‡]This assumption is based on the calculations of a midwife on the amount of deliveries and antenatal care that can be delivered in an institutional setting since no literature is available on this subject.
[§]Costs for medicines were included in the user fees.

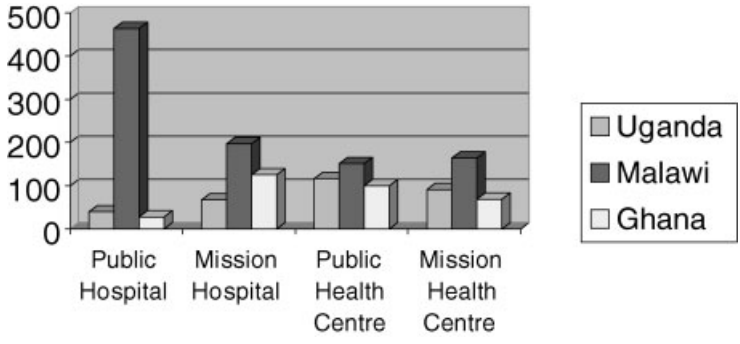

Figure 2. Number of deliveries per midwife

fees, travel and other costs—are higher than for routine services. With the exception of Malawi, the costs are higher in mission than public facilities for treatment of complications.

Costs to the client are generally higher at hospitals than health centres and at mission than public facilities, due to higher user fees as well as travel costs in many cases. The differences between client costs at mission and public facilities are particularly large at the health centres, since fees are low at public health centres. The higher travel costs suggest that the average distance to the hospitals is farther

Table 6. Costs to client for antenatal care and vaginal delivery

	Uganda		Malawi		Ghana	
ANC	Public	Mission	Public[a]	Mission	Public	Mission
Hospitals (N)	(40)	(36)	(13/36)	(38)	(39)	(40)
User fees	0.84	0.64	7.50/0.00	0.59	2.40	2.42
Travel costs	0.83	1.26	1.13/1.12	0.51	0.60	0.64
Other costs	0.04	0.16	0.07/0.04	0.09	0.05	0.09
Average total cost/client	$1.71	$2.06	$8.70/1.16	$1.19	$3.06	$3.15
Health centres (N)	(20)	(13)	(20)	(22)	(19)	(18)
User fees	0.35	2.15	0.00	0.94	0.47	0.65
Travel costs	0.56	0.00	0.12	0.22	0.15	0.08
Other costs	0.07	0.64	0.13	0.01	0.00	0.05
Average total cost/client	$0.97	2.79	0.15	1.17	0.62	0.78
Vaginal delivery (N)						
Hospitals	(9)	(3)	(2/21)	(27)	(2)	(9)
User fees	4.35	18.26	7.50/0.0	5.45	11.77	18.10
Travel costs	3.83	4.06	0.19/1.56	2.37	0.75	1.35
Other costs	3.03	0.43	0.00/0.00	0.04	0.00	1.19
Average total cost/client	$11.20	$22.75	7.69/2.56	7.86	12.52	20.64
Health centres (N)	(1)		(4)	(9)		
User fees	0.70	NA	0.00	1.35	NA	NA
Travel costs	0.52	NA	5.30	0.41	NA	NA
Other costs	1.04	NA	0.06	0.01	NA	NA
Average total cost/client	$2.26		0.35	1.77		

[a]In the public hospital in Malawi, both paying and non-paying clients were interviewed.

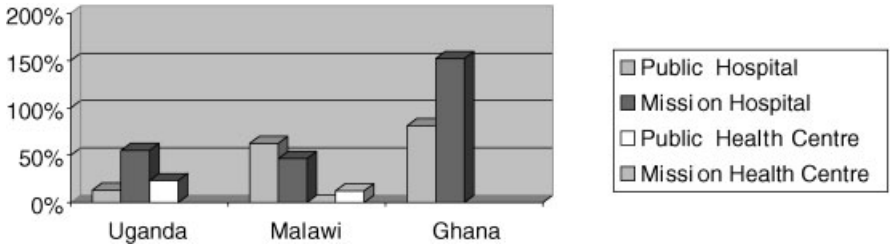

Figure 3. Cost recovery rates for vaginal delivery by facility and country

than to the health centres, but could also be explained by differences in type of transport.

With the exception of the paying ward in the public hospital in Malawi, the costs to the clients is higher at the six mission facilities than the six public facilities, because of either higher user fees or travel costs.

Cost recovery rates

For antenatal care, the service costs recovered by user fees in the 12 facilities are relatively low. In Uganda and Malawi, the rates are under 35%, with the exception of the paying ward at the public hospital in Malawi. In Ghana, where the drug costs are being fully recovered, the rates range from 15% in the public health centre to 81% in the mission hospital. One reason that cost recovery rates are so low for ANC is that facilities often set their fees lower for this service to encourage its use.

Cost recovery rates (Figure 3) are generally higher for vaginal delivery than for ANC, particularly in the hospitals. However, the rates are still low in the public hospital in Uganda, public health centre in Uganda, and mission health centre in Malawi. The rates at mission hospitals are higher than those of public hospitals in Uganda and Ghana, but not in Malawi since fees in the paying ward were high. The rates are highest at the Ghana mission hospital (152%). When the percent of material costs recovered is examined, most are obtained at the hospitals (over 100% in the facilities in Uganda and Ghana), while the percent recovered at health centres is lower.

Cost recovery rates are often higher at the hospitals than health centres in our sample, although this relationship does not always hold for antenatal care. They are usually higher for mission than public facilities in our sample. Cost recovery rates in facilities in Ghana are particularly high, and, in a few cases, are higher than 100%.

Cost recovery rates are higher for mission health centres than public health centres, but there is no directional pattern for differences in hospitals. The amount recovered for drugs and materials is higher, but does not recover all of the costs in most cases.

DISCUSSION

The country case studies that led to this synthesis found considerable variation in the unit costs of maternal health service provision in the sample facilities in each of the

three countries, both between levels and among public and mission facilities. Unit costs are lowest for antenatal care services at all facilities because the services require little personnel time and short facility stays. Treatment of obstetric complications are the most costly, due to higher use of drugs and supplies, personnel time in some cases, and indirect costs such as maintenance and utilities because of the longer stay required at the hospitals.

The variations in costs of services are more closely associated with differences in facility levels than with inter-country differences. The estimated unit costs of routine services are lower than those found in other studies conducted in Latin American countries due to differences in salary levels. The unit costs of caesarean delivery are similar, however, to those found in other studies.

When the cost of services are compared with those of the costing study conducted in Uganda using the Mother-Baby Package Costing Tool, this study's total service costs are found to be higher (Weissman *et al.*, 1999). The reason for the differences in unit costs can be explained by methodological differences between the two studies. This study conducted direct observation of personnel time use while the Weissman study used recall methods, i.e. interviews of health personnel, accounted for a wider range of drugs and supplies, and included more indirect costs.

Costs by components

Drugs and supplies are the most costly component of maternal health services, comprising on average half of the unit costs of services. The reasons for this finding include: (1) drugs and supplies are imported whereas other costs such as personnel are paid in local currency; and (2) the cost of labour is relatively low. Labour costs comprise a small share of total costs due to low salary structures in the three African countries. Secondly, the time requirements for most maternal health services are small, excepting vaginal delivery and eclampsia services. Third, lower-level personnel such as enrolled nurse-midwives are more likely to provide services than higher-level personnel.

Indirect costs, which comprise the costs of noncontact time of health personnel, time of supervisory and support personnel, and maintenance and utilities, are also an important part of total costs for the services costed in the sample: from 17% to 52.7% of routine services and 16.1% to 62% of obstetric complications.

Some types of indirect costs are often not calculated in studies, particularly the costs of noncontact time of health personnel. The high percentage of total costs spent on noncontact time demonstrates their importance and the usefulness of conducting personnel observation. This information can be used to assist managers to make efficiency improvements in their facilities, for example, to reduce the amount of time required for administrative activities such as recordkeeping.

Because they support all the services provided in a facility, indirect costs are related to the overall service volume in facilities as well as to the number of supervisory and support personnel at hospitals. As the total number of services provided increases, the percentage of indirect cost for an individual service

decreases. This effect of higher utilization on a facility's indirect costs was seen in Ghana, where the indirect costs at the mission hospital, which had considerably higher utilization than did the other three facilities studied, comprised a lower percentage of total unit costs.

Because drug and supply costs comprise such a large share of unit costs of maternal health services, it is important that appropriate use of this resource is taking place. Ensuring that rational use of drugs and supplies is occurring is critical in health systems with limited resources. Development of treatment protocols should be emphasized as well as compliance to these to ensure that resources are used wisely.

Similarly, the results indicate that indirect costs drive up costs and these costs can often be lowered through increasing the number of services provided in a facility and improved use of personnel.

Cost differences by level and type of provider

Unit costs of routine services differ between hospitals and health centres. In general, unit costs of services are higher at hospitals than at health centres due to more use of materials and higher indirect costs, particularly in the public hospitals. However, some exceptions occur—such as antenatal services in mission facilities—since factors such as service volume and use of more highly skilled personnel also affect costs.

The authors found differences between unit costs of maternal health services in public facilities and costs in mission facilities. In mission health centres in Malawi and Ghana, costs are about 30% higher than in the public health centres, because more labour time and materials are used in service provision.[¶] While structural quality indicators—the availability of materials and equipment—are not necessarily better in the three mission health centres, the process quality indicators that were examined—receipt of prescribed drugs by patients, adherence to standard protocols for treatment—are better in two of three. Clients also indicated that they are slightly more satisfied with the services at mission health centres than at public health centres in all three countries.

When cost differentials are examined in public and mission hospitals, unit costs of five of the six services (the exception being antenatal care services) are found to be higher in public hospitals than in mission hospitals in Malawi and Ghana; in Uganda, costs are higher in the mission hospital for five of the services. Despite this finding, structural and process quality indicators are generally better at the mission hospital than at the public hospital in all three countries, similar to the findings of other studies (e.g. Wouters, 1994). In addition, the three mission hospitals have more appropriate staffing for the number of maternal health services that they

[¶]The percent difference between unit costs of the two routine services in public and mission health centres in Uganda is much greater (190% to 465%) because the mission facility used a medical doctor rather than a midwife to provide routine services.

provided. In general, more materials are used in mission health centres than in public health centres, while the differences are mixed in hospitals.

The findings suggest that the mission facilities in the sample provide maternal health services at the same or better level of quality than public facilities, and with costs that are slightly higher than in health centres but often lower than in hospitals. However, it should be noted that these facilities have some of the same inefficiencies—for example, underutilization of services—as do public health facilities.

Efficient use of resources

The studies observe inefficient use of labour resources in some of the facilities. In the three public hospitals and, to a lesser extent, the three mission hospitals, the number of midwives appeared to be inappropriate, either greater than required for the number of services provided (Uganda and Ghana) or lower than required (Malawi). When overstaffing takes place, the cost of personnel used to provide services is often higher than it should be. Conversely, if understaffing occurs, the cost of personnel is lower but the process quality of services may be unsatisfactory because less, and perhaps inadequate, time will be spent to provide a service to each client.

Economies of scale in hospitals result in lower costs of labour for antenatal care, but had little effect otherwise.

Health centres are generally staffed appropriately, since they require a minimum of two staff to be available to provide services at night or on weekends. However, in a few cases, use of health personnel are inappropriate, as in the mission health centre in Uganda where a physician provided routine services, or insufficient, as in the public health centre in Uganda. When the personnel are too highly skilled to provide only routine services, the labour costs will be higher than necessary. When not enough staff is posted to a health centre, access to services will be limited.

In addition, in places where personnel were spending too much time on administrative activities, the requirements for record-keeping should be examined.

Client costs

Costs to the client other than fees for services comprise more than 50% of total costs when fees for services are low, as in the case of Ugandan routine services and in public facilities in Malawi (with the exclusion of the paying ward in the Malawi public hospital). In cases when the fees were more substantial, such as the mission facilities in Malawi and all facilities in Ghana, costs other than fees are less than 50% of client costs.

The implication of the relative importance of travel and other costs to total client costs in the study sample is that facilities should take these costs into account when making adjustments to their fee levels, particularly when user fees are low. When introducing or increasing fees for services, it is also probably important for facilities to launch promotion campaigns on the benefits of using services at their facilities as well as to increase their responsiveness to client needs.

Client costs are found to be generally higher at hospitals than at health centres and at mission facilities than public facilities for the same service. Despite higher costs at hospitals, however, clients are more likely to use hospitals than health centres, probably because they feel that service value is higher at these facilities.

Cost recovery

In general, cost recovery rates of recurrent costs of maternal health services is higher at hospitals than health centres and at mission than public facilities in the study sample, and these differences may be appropriate since they are trying to attract different clientele. As noted earlier, the higher rates does not appear to be affecting choices of facility level since service volume is considerably higher at hospitals than health centres. These may be affecting choices of mission over public facilities to some extent.

Cost recovery rates does not appear to be set systematically or considered when setting user fees in the facilities in two of the three countries, Uganda and Malawi. In addition, there are wide differences between cost recovery rates in health centres, public facilities, and mission facilities. Policies on cost recovery should be developed, including determining the percentage of operating costs that facilities would like to recover as well as potential impact on utilization.

Issues in methods of data collection

The methodology that is used in this study differed from other costing studies of maternal health care in a few ways. First, it involves the use of personnel observation and collection of recall information rather than only recall to obtain information on how they allocated their time at the health facilities. The observation of personnel time use has both advantages and disadvantages. Two advantages are that it allows labour costs to be calculated more accurately for the activities that are observed (Bratt *et al.*, 1999); and it allows for the time spent on administrative and unoccupied and personal activities to be estimated. Two disadvantages are that some obstetric complications are rarely observed and the labour costs must be estimated through recall anyway; and observation is labour-intensive, and therefore, costly, and results in a reduced sample size when a study's budget is limited.

The findings of the three case studies demonstrate a few areas where data collection methods can be further enhanced. First, the way in which drug and supply costs is estimated is based on recall of maternal health personnel, usually midwives. A possible alternative type of data collection that would allow assessment of prescribing practices would be to include some observation of use of drugs and supplies during service provision.

POLICY IMPLICATIONS

The findings of the study yield some policy implications regarding the allocation of scarce resources and financing options.

Improving efficiency

Overstaffing at hospitals in the study sample results in higher labour costs, as in the case of the four facilities in Uganda and Ghana, while understaffing results in compromised service quality, as in the case of Malawi. In addition, the use of overly skilled staff to provide routine services also increases service costs. In these cases, the staffing should be adjusted so that the number of staff is appropriate for the service volume at specific facilities. The findings in our sample suggest that the appropriate use of facility staff should be assessed and adjusted if necessary. In addition, facilities should examine the time use of their staff. If they find, for example, that staff are spending too much time on administrative duties, then some of these activities should be streamlined to allow the staff to spend more time on other relevant activities.

When service volume is too low in a facility, unit costs of services are increased since indirect costs have to be spread across fewer units of output (services provided) (Janowitz *et al.*, 2002). In facilities where service volume is too low, facilities should try to attract more clients through improving service quality, or, when appropriate, promotional activities. In addition, some assessment of clients' willingness and ability to pay fees for services should be conducted to determine whether they are a deterrent to use and whether some adjustment is required.

Since the sample size of the study is too small to draw inferences from, the findings regarding differences in costs between facility level and private/mission will have to be verified in a larger costing study.

Cost recovery

The analysis of unit costs and percent of costs recovered from user fees in the sample indicates that a more systematic method of price setting in these facilities would assist facilities to reach their goals of financial sustainability. A facility could decide, for example, that at a minimum, it wants to recover a certain percentage of the costs of drugs for a given service; fees can then be set to achieve this goal.

Because of large differentials between user fees in the public and private sectors in the sample in some cases, the former sector may want to consider raising its fees or introducing financing schemes such as insurance schemes in order to cover more of its costs. At the same time, it should investigate how to improve its supply of essential drugs so that it can assure a minimum level of quality control before raising its fees structure significantly.

Before considering an increase in user fees, the public sector facilities should insure that the population would continue to be able to utilize its services if fees were increased through some assessment of willingness and ability to pay by clients. This is important both in terms of evaluating the impact of higher fees on clients' overall demand for services and their choice between public and private providers, especially when service volume is low as mentioned above. As learned in Kenya (Collins *et al.*, 1996), cost recovery goals and user fee levels then need to be well communicated to the public so that they know the uses of their money and how much their services are still subsidized.

ACKNOWLEDGEMENTS

This three-country case study was supported by the Bureau for Africa of USAID and coordinated by Partnerships for Health Reform (PHR) to compare costs of maternal health services in Ghana, Malawi and Uganda. Discussions with the Ministries of Health, as well as with USAID, World Bank, WHO and MotherCare Project representatives in Uganda, informed the focus and design of the study.

The study team would also like to acknowledge the support of the Makerere Institute of Public Health in Uganda, the University of Malawi Centre for Social Research and Research International in Ghana for their participation in the study. Implementation of the cost study in each country would not have been possible without the hard work and dedication of the study teams' data collectors and observers. In addition, we would like to thank all the hospital and health centre staff, private midwives, traditional birth attendants and clients that participated in and contributed to the study.

The authors are grateful for the valuable comments of Dr Charlotte Leighton, Dr Barbara Janowitz, Holly Flutey Dempsey and Dr Jeanne McDermott.

REFERENCES

Bratt JH, Foreit J, Chen PL, West C, de Varga T. 1999. A comparison of four approaches for measuring clinician time use. *Health Policy Plan* **14**: 374–381.

Collins D, Quick JD, Musau SN, Kraushaar D, Hussein IM. 1996. The fall and rise of cost sharing in Kenya: the impact of phased implementation. *Health Policy Plan* **11**: 52–63.

Dmytraczenko T, Carrasco S, Seone K, *et al*. 1998. *Evaluación del Seguro Nacional de Maternidad y Niñez en Bolivia*. PHR Technical Report 28. Abt Associates: Bethesda, MD.

Favin M, Bradford B, Cebula D. 1984. *Improving Maternal Health in Developing Countries*. World Federation of Public Health Assoc: Washington, DC.

FHI. 1996. Manuscript on the *Methodology and Cost Analysis for APROFE, the Ecuadorean IPPF Affiliate*. Family Health International: North Carolina.

Janowitz B, Johnson L, Thompson A, West C, Marangwanda C, Maggwa NB. 2002. How excess capacity affects the costs of adding a reproductive health service to family planning clinics in Zimbabwe. *Int Family Plan Perspect* **28**: No. 2.

Levin A, Amin A, Rahman A, Saifi R, Khuda B, Mozumder K. 1999a. A cost-effectiveness analysis of family planning and maternal and child health alternative service delivery strategies in rural Bangladesh. *Int J Health Plann Mgmt* **14**: 219–233.

Levin A, Dmytraczenko T, Ssengooba F, *et al.* 1999b. *Cost of Maternal Health Care Service in Masaka District, Uganda*. Special Initiative Report 16, Partnerships for Health Reform. Abt Associates: Bethesda, MD.

Levin A, Mangani R, McEuen M, Chiweza R, Chizani N. 1999c. *Cost of Maternal Health Care Services in Blantyre District, Malawi*. Special Initiative Report 17, Partnerships for Health Reform. Abt Associates: Bethesda, MD.

Levin A, McEuen M, Tanzi V, Van Dyck G, Sekyere-Boakye N. 1999d. *Cost of Maternal Health Care Services in South Kwahu District, Ghana*. Partnerships for Health Reform. Abt Associates: Bethesda, MD.

Reinke W (ed.). 1988. *Health Planning for Effective Management*. Oxford University Press: New York.

Rosenthal G. 1991. *Maternity Services in Cochabamba, Bolivia: Costs, Cost recovery, and Changing Markets report of a Field Study*. Mothercare/John Snow, Inc. Report prepared for the Agency for International Development: Arlington, VA.

Tinker A, Koblinsky M. 1992. *Making Motherhood Safe*. The World Bank: Washington, DC.

Weissmann E, Sentumbwe-Mugisa O, Mbonye AK, Lissner C. 1999. *Uganda Safe Motherhood Programme Costing Study*. (WHO/CHS/RHR/99.9). WHO: Geneva.

World Bank. 1993. *World Development Report*. World Bank: Washington, DC.

Wouters A. 1994. *Quality of Health Care and Cost Recovery in Africa: Evidence from Niger and Senegal*. Health Financing and Sustainability Project, Abt Associates: Bethesda, MD.

