

# Assessing the costs and cost-effectiveness of a Skilled Care Initiative in rural Burkina Faso

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## Summary

**OBJECTIVES** The objectives of this study were to assess the cost-effectiveness of a skilled attendance strategy (the Skilled Care Initiative, SCI) in enhancing maternal health care in a remote, rural district of Burkina Faso and to analyse more broadly the costs and cost patterns of maternal health provision in the intervention and comparison districts.

**METHODS** The approach used was to cost the standard provision of maternal care, to analyse the main cost structures, and to derive cost estimates per facility. The additional costs attributable to SCI were identified. Several measures of cost-effectiveness or performance were calculated, including cost per delivery and utilisation.

**RESULTS** If the increase in deliveries in Ouargaye between 2004 and 2005 is attributed solely to the stimulus of demand for skilled care by the SCI community mobilisation and behavioural communication change activities, the incremental cost per delivery was \$164 international dollars. This compares with an average cost per delivery in Health Centres across the two districts of \$214 international dollars. However, if a broader measure of SCI costs is used, the incremental cost per delivery increases markedly, to \$1306 international dollars. At the level of individual Health Centres, utilisation is a better measure of performance than cost per delivery and Health Centres in Ouargaye are utilised more than in Diapaga.

**CONCLUSIONS** Demand side actions, such as community mobilisation and behavioural communication change activities, can be as important in improving skilled care at delivery as investment in health facilities, assuming there is some spare capacity, as has been the case in Burkina Faso. These conclusions have important potential implications for planning and resource allocation to achieve safer delivery for all women in Burkina Faso.

**keywords** costs, cost-effectiveness, maternal care, Burkina Faso

## Introduction

Achieving the Millennium Development Goal of improving maternal health (MDG 5) has been hindered by a lack of evidence on both the effectiveness and cost-effectiveness of existing safe motherhood strategies in the developing world, as well as lack of effective means for tracking progress in the short term (Ronsmans & Graham 2006). Impact, a global research initiative, worked in Burkina Faso, Ghana and Indonesia in response to this urgent call and several existing safe motherhood strategies were subsequently selected for cost-effectiveness evaluation. However, evaluating the cost-effectiveness of maternal and newborn health strategies encounters several methodological and measurement issues among which are the difficulties of having mutually exclusive strategies within the

same population, the problems of estimating the costs of maternal care, and the challenge of isolating the impact of strategies on process and outcome measures.

In Burkina Faso, we used a quasi experimental design to assess in the intervention district (Ouargaye) and a comparison district (Diapaga) the effectiveness of Family Care International's Skilled Care Initiative (SCI) in reducing maternal and perinatal mortality. A detailed description of the SCI and the evaluation methods employed are presented elsewhere (Graham *et al.* 2008; Hounton *et al.* 2008). This paper has two objectives. First, it seeks to assess the cost-effectiveness of the SCI, specifically in terms of increasing skilled attendance at delivery in Health Centres. Second, it seeks to cost maternal health provision in the two districts and identify differences in performance between Health Centres.

## Methods

### Overview

Given the complexity of both the evaluation settings and the implementation of the SCI, it proved very difficult to measure definitively the effects of the SCI. However, there is evidence that it did lead to increased numbers of women delivering in health facilities (Hounton *et al.* 2008).

The SCI involved health investment expenditure in 14 (out of 22) Health Centres and the District Hospital in Ouargaye. Some expenditure, such as on solar energy and field telephones, was on items which are part of standard maternal health care provision in Burkina Faso. Other expenditure was on more innovative items such as community mobilisation and behavioural communication change (CMBCC) activities. These activities took place across the whole district, not just at designated SCI Health Centres, because they were organised not by Health Centre catchment areas but by the areas covered by traditional community leaders.

We costed maternal health care provision in both districts, Ouargaye and Diapaga, in order to better identify the distinctive elements of the SCI. This process then made possible a further type of analysis, of variations in performance across Health Centres in the two districts.

### Theoretical and practical considerations

Costing can be conducted at various levels of accuracy (Brouwer *et al.* 2001; Drummond *et al.* 2004; Evans *et al.* 2005). Micro-costing, in which each individual element of resource use is separately identified and costed, is the most accurate but is the most research intensive. A more macro approach was employed here. We estimated the main facility costs from Ministry of Health (MoH) budgetary information and then allocated these between maternal care and other health care to derive the costs of maternal care. Sensitivity analysis was conducted to examine the effect of the various assumptions and procedures which were used. The budgetary allocations for drugs and for recurrent items like minor equipment, utilities and maintenance were obtained from the relevant MoH district plans. The MoH personnel division provided us with data on the salary and allowances of different types of health workers for use where it was known that a particular type of health worker was present at a facility but not what their actual salary costs were. The MoH infrastructure division provided us with the cost figures used for a standard Health Centre or District Hospital. This information from the MoH was supplemented by other data sources including some primary data collection.

To identify the costs of maternal health care, information was collected on the whole range of costs of maternal health service provision, in the two District Hospitals, SCI and non-SCI Health Centres in Ouargaye, and Health Centres in Diapaga. The principal cost categories were health workers (midwives, nurses and outreach health workers), other personnel, drugs, other recurrent items, buildings and other infrastructure, and vehicles. We included the costs of CMBCC activities under 'other personnel', allocating this expenditure to all Health Centres in Ouargaye, pro rata to the catchment population of the Health Centres.

The costs of capital items, such as buildings and vehicles, were annualised so that they could be added to recurrent costs to derive a measure of annual costs of provision. Discounting requires information on the useful life of a building or piece of equipment and the choice of an appropriate discount rate. In this and other aspects of the costing process, we followed the WHO-CHOICE guidelines on cost-effectiveness analysis (WHO, 2003).<sup>1</sup>

The next step was to determine the proportion of total costs attributable to maternal care. For all cost categories other than health worker costs, we used appropriate proxies of the volume of maternal care. For health worker costs, the results of a specially designed Time Allocation Instrument were used to compute average percentages of time spent on maternal care for each type of health worker.

Having established the costs of standard maternal health care provision, we sought to identify, and estimate, those (additional) costs of the Health Centres (and District Hospital) in Ouargaye which were attributable to the SCI. The basic approach was to try to isolate those costs which were unique or particular to the SCI. It is only these additional costs, which would not have been incurred anyway, which distinguish the SCI from standard maternal health care provision.

Data on SCI expenditure (for the period 2001–2005) was available, classified according to 10 main headings: establishment of the programme; running the programme; surveys; training; medical equipment; an ambulance; field communication equipment; solar energy equipment; refurbishment of maternities; and CMBCC activities.

We grouped these 10 headings into three categories: programme management expenditure, health investment expenditure and expenditure on CMBCC activities. Programme management expenditure consisted of the costs of

<sup>1</sup>More details about the costing methods employed, the costing spreadsheets and additional tables of results are available from the authors on request.

establishment and running of the programme, surveys and training. Health investment expenditure consisted of medical equipment, the ambulance, field communication equipment, solar energy equipment and refurbishment of maternities. Expenditure on CMBCC activities consisted of that single expenditure heading.

We discounted health investment expenditure completely, not including it in calculations of the cost-effectiveness of the SCI programme. The reason for doing so is that these costs are ones which almost certainly have been met anyway, either by the MoH or by other donors. They are not additional to standard maternal health care provision.

CMBCC expenditure, over the period 2003–2005, is the one item of wholly additional maternal health care expenditure in Ouargaye which is unlikely to have been incurred anyway. It is the base for our 'narrow' measure of incremental costs. Programme management expenditure is most relevant to the rolling out of such an initiative to other areas but also contributed to any successes of the SCI. The sum of programme management expenditure and CMBCC expenditure is the base for our 'broad' measure of incremental costs.

### Assessing cost-effectiveness

To assess the cost-effectiveness of the SCI, we computed the costs of additional deliveries at Health Centres in Ouargaye. As just explained, we employed both a narrow and a broad measure of SCI costs, depending on whether programme management costs are excluded or included.

To assess the performance of individual Health Centres in Ouargaye and in Diapaga, we began with the average cost per delivery but then developed a number of other indicators or factors, of which the most important are the deliveries factor and the utilisation factor. The deliveries factor decomposes what part of the differences in average cost per delivery is attributable to differences in total costs and what part to differences in the number of deliveries. In turn, the utilisation factor decomposes what part of the differences in the proportion of women using their nearest Health Centre to deliver is attributable to differences in the number of deliveries and what part to differences in population. The utilisation factor rests on the (reasonable) assumption that the number of women having babies in each Health Centre area is proportionate to total population. As we are not primarily interested in the absolute value of any of the factors, they are all expressed relative to the appropriate value for the Health Centre with the lowest average cost per delivery across the two districts.

### Results

#### The cost-effectiveness of SCI in increasing skilled care at delivery

Between 2002 and 2005, the proportion of institutional births increased by 20.8% in Diapaga, a mean annual rate of increase of 6.5% (Hounton *et al.* 2008). In the first 2 years, between 2002 and 2004, there was a very similar annual rate of increase in Ouargaye (6.6% in SCI supported facilities, 6.3% in the others). However, between 2004 and 2005, there was a sharp increase in the proportion of institutional births (31.1% in SCI supported facilities, 32.6% in the others) which corresponds with the introduction of community mobilisation and behavioural change communication activities across Ouargaye district.

The health system in Burkina Faso is standardised, irrespective of donors (Direction des Infrastructures des Equipements et de la Maintenance (DIEM) 2004; Direction de la Santé de la Famille (DSF) and Ministère de la Santé, Burkina Faso 2004a,b,c). Comparing Ouargaye and Diapaga districts, the only distinctive intervention appeared to be SCI demand side activities. Hence, it is likely that the observed sharp increase between 2004 and 2005 in the proportion of institutional births in Ouargaye was the result of CMBCC activities. It is unlikely to have been by chance and there are no obvious confounding factors. While these trends refer to institutional births, approximately 95% of such births are at Health Centres, and we assume that the same rates of change occur at all health facilities.

We assume that, in the absence of SCI, the proportion of institutional births in Ouargaye would have increased by 6.6% between 2004 and 2005. There were 6900 deliveries at Health Centres in Ouargaye in 2005 but, had the previous trend rate applied, there would have been 5581 deliveries, 1319 fewer.

If these additional institutional deliveries are attributed solely to the stimulus of demand for skilled care by the CMBCC activities, which cost 37.5 million CFA<sup>2</sup>, our narrow measure of incremental cost per delivery was 28 431 CFA or \$164 international dollars.<sup>3</sup> This is our favoured estimate. It compares with the average cost per delivery in Health Centres across the two districts which we estimate below to be \$214 international dollars.

If, however, SCI programme management costs (260.9 million CFA) are also included, the incremental cost per

<sup>2</sup>West African Francs.

<sup>3</sup>International dollars are ones adjusted for differential purchasing power. In Burkina Faso, they are less than one third of the dollar equivalent using market exchange rates.

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delivery increases markedly to 226 232 CFA or \$1306 international dollars.

**Costs and cost structures**

Table 1 shows the maternal health costs and cost structures of Health Centres in Ouargaye and in Diapaga and the two District Hospitals. Patient costs, such as items paid for by user fees or purchased outside health facilities, are not included although we recognise that such costs may affect utilisation. For reference, the mean catchment population of Health Centres in the two districts is just under 12 000. These estimates represent one of the first attempts to cost standard maternal health care provision, as opposed to emergency obstetric care, in a developing country (Jowett 2000).

Comparing the two districts, mean total maternal health costs are very similar: 11.0 million CFA (\$63 518 international dollars) in Ouargaye compared with 11.2 million CFA (\$64 673 international dollars) in Diapaga. In terms of the mean distribution of costs, the pattern is fairly similar in the two districts, apart from other personnel costs. These are significantly higher in Ouargaye because this is the category to which we allocated the costs of SCI/CMBCC activities.

By far, the most important single item is buildings, infrastructure and equipment, accounting for over 60% of total annualised costs. Health worker costs are the next largest category. The other categories – other personnel, drugs and medicines, other recurrent costs, and vehicles – each account for relatively small proportions, 2–11%, of total costs. Mean capital costs (including vehicles alongside buildings, infrastructure and equipment) across all Health Centres account for 66% of total maternal health care costs and recurrent costs the remaining 34%.

Table 1 also shows the maternal health care costs, and cost patterns, for the two District Hospitals. Total maternal health care costs are broadly comparable in magnitude at the two District Hospitals, 43.8 million CFA (\$252 916 international dollars) at Ouargaye and 50.2 million CFA (\$289 862 international dollars) at Diapaga. The pattern

of costs is also roughly similar. The greater differences are between the District Hospitals and the Health Centres, in the magnitude of maternal health care costs, fairly obviously, and, less obviously, in the pattern of costs. Total maternal health care costs at the Ouargaye District Hospital are 4.0 times as great as the mean for the Health Centres in that district. The ratio in Diapaga, between District Hospital and the mean for the Health Centres, is similar (4.5). The proportions of costs attributable to drugs and medicines and to other recurrent costs (which includes minor equipment) are distinctly higher in the District Hospitals than in the Health Centres but the proportion of costs attributable to buildings, infrastructure and (major) equipment is lower. In summary, therefore, the difference in the magnitude and pattern of costs at the District Hospitals by comparison with the Health Centres reflects the greater scale, complexity and diversity of health care at the District Hospitals.

Table 2 shows total costs, the number of deliveries and the average costs per delivery, both mean values and the range from highest to lowest values. Total costs are highest at Kantchari Health Centre in Diapaga district (22.4 million CFA, \$129 341 international dollars) and lowest at Dahangou Health Centre in Ouargaye district (7.8 million CFA, \$45 040 international dollars). The ratio of highest to lowest total maternal health care costs is just under 3.

There is much greater variation in the number of deliveries. The highest number of deliveries, 1375, was at Mahadaga Health Centre, a missionary health centre in Diapaga district. The lowest number, 65, was at Tapoa Djerma Health Centre, also in Diapaga district. The ratio of highest to lowest number of deliveries is over 21. Mahadaga has the lowest average cost per delivery figure, 11 357 CFA (\$65.58 international dollars) per delivery, and Tapoa Djerma, the highest figure, 132 097 CFA (\$762.75 international dollars) per delivery. The ratio of highest to lowest average cost per delivery is nearly 12. The average cost per delivery across the two districts is 37 042 CFA or \$214 international dollars.

Average cost per delivery is one possible measure of relative performance. However, adjustment for a number

**Table 1** Summary of District Hospital and Health Centre costs and cost structures in Ouargaye and Diapaga Districts, Burkina Faso

	Total costs (CFA)	HW (%)	OP (%)	D (%)	OR (%)	BIE (%)	V (%)
Mean Ouargaye Health Centres	11 012 675	14.3	11.1	2.1	6.8	63.3	2.4
Mean Diapaga Health Centres	11 181 940	15.8	4.6	3.3	10.4	60.3	5.7
Ouargaye District Hospital	43 794 077	15.0	4.1	4.0	13.0	58.9	5.0
Diapaga District Hospital	50 177 268	12.0	6.3	5.3	16.4	53.1	6.9

HW, health workers; OP, other personnel; D, drugs and medicines; OR, other recurrent costs; BIE, buildings, infrastructure and equipment; V, vehicles.

D. Newlands *et al.* **Cost effectiveness of Skilled Care Initiative in rural Burkina Faso****Table 2** Decomposition of average cost per delivery, Ouargaye and Diapaga Districts, Burkina Faso

	Mean	Range	Mean Ouargaye	Mean Diapaga
Total costs (CFA)	11 095 339	7 820 900 (Dahangou) to 22 443 033 (Kantchari)	11 012 675	11 181 940
Deliveries	300	65 (Tapoa Djerma) to 1375 (Mahadaga)	314	285
Average costs (CFA)	37 042	11 357 (Mahadaga) to 132 097 (Tapoa Djerma)	35 113	39 268
Average costs factor	3.17	1.00 (Mahadaga) to 11.63 (Tapoa Djerma)	3.01	3.37
Total costs factor	0.69	0.50 (Dahangou) to 1.44 (Kantchari)	0.69	0.70
Deliveries factor	0.22	0.05 (Tapoa Djerma) to 1.00 (Mahadaga)	0.23	0.21

Mahadaga, in Diapaga district, was the Health Centre with the lowest average cost per delivery and it was chosen as the numerator.

Average costs factor = average cost per delivery at Health Centre/average cost at Mahadaga.

Total costs factor = total costs at Health Centre/total costs at Mahadaga.

Deliveries factor = number of deliveries at Health Centre/number of deliveries at Mahadaga.

Average costs factor = total costs factor/deliveries factor.

**Table 3** Decomposition of deliveries factor, Ouargaye and Diapaga Districts, Burkina Faso

	Mean	Range	Mean Ouargaye	Mean Diapaga
Deliveries factor	0.22	0.05 (Tapoa Djerma) to 1.00 (Mahadaga)	0.23	0.21
Population	11 984	3403 (Nabangou) to 28 755 (Logobou)	10 455	13 585
Population factor	0.71	0.20 (Nabangou) to 1.70 (Logobou)	0.62	0.80
Utilisation factor	0.31	0.10 (Botou) to 1.00 (Mahadaga)	0.37	0.26

Mahadaga, in Diapaga district, was the Health Centre with the lowest average cost per delivery and it was chosen as the numerator.

Deliveries factor = number of deliveries at Health Centre/number of deliveries at Mahadaga.

Population factor = catchment population of Health Centre/catchment population of Mahadaga.

Utilisation factor = utilisation of Health Centre/utilisation of Mahadaga.

Utilisation factor = population factor/deliveries factor.

of other factors provides better measures of efficiency and points to different rankings of Health Centres. Table 3 adjusts for the different populations covered by the Health Centres to derive the utilisation factor, again showing both mean values and the range from highest to lowest values. The two extreme examples illustrate the effect of adjustment for population. Logobou Health Centre in Diapaga district has 32% of the number of deliveries of Mahadaga but since it covers 1.7 times the population of Mahadaga, Logobou's utilisation factor is only 19% of Mahadaga's. Nabangou Health Centre in Ouargaye district has just 6% of the number of deliveries of Mahadaga but since it covers only about 20% of the population of Mahadaga, Nabangou's utilisation factor is 28% of Mahadaga's.

The utilisation factor is a different and in some ways superior measure of performance of a Health Centre to total cost per delivery given that the latter is determined to a considerable extent by just two factors: the fixed cost of buildings and the population of the area that the Health Centre serves. Mahadaga remains the top ranked Health Centre by utilisation but, otherwise, the rankings of

Health Centres change considerably between the average cost per delivery and the utilisation factor, as Table 4 shows. The correlation coefficient between the two rankings is only 0.546. SCI Health Centres rank higher by the utilisation factor than by cost per delivery while the opposite is true of Health Centres in Diapaga.

However, the analysis does not – or should not – stop there. Just as comparison of cost per delivery figures prompts a search for the underlying explanations for observed variations, so the reasons for differences in utilisation should be pursued. There are several different possibilities. Contrary to our assumption that the number of births is proportionate to population, there may be some variation between Health Centre areas although any variation is unlikely to be substantial. The proportion of pregnant women seeking to deliver at a Health Centre will vary according to local cultural factors, the ease and cost of travel, and the reputation of the nearest Health Centre(s). The extent of travel to Health Centres outside the catchment area – although some such Health Centres may actually be closer in terms of time or distance – may be a significant determinant of observed differences in utilisa-

D. Newlands *et al.* **Cost effectiveness of Skilled Care Initiative in rural Burkina Faso****Table 4** Rankings for 43 Health Centres in Ouargaye and Diapaga Districts, Burkina Faso, by utilisation and by average cost per delivery

Health centre	District	Ranking by utilisation	Ranking by average cost
Mahadaga	Diapaga	1	1
Ouargaye	Ouargaye	2	22
Salambore	Ouargaye	3	20
Tensobtenga	Ouargaye	4	24
Zoaga	Ouargaye	5	15
Dourtenga	Ouargaye	6	6
Mene	Ouargaye	7	4
Vaongho	Ouargaye	8	7
Cominyanga	Ouargaye	9	2
Kohogho	Ouargaye	10	14
Bousgou	Ouargaye	11	29
Kogoli	Diapaga	12	8
Namounou	Diapaga	13	3
Yargatenga	Ouargaye	14	32
Zembende	Ouargaye	15	5
Cinkinse	Ouargaye	16	10
Lalgaye	Ouargaye	17	11
Dahangou	Diapaga	18	36
Tansarga	Diapaga	19	17
Yourga	Ouargaye	20	16
Yonde	Ouargaye	21	13
Bitten	Ouargaye	22	34
Mordeni	Diapaga	23	33
Nabangou	Ouargaye	24	40
Sampieri	Diapaga	25	27
Tounougou-Tome	Ouargaye	26	33
Kaabougou	Diapaga	27	37
Yirini	Diapaga	28	35
Kotchari	Diapaga	29	23
Tambaga	Diapaga	30	28
Diagoarou	Diapaga	31	26
Kaongho	Ouargaye	32	30
Sangha	Ouargaye	33	18
Logobou	Diapaga	34	9
Partiaga	Diapaga	35	21
Boudieri	Diapaga	36	41
Kantchari	Diapaga	37	39
Diapaga	Diapaga	38	25
Soudougui	Ouargaye	39	19
Kalbouli	Diapaga	40	12
Tapoa Djerma	Diapaga	41	43
Sambalgou	Diapaga	42	42
Botou	Diapaga	43	31
Ouargaye mean ranking		15.6	18.4
Diapaga mean ranking		28.7	25.6

tion. Certainly, there is anecdotal evidence that people travel to Mahadaga from all over Diapaga because of the quality of care provided there.

**Discussion**

The study found that cost levels and structures were similar in both intervention (Ouargaye) and comparison (Diapaga) districts. The similarity in the costs structure between the two districts is largely explained by a standardised health system across Burkina Faso. There are specific norms for Health Centres and District Hospitals regarding the buildings, equipment and staffing and these norms are adhered to regardless of the sources of funding (Direction des Infrastructures des Equipements et de la Maintenance (DIEM) 2004; Direction de la Santé de la Famille (DSF) and Ministère de la Santé, Burkina Faso 2004a,b,c). One important implication of this degree of standardisation, which is especially significant for the rolling out of similar interventions, is that building new Health Centres in areas with a small population or which are going to have a small number of deliveries for other reasons will inevitably result in high cost per delivery figures.

The significant variation across Health Centres in utilisation – and thus cost per delivery – may be due in part to unobserved differences between facilities, most obviously in terms of (perceived) quality of care. However, as Hounton *et al.* (2008) show, it is difficult to capture quality of care and some of the factors which might be expected to be important turn out not to be. For example, health worker density (the number of health workers per 10 000 population) was not found to be a significant determinant of institutional births.

Most of the additional costs specific to the SCI are devoted to CMBCC activities. As Table 4 shows, the ranking of Health Centres in Ouargaye improves significantly when conducted by utilisation factor rather than cost per delivery. This implies that community mobilisation activities appear to be an effective and cost-effective way of getting more women to seek skilled delivery care at their local Health Centre. CMBCC activities are the major source of potential economies of scale if the SCI programme were to be scaled up. However, this result is conditional on the existence of spare capacity, of buildings and personnel, at Health Centres. While this appears to have been true of Burkina Faso, or at least Ouargaye and Diapaga districts, it may not be the case in other settings.

**Conclusions**

This paper has been concerned with the costing of maternal health provision in two remote, rural districts in Burkina Faso. The largest element of maternal health care costs in both districts was the cost of buildings. Building and health worker costs dominated other routine costs such as drugs.

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Our analysis suggests that one of the most effective and cost-effective components of the SCI package are CMBCC activities. Such demand side actions can be as important in improving skilled care at delivery as investment in health facilities. These conclusions have important potential implications for planning and resource allocation to achieve safer delivery for all women in Burkina Faso.

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**Conflicts of interest**

The authors have declared no conflicts of interest.

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