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**COST AND FUNDING PROJECTIONS
FOR THE MINIMUM PACKAGE OF
ACTIVITIES FOR HEALTH CENTERS
MINISTRY OF HEALTH
ROYAL GOVERNMENT OF CAMBODIA**



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The authors of the report are David Collins, Zina Jarrah and Prateek Gupta. David Collins is Director of Finance and Accounting for Management Sciences for Health (a partner under USAID/BASICS) in Cambridge, Massachusetts, USA. At the time the study was carried out Zina Jarrah was an intern with Management Sciences for Health and an MPH student at Boston University, and Prateek Gupta was the USAID/BASICS Country Coordinator in Cambodia.

The photograph used on the cover of this report was taken and provided by David Collins.

EXECUTIVE SUMMARY

The primary objective of this study was to model the costs and funding requirements of the Ministry of Health's Minimum Package of Activities (MPA), which covers services provided by health centers. The resulting cost and funding estimates are intended to support the planning and implementation of the Health Strategic Plan, 2008-2015 (HSP2), specifically to assist in the preparation of district and provincial service delivery plans and budgets and in the development of business plans for health centers and Operational Districts (ODs). They should also assist the MOH to coordinate and harmonize external assistance.

This cost modeling builds on work done previously to estimate the cost of implementing the Child Survival Strategy (CSS) and complements that work by producing detailed costs of the CSS interventions within the context of the MPA. It also produces costs for other key interventions such as TB and HIV/AIDS.

The model uses incidence and prevalence rates together with catchment population figures to estimate the number of each type of service needed for different levels of coverage (overall utilization of a facility by the community). The model analyzes and estimates the costs and revenues using a bottom-up, or micro-costing, approach. It determines the standard costs associated with the delivery of a particular health service, taking into account the staff time, drugs, medical supplies and tests required. Operating costs and indirect staff costs are distributed proportionally across the health services in accordance with direct staff costs. The model determines the unit cost for each service, which is used to allocate actual costs across services or to project costs under different scenarios. The model also includes standard fees for service and other types of funding and uses those figures to assess actual revenues and funds received and to estimate income under the different scenarios.

All the major assumptions used in the model can be changed easily by the user. These include the catchment population, need norms, overall utilization rate, standard quantities and prices of Drugs and supplies, standard staff times, staff pay levels and standard operating costs. Any new services added to the MPA list of services can also be included.

In order to collect and verify data for the costing and to test both the functionality of the model and the norms, standards and prices used, the model was used to estimate costs and revenues for a sample of 18 health centers. The comparisons of utilization and costs across these health centers will be written up in a separate study.

Based on the need norms, the model shows that for a health center to meet 100% of the services needed by the community it should provide an average of 2.77 services per capita. We assumed that a figure of 90% of the services needed by the community is the maximum feasible for most services and on that basis a health center should provide an average of 2.49 services per capita. This figure of 2.49 services is used as the ultimate target for estimating the costs. For a health center to meet 60% of the services needed it should provide a total of 1.66 services per capita, and for it to meet the child survival strategy (CSS) targets for 2010 and 60% of the other services

needed it should provide 1.95 services per capita. Around 60% of the total number of services should be preventive, which amounts to 1.31 services per capita under the 90% scenario. These projections represent significant increases from the average levels achieved for health centers across the country in 2007, which were 1.16 total services per capita and 0.68 preventive services per capita.

Using the standard costs, the total cost would be \$3.03 per capita for the 60% coverage scenario, \$3.56 for the CSS scenario and \$4.43 for the 90% scenario. Under the 90% scenario, \$1.74 per capita would be spent on staffing, \$2.39 on Drugs and supplies and \$0.30 on other fixed costs. For a catchment population of 10,000 people a health center would require four nurses and two midwives to achieve 60% coverage, five nurses and three midwives for the CSS coverage, and six nurses and three midwives for 90% coverage. An average annual pay figure of \$1,931 per employee was assumed, based on actual amounts paid in some of the contracting districts.

The average cost per service would be \$1.78 under the 90% scenario. Curative services would have an average cost of \$2.46 per service, preventive services would cost \$0.96 per service and other services (deliveries and abortions) would cost \$12.72 per service.

Most of the total cost would be related to curative services, which, as noted above, have a much higher average cost than preventive services. Under the 90% scenario, \$2.85 per capita would be spent on curative services, \$1.26 on preventive services and \$0.32 on other services. Under the same 90% scenario, around 47% of the total cost (\$20,977) would relate to the Reproductive, Maternal, Newborn and Child Health (RMNCH) Program, 41% (\$18,686) would relate to the Communicable Disease Control (CDC) Program and 12% (\$4,600) to the Non-Communicable Disease (NCD) Program. Around 25% of the total cost would be spent on child survival services, 4% on HIV/AIDS services and around 10% on TB treatment services.

In terms of funding, under the 90% scenario around 11% of the total could come from user fees, health insurance and health equity funds, and the delivery incentive could contribute about 5%. GOC salaries, overtime and mission funds could be around 16% of total revenue, and the PAP contribution around 5%. The Drugs provided by CMS could come to about 48% of the total revenue and donated vaccines and medical supplies could contribute another 2%. We have assumed that donor assistance would be required to fund the performance incentives and this could come to 13% of the total funding.

It is important to note that while the figures produced by the study appear to be precise, they are only estimates and are based on the norms, standards and resource prices. A detailed review by the MOH would be worthwhile before the models or specific figures produced by them are used for resource allocation, budgeting or business planning. In addition, the prices used were from 2007 and will need to be updated before the model is used for planning and budgeting.

Based on the experiences of gathering information for developing and testing the models, it appears that financial information is not generally collected at the health center level and is not often used for allocating and monitoring the use of resources. In addition, the information reported in the HIS does not always appear to be reliable and some key service figures are not

included. Strengthening the systems for the collection, management and use of financial and health service information will be necessary to achieve the proposed national improvements in planning, budgeting and reporting.

The cost model is ready to be used and a manual is available, although it needs to be updated for the Cambodia adaptation. It is recommended that training in the use of the model and the application of the results be provided to relevant managers. This should start with national, provincial and operational district managers and should involve using the model to prepare the budgets for a sample of facilities and districts.

1. INTRODUCTION

The Cambodian Ministry of Health (MOH), with assistance from several key donors, has developed an overarching strategic plan for the health sector for the years 2008 through 2015, called the Health Strategic Plan, 2008-2015 (commonly referred to as HSP2). Separate strategic plans for priority programs, such as Child Survival, Reproductive Health, Malaria and HIV/AIDS, have also been developed with the support of different donor agencies and have been taken into account in HSP2. HSP2 will serve as a basis for the preparation of 3-Year Rolling Plans and Annual Operating Plans (AOPs).

General cost estimates were prepared for HSP2 but these were not detailed enough to provide specific figures for the 2009/2011 Rolling Plan and the 2009 AOP, and in some cases the figures were not considered sufficiently accurate for that level of planning¹. For example, the estimated costs of health center and hospital services were based on historical expenditure, services mixes and utilization levels at a very small sample of facilities. In addition, some of the components of HSP2 overlap, resulting in possible duplication of costs.

The MOH has developed a Minimum Package of Activities (MPA), covering health center and community services, and a Complementary Package of Activities (CPA), covering referral hospital services. These packages include some services which were not taken into account in the HSP2 costing, and the numbers of services required may differ significantly from those used in deriving the figures used in that costing. A thorough modeling of MPA and CPA costs was, therefore, deemed important, especially since the HSP2 plans and targets assume that these facilities have the capacity to scale up different priority services, such as child survival, significantly and simultaneously. An accurate modeling of these costs would provide cost estimates for different levels of activities and could indicate possible constraints to scaling up.

The primary objective of this study was to model the costs and funding requirements of the MPA. The resulting cost and funding estimates are intended to assist in the preparation of health center, district and provincial service delivery plans and budgets and in the development of business plans for health centers and Operational Districts (ODs). They should also assist the MOH to coordinate and harmonize external assistance.

This cost modeling builds on work done previously to estimate the cost of implementing the Child Survival Strategy (CSS)^{2,3} and is aimed at complementing that work by producing detailed costs of the CSS interventions within the context of the MPA.

¹ See Costing of Health Strategic Plan (2008-2015) by Mark Pearson.

² Scaling Up Child Survival Interventions in Cambodia: The Cost of National Program Resource Needs. The BASICS Project (USAID) and WHO. 19 June 2007. David Collins, Elizabeth Lewis and Karin Stenberg.

The costing was done using a model so that the MOH can change the cost projections for different situations. It is intended that this model can be used by national, provincial and operational district MOH managers and eventually by health center managers when capacity increases at that level. The information produced by the model would be applicable for individual health centers and networks of health centers (e.g. ODs), and could be used for:

- Planning service delivery strategies and setting service delivery targets;
- Allocating resources and budgeting;
- Preparing business plans;
- Developing contract service deliverables and payment levels;
- Setting user fee levels and insurance reimbursement rates;
- Establishing donor funding levels;
- Comparing performance across health centers and ODs.

³ Scaling Up Child Survival Interventions in Cambodia: Service Delivery Costs. The BASICS Project/USAID. 25 February 2008. David Collins, Chan K. Chhuong and Kun Reth.

2. THE COST AND REVENUE MODELING

A. MODEL DESCRIPTION

The model used in this study analyzes and estimates costs and revenues using a bottom-up, or micro-costing, approach. The model determines the standard costs associated with the delivery of a particular health service, taking into account the staff time, drugs, medical supplies and tests required. Operating costs and indirect staff costs are distributed proportionally across the health services in accordance with the direct staff costs. The model determines the unit cost for each service, which is used to allocate actual costs across services or to project costs under different scenarios. Standard fees for service and other types of funding are also included in the model, which then uses those figures to assess actual revenues and funds received and to estimate income under the different scenarios.

The model contains five different scenarios:

- Scenario A: actual services and actual costs;
- Scenario B: actual services and standard costs;
- Scenario C: needed services and standard costs;
- Scenario D: projected services and standard costs; and
- Scenario E: projected services and standard costs using shared or part time staff.

For the purposes of projecting the costs and funding requirements in Cambodia, Scenario D is the most relevant. Scenarios A and B can be used to compare and analyze the generation, allocation and use of resources at actual health centers. Scenario C assumes 100% coverage and Scenario E is used where staff can be shared across facilities or where part time staff can be used. Neither of these scenarios is generally feasible for the MOH health centers.

In order to estimate the cost of needed or projected numbers of services, the model uses incidence and prevalence rates together with catchment population figures to estimate the number of each type of service needed for full coverage of the community. The model can then be set to a percentage of the total need figures so that projections or targets can be used.

The standard costs are estimated by determining the quantities of resources (staff type and time, Drugs and supplies, and tests) required to provide a good quality service. These quantities are then multiplied by the price of each resource to produce a total standard cost for each service. The portion of staff time related to the each service is treated as a direct cost and the balance of staff time used for non-patient tasks, such as health center management, is treated as an indirect staff cost. A separate cost is determined for the fixed facility operating costs (e.g., electricity) and that cost, together with the indirect staff cost, is allocated across the services in proportion with direct staff cost.

The standard costs represent the cost of the resources that are required to provide each service at an ideal level of quality. Recognizing the resource constraints faced by the MOH, the model was adapted to allow the standard staff times to be reduced across the board. This feature can be used if it is decided that an acceptable level of quality can be provided with less than optimal staff times.

Standard costs are determined according to the standard resources required and standard prices for those resources. The actual costs may be quite different from the standards because the actual resources used and/or prices paid can be quite different from the standards. Actual costs may be lower because fewer resources were available (e.g., insufficient staff or Drugs) or lower prices were paid, or they may be higher because excessive resources were allocated or higher prices were paid. Where there are fewer resources available than those required according to the standards, the quality of the services may not be adequate and where resources are greater there may be waste.

Revenues that relate to numbers of services provided (such as user fees) are calculated by multiplying the standard fee for a service by the number of services. Other sources of funds, such as MOH salaries and Central Medical Stores (CMS) supplies, are tied to the related cost item. Fixed sources of funding can be entered directly into the model. Funding for performance incentives is also included.

All the major assumptions used in the model can be changed easily by the user. These include the catchment population size, need norms, overall utilization rate, standard quantities and prices of Drugs and supplies, standard staff times, staff pay levels and standard operating costs. Any new services added to the MPA can also be included in the model.

B. MODELING TOOL

The Cost and Revenue Plus (CORE Plus) analysis tool was used to develop the model⁴. CORE Plus and an earlier version called CORE are flexible tools that have been used in many countries⁵. CORE Plus has been reviewed by international donor agencies, including the World Health Organization (WHO), and details of the review can be found on the web site of the Partnership for Maternal, Neonatal and Child Health⁶.

⁴ CORE Plus was developed by Management Sciences for Health (MSH) and a generic version and user's manual can be found on MSH's web site at <http://erc.Ms.h.org/mainpage.cfm?file=5.11.htm&module=toolkit&language=English>

⁵ For example, CORE Plus was used in a recent study in Rwanda to do an in-depth analysis of the unit costs and revenues for HIV/AIDS services under its Performance-Based Financing Program ("Cost and Revenue Analysis in Six Rwandan Health Centers: 2005 costs and revenues").

⁶ http://www.who.int/pmnch/topics/economics/costing_tools/en/index.html

The tool was adapted to fit the MOH's specific modeling needs, which include producing total cost figures by program, allowing for rapid adjustments to standard staff times, and handling more revenue and funding information.

CORE Plus is a Microsoft Excel-based workbook⁷ that contains different types of worksheets including: service practice worksheets, assumptions and data entry worksheets, calculation pages, and data report pages.

The service practice worksheets are the backbone of CORE Plus as they are used to determine the standard staff time needed for each service, as well as the standard quantities and types of Drugs, medical consumables and laboratory tests required. Prices of Drugs, clinical supplies, and tests are also entered into the service practice worksheets via a Look-Up sheet. In addition to the service practice details, CORE Plus requires general facility data, personnel information, number of services, and income and expenditure figures for each health center. Prevalence or incidence norms are also necessary for each service, in order to estimate the numbers of services needed.

CORE Plus has an accompanying User's Manual and assistance can also be obtained from MSH.

C. DATA AND ASSUMPTIONS

The model covers MPA activities carried out by, or through, the health center, including outreach activities. It does not include some preventive activities carried out primarily by national programs, such as the distribution of Insecticide Treated Nets (ITNs) and vector control for dengue fever.

The model only includes expenditures made by, or on behalf of, the health center and does not include the opportunity cost of volunteer activities; for example, the time of Village Health Support Group (VHSG) members. It does not include any Non-Governmental Organization (NGO) or donor agency costs other than those paid to, or on behalf of, the health center. It does include expenditures paid by donors or district office on behalf of the health centers, such as performance incentive payments and donated drugs and vaccines.

Management costs have been included at the level of the cost center where they are budgeted and incurred. For example, the cost of supervising and supporting the VHSGs is included in the health center costs since the staff members that perform that function are under the health center budget. Similarly the cost of district office supervision of the health centers is not included in this study because it is under the district office budget.

⁷ The use of Microsoft Excel requires a license from Microsoft Corporation. This tool is not a product of Microsoft Corporation and is not guaranteed by that company.

The cost of outreach services has been included in the study since they are part of the health center activities. VHSG services are not included in the HIS, but are assumed to be in support of outreach services. Activities and costs of health posts, of which only a few exist, are included under the health center.

Neither capital expenditures nor depreciation costs are included in the costing since these are not part of the recurrent budgets of the MOH. In addition, the cost of training staff, either pre-service or in-service, has not been included. The cost of related services sometimes used by a health center such as blood, ambulance and external laboratory tests are also not included.

The data collection and modeling was done in Riels and the results converted into US\$ using an exchange rate of 4,100 Riels to 1 US\$. Inflation has not been taken into account in the projected costs.

D. COSTING A SAMPLE OF ACTUAL FACILITIES

In order to collect and verify additional data for the costing and to test both the functionality of the model and the norms, standards and prices used, we used the model to run costs and revenues for a number of health centers⁸.

Of the 18 health centers in the sample, 11 were from ODs that are contracting districts⁹. This is because data are more easily available for those districts and because those health centers are considered more likely to have greater utilization, efficiency and quality. Of the other 7 health centers, 4 are supported by international and local organizations and the other 3 were selected by the MOH from facilities that have no support. The organizations and ODs are listed in Annex 3.

Six of the health centers are in Ang Roka and Kirivong ODs in Takeo Province and are under a contracting program managed by Swiss Red Cross (SRC). These were a main source of data for the study because the OD managers routinely compile the cost and revenue information for the health centers and this is reviewed and used by SRC. Also SRC has conducted several studies of cost, revenue and performance. The six health centers comprise urban, rural and remote rural

⁸ The testing involved using the model to calculate the actual cost of the current level of services for each health center and the cost of scaling up utilization at those facilities. More information on the findings from these analyses will be shown in a separate report.

⁹ A representative sample of facilities was not used since purpose of the study is to estimate the resources needed for a well-functioning health center.

facilities and were selected as being well-performing (according to a recent evaluation report, they generally met most of their performance targets¹⁰).

E. LIST OF SERVICES

The services included in the modeling are those set out in the MPA. Using a translated version of the MPA Guidelines, a list of services was compiled, with each service classified as preventive or curative and also identified as being under one of three major programs as defined by HSP2: Reproductive, Maternal, Newborn, and Child Health Services (RMNCH), Communicable Diseases Control Services (CDC), and Non-communicable Diseases Services (NCD)¹¹. The information reported in the Cambodian Health Information System (HIS), which contains data from monthly health center reports, was also taken into account since it is important that the numbers of the services modeled are reported in the HIS.

Whereas the MPA and HIS include a large number of services, we limited the number of services in the model to make it more manageable. Services that are high priority or are high volume or require expensive treatments were listed individually, while other services were bundled together. For example, services specific to child survival interventions, such as Vitamin A supplementation and measles vaccination, remained as individual services. On the other hand, the numbers of diphtheria, pertussis, and typhoid treatments were small and these services were therefore bundled together under “Other”.

The “Other” service category also includes treatment for minor ailments (general aches and pains) that make up a large number of contacts at health centers. According to the 2007 HIS survey, “Other” was consistently the single highest-volume service throughout health centers in Cambodia. However, since the HIS does not require breakdown of “Other” services, an assumption was made, based on anecdotal evidence, that treatments are mostly gastritis or general pain.

With the above bundling of services, we arrived at a total of 49 services (See Annex 1). One of these is dental health, but since most health centers are not equipped or staffed for this service we set the incidence rate at zero. As a result, the model shows the complete package as having 48 utilized services. The CORE Plus tool has a limit of 60 services and having 49 services pre-entered allows the MOH to add another 11 services¹².

¹⁰ See Contracting of Health Services: Ang Roka and Kirivong Operational Districts, Takeo Province, Cambodia – Final Evaluation Report.

¹¹ A list of the services under each program is provided in Table 10 of HSP 2.

¹² The number of services can be increased beyond 60, but this requires changes in formatting and copying formulas, and should only be done by a person who is very experienced in working with spreadsheets.

We were advised that Drugs for hypertension and diabetes, which are included in the MPA, are not provided to the health centers. These services were, therefore, only included in the model as counseling.

F. NEED NORMS

The prevalence and incidence rates that are used to estimate the numbers of services needed (need norms .) were obtained from a variety of sources, including HSP2, the national program plans and the Cambodian Demographic Health Survey (DHS) (see Annex 1 for a list of the norms and sources).

Important sources of information for norms came from three previous studies: two costings of the child survival strategy, and the costing of the reproductive health strategy¹³. The prevalence rates for certain services such as TB, HIV/AIDS, and malaria were found on the WHO website.

Where norms could not be identified for some curative services, rates were calculated by dividing the actual total number of services in 2007 for each service per the HIS by the relevant population. We either used the Ang Roka OD or national figures, whichever were the highest. We chose Ang Roka since the numbers of many curative services there are much higher than the national average and we assumed that this is reasonable because the facilities are better resourced because of the contracting program. We then increased these figures so that the 90% targets would be the same as the actual numbers of services. We assumed that these figures do not represent the incidence of these illnesses on the grounds that a significant proportion of the population does not seek care at the health centers. These norms, therefore, represent services that should be provided at the health centers and not need norms per se. To illustrate, we take the example of Adult Simple Diarrhea, one of the services listed in the MPA. To calculate the national rate, we divided the total number of adult simple diarrhea cases in 2007 by the national population over the age of five, resulting in a rate of 1.61%. We then performed the same calculation using total cases in Ang Roka over its adult population, resulting in a rate of 1.57%. Since the national rate is higher for this service, we then set this rate to equal 90% of the norm. As a result, we calculated the normative rate to be 1.79%, and input this figure into the Need spreadsheet of CORE Plus.

Because the prevalence of both malaria and dengue fever can vary greatly between endemic and non-endemic areas, two different need norms were established for these services. The Cambodia version of CORE Plus allows the user to input whether or not a particular health center is located in an endemic malaria or dengue fever area; as a result, the appropriate prevalence is applied to each situation.

¹³ Scaling Up Child Survival Interventions in Cambodia: The Cost of National Program Resource Needs; Scaling Up Child Survival Interventions in Cambodia: Service Delivery Costs; and the National Strategy for Reproductive and Sexual Health in Cambodia, 2006-2010

G. SERVICE STANDARDS

The service delivery standards were determined by a small team of local experts and were based where possible on GOC official guidelines and standards of treatment. This team of physicians provided detailed information on the staff time and activities, Drugs and supplies, and laboratory tests required for each service.

The standards were entered into the CORE Plus service practice worksheets and these were distributed to a MOH costing task team for feedback. Where possible, national program staff were also consulted to confirm or correct the service delivery standards. In addition, they were compared with the standards used in previous costing exercises in Rwanda and South Africa. (See Annex 2 for a list of sources and assumptions for each service).

It should be noted that time for IMCI consultation has been included under each curative child service and time for counseling has been included under antenatal, postnatal and each immunization service.¹⁴

H. SERVICE STATISTICS

Since the costing is based on numbers of services provided to patients, we only took into account services where a single patient or client has contact with a health center employee¹⁵.

The numbers of services used in this study were extracted from the HIS database for 2007. Only figures that represent services provided were used. We therefore excluded some figures, for example:

- We excluded the figures for “Referred to” in the HIS on the assumption that they represent patients that were either already included in the numbers of patients treated or they did not receive any treatment.
- We excluded lab tests on the assumption that those tests formed part of the services provided to patients that were already recorded elsewhere in the HIS.
- We excluded de-worming services for pregnant women and lactating mothers since we assumed that they were part of ante-natal and post-partum visits which were recorded elsewhere.

¹⁴ For certain services, the team of local experts suggested consultation times that greatly exceeded previous estimations from the Child Survival Costing and other CORE Plus studies. In such cases, we used an average of the consultation times suggested by the local experts and previous studies.

¹⁵ For example, health talks given to groups of people are not included.

- We excluded staff time for de-worming for school-children, since these services are reportedly provided by teachers. However, the numbers and costs of mebendazole pills were included in the model.
- For family planning services we only included services that reflected contacts made during the year.
- In the case of birth control pills, we deducted 10% of the client numbers based on an estimate provided in Takeo that 10% of the services are provided by Community Based Distributors (CBDs)¹⁶.

The HIS has a section for repeat visits which are not identified in terms of the specific services. We therefore allocated these figures across the services in proportion to the numbers of services recorded.

The HIS does not include utilization figures for TB, HIV/AIDS, VCCT, Avian Influenza and diabetes. These figures should, however, be available from the OD managers.

Each service was identified in the model as curative or preventive and also categorized under one of the three major programs: RMNCH, CDC or NCD. The model also identifies each of the services under the Child Survival Scorecard. This enabled the model to automatically calculate the total numbers of services and costs for each program.

¹⁶ We assumed that the cost related to those CBDs and the commodities are not part of the health center budget.

I. DRUGS AND MEDICAL SUPPLIES

Prices for Drugs and medical supplies were obtained from a database¹⁷ of quarterly Central Medical Stores (CMS) invoices issued for each Operating District (OD). A list of all the requisite Drugs and supplies was compiled from the service practice worksheets and they were matched with CMS invoices from two different quarters in 2007 to determine the prices. In the case of price fluctuations, an average Drug price was calculated. To avoid fluctuating prices for anti-retroviral Drugs, the WHO Global Price Reporting Mechanism was used, with standard prices specific to Cambodia¹⁸.

Vaccines were not included in the CMS invoices and so we modified CORE Plus to show these as donations using the standard cost and the number of services provided¹⁹. The MSH International Drug Price Indicator Guide was used for the prices²⁰.

We did not include certain common low-cost supplies used in small quantities (such as cotton, gauze and alcohol) under individual services, but treated them as bulk supplies instead. An average bulk supply cost per service was determined by dividing the total estimated bulk supply costs by the total number of services²¹. Based on the CMS, invoice information from the Ang Roka and Kirivong ODs in Takeo province, a bulk supply cost of \$0.06 (259 Riels) per service was calculated. The bulk supply costs were then added to the normative Drug and supply costs, as determined by the service practice worksheets.

It should be noted that the quantities of vaccines used in the model are understated to some degree since wastage has not been taken into account. This may also apply to some other Drugs and supplies that are particularly subject to wastage.

¹⁷ This database is maintained by the Reproductive and Child Health Alliance (RACHA).

¹⁸ <http://www.who.int/hiv/amds/gprm/en/>

¹⁹ We were also unable to identify HIV/AIDS Drugs on the CMS supply invoices. If they are not included in the CMS invoices they should be added to the donated figures on the revenue side.

²⁰ <http://erc.Ms.h.org/mainpage.cfm?file=1.0.htm&module=DMP&language=English>

²¹ To estimate total bulk supply costs per year, we first multiplied the quarterly CMS invoices for bulk supplies by four. Next, we divided this yearly figure by the total number of health services provided by the OD in 2007 to approximate bulk supply cost per service. We performed this calculation for two ODs and averaged the two figures to get a final cost of 259 Riels per service. This figure can be updated easily in CORE Plus.

J. STAFFING

We used information from the sample of health centers in Takeo Province to estimate staff time used for vacation, sickness and training. This was then used to estimate the average staff time available for each center. We also obtained estimates of how much time each type of staff member spends in meetings of different types and also, where applicable, in travelling to provide outreach services. The average meeting and travel time per staff person was deducted from the average number of days worked in order to estimate the time available to provide patient care services.

The team of local experts decided whether a nurse or midwife should be the key provider for each service. Based on the number of each kind of services and the standard times, the model determines how many nurses and midwives are required in total for each health center. No differentiation was made between primary and secondary level staff in terms of ability to provide services.

The figures for payments to staff were based on the actual amounts paid in contracting districts. Due to a complex system of fixed salaries, performance incentives, delivery incentives, and user fees, a new staff assumptions worksheet was created in CORE Plus. Each element of the staff pay was calculated differently:

- The GOC salary, overtime, and mission payments were treated as fixed amounts per employee costs and for these we assumed annual rates of \$417 (1,710,520 Riels), \$228 (936,618 Riels) and \$133 (544,398 Riels) respectively. The rates were based on averages for 2007 from 6 contracting health centers in Takeo and the 3 contracting health centers in Kampong Cham. A review of that actual data indicated that there was no difference in general between the pay of nurses and that of midwives, only between secondary and primary levels of staff. Since we did not differentiate between services provided by secondary and primary staff we used an average for pay across the two categories.
- The amounts paid to staff from user fees, health equity fund and health insurance revenues were linked to the revenue earned which are driven by the user fee rates and the numbers of services. It was assumed that 60% of those fees are shared among the staff and the amount per staff member varies with the number of staff.

- The amounts paid to staff from the GOC delivery incentives are linked to the revenue earned for those incentives, which is based on the numbers of deliveries and the incentive payment rates. The rates used were \$15 (60,000 Riels) and \$10 (40,000 Riels) for every birth at the health center or at home attended by a health center midwife. Based on the distribution of this revenue in Takeo, we assumed that 70% of the revenue received is retained by health center staff²², of which the nurses get 20% and the midwives 80%.
- We set a minimum total annual pay of \$1,931 (7,917,495 Riels), again based on figures from contracting health centers in Takeo and Kampong Cham. The assumption was made that this amount constitutes a minimum needed to provide the incentive for employees to work well. Where the total of the pay elements stated above comes to less than the minimum, the model shows the difference as a performance incentive.

Because revenue from user fees and delivery incentives is not related directly to the number of staff, the amount distributed to each employee varies with the number of staff (i.e., if it is distributed to more employees the amount per employee is reduced).

We set the number of staff at a minimum of 5 for each health center. The model was, therefore, modified so that when Scenarios B, C or D are used, if the model calculates that less than 5 staff are required, the number of 5 is used by default. The number of 5 was based on information provided by Operational District managers in Ang Roka and Kirivong, where many health centers reportedly achieve good results with 5 staff²³. The 5 staff members are assumed to comprise 3 nurses and 2 midwives.

K. OPERATING AND OTHER FIXED COSTS

A standard figure of \$2,268 (9,328,233 Riels) per year was used for operating costs (such as electricity and water), which was based on actual expenditures for 2007 from the sample of health centers in Takeo. This figure was used for all the scenarios. We also included the salary costs related to meetings and travel time to provide outreach services. This was assumed to be 17.7% of staff time for health centers with outreach and 8.8% for health centers with no outreach (using a sample of health centers from Takeo province). We also included the 30% of the GOC delivery incentives that is paid to persons not on the health center staff (e.g., Traditional Birth Attendants) and which varies with the number of deliveries.

²² The other 30% of the delivery incentives are, reportedly, paid to members of the community, such as traditional birth attendants.

²³ According to the MPA, the minimum staff for a health center is 10. However, this does not agree with the figures in the Health Workforce Development Plan 2006-2015, which projects a total of 6 staff for a health center with 10,000 population (see details later in this study).

It is recognized that certain operating costs, such as transport, may be higher for facilities in remote areas. No additional cost has been included for this but one can be added where applicable on the basis of circumstances at particular facilities²⁴.

L. REVENUE MODELING

Revenue that varies with the numbers of services comes from user fees and service delivery incentives. Health Equity Funds (HEF) and health insurance revenue are received in place of user fees and are, therefore, treated as part of user fees. The fee revenue was based on the Takeo fee structure and the numbers of services. The percentage of user fees represented by HEF and health insurance are based on the actual figures in Ang Roka and Kirivong. For the GOC delivery incentive, we used the current incentive rate and the numbers of deliveries attended by health center staff.

Drugs and medical supplies from CMS are included under CMS and are based on the cost figure which varies with the number and mix of services. The amount of 39% of the user fees that is allocated for purchasing Drugs and supplies is deducted from the CMS figure on the assumption that CMS would only provide the balance. The cost of vaccines also varies with the number of services and is treated as a donation under revenue.

Revenue that does not vary with the numbers of services includes GOC salaries, mission, overtime, and PAP (operating costs). Since we assumed a minimum pay level for staff that means that a portion of it is likely to come from performance incentives, and we showed the funding for these incentives as donor assistance. These should also vary with performance but we did not take that into account in the model²⁵.

²⁴ At one remote rural health center in Takeo the operating costs for 2007 were R1.2 million (\$300) higher than average – reportedly due to the higher transport cost of having to use boats for outreach.

²⁵ The modeling of performance incentives on both the revenue and cost side is likely to be complex but can be done once the performance factors and relationships are determined.

3. MODELING RESULTS

The modeling was done for a health center supporting a catchment population of 10,000 people, which is the optimal population for a health center according to the Health Coverage Plan (HSP2). The results of the projections shown here are for a health center that is not in an area where malaria or dengue fever is endemic and is not in a remote area where operating costs are higher.

A. UTILIZATION

Costs were estimated for three projected levels of utilization, as follows²⁶:

- 60% of the number of needed services for all services, which translates to an average of 1.66 services per capita²⁷.
- 60% of the number of needed services for all services except for the child survival scorecard interventions for which we used the coverage targets for 2010 (Annex 6). This results in an average of 1.95 services per capita.
- 90% of the number of needed services for all services, which translates to an average of 2.49 services per capita.

All the above figures are for areas where malaria and dengue fever are not prevalent. It should be noted that we were unable to get need norms for some curative services and we based the norms on actual utilization figures in a district where utilization levels are relatively high. The numbers of services per capita do not, therefore, represent the full need because they do not include all cases where treatment is self-administered or sought in the private sector.

For most services, we assumed that 90% of full coverage is the maximum feasible, which means that the persons in the catchment population use the health center 90% of the time that they need care from a medical professional. The figure of 90% was deemed as the maximum that was feasible for the long term child survival interventions, and was used for the 2015 targets in the second Child Survival costing study.

The three projected utilization levels are shown in Table 1²⁸. They are also compared with the actual national health center utilization rates for the country in 2007. Based on a national

²⁶ Ideally we would have used the targets and indicators set out in HSP2 for all the projections. However, many of those figures are neither directly related, nor can easily be translated, to numbers of health center services.

²⁷ The total number of services needed from the health center comes to an average of 2.77 per capita.

²⁸ We did not take population growth into account in these health center projections, and the catchment population is therefore assumed to stay at 10,000 each year.

population estimate of 14.3 million, the national rates for 2007 were 1.16 per capita for all services, 0.47 for curative services and 0.68 for preventive services²⁹. A full list of utilization figures for each service is shown in Annex 4.

Getting from the national average of 1.16 services per capita to the 60% projection of 1.66 services per capita would require an increase of 43%. An increase of around 68% is needed to get to the CSS projection of 1.95 services per capita and an increase of 115% would be needed to get to overall coverage level of 2.49. The increases in the numbers of preventive and other services would need to be especially high. For example a 94% increase would be required to get preventive services from the actual level of 0.68 preventive services to the 90% coverage levels of the 1.31 services per capita. In addition, at the same time that the overall number of services provided is increasing, the mix of services within each category will also have to change to reflect what is actually needed to reach the HSP2 targets. The numbers of some services may need to be increased while others may need to be reduced.

It should be noted that in the total utilization figures and rates each service is counted as one even though some types of service are very different – for example, a delivery and a vaccination. The figures broken down by type of service are, therefore, more valuable for comparisons.

²⁹ It is assumed that the 2007 figure of 0.51 contacts per year for national and provincial outpatients referenced in the HSP2 report excludes preventive contacts and, if so, is comparable with this national figure for curative contacts at health centers of 0.47 (the balance presumably representing hospital services).

Table 1: Actual and projected utilization figures for a health center serving 10,000 people

	National Actual 2007	60% Need	60% & CSS 2010 Targets	90% Need
UTILIZATION				
Catchment Population	10,000	10,000	10,000	10,000
Total Types of Services Offered in Scenario	44	48	48	48
% of Needed Services	41.80%	60.00%	70.30%	90.00%
Total Curative Services	4,727	7,727	8,280	11,591
Total Preventive Services	6,760	8,718	10,997	13,077
Total Other Services (mostly deliveries)	96	168	189	252
Total Services	11,584	16,613	19,466	24,919
Curative Services per Capita	0.47	0.77	0.83	1.16
Preventive Services per Capita	0.68	0.87	1.1	1.31
Other Services per Capita	0.01	0.02	0.02	0.03
Total Services per Capita	1.16	1.66	1.95	2.49

As an example of the effect of the different scenarios on one service we can look at postpartum care visits. The national average actual number of services for 2007 was 184 visits for a population of 10,000 with an overall utilization level of 1.16. Based on the need norms there should have been 396 visits for the same overall utilization level of 1.16 (because the actual mix was not in line with the needs). With the utilization rate increased to 60% of the overall need there should be 483 visits. And increasing to full feasible coverage of 90% should result in 724 visits.

B. PROJECTED COSTS

The projected costs are based on the projected utilization figures and the standard costs, assuming ideal numbers of resources. Table 2 shows the costs by type of input for a health center serving 10,000 people using the three projections (60%, 60% with CSS targets, and 90%). These can be summarized as follows:

Increasing the overall utilization rate would not only increase the number of services per capita but would also result in a change in the mix of services to match the needs. Both of these have an impact on the cost. The total cost for the 60% projection would be \$30,267 (\$3.03 per capita³⁰)³¹.

³⁰ Cost per capita can be viewed as the cost per service times the number of services, which is then divided by the catchment population. In other words, it is a function of how much a service costs and how many times on average each person in the community uses the service (utilization rate).

Reaching the 2010 targets for CSS and 60% utilization for other services would cost \$35,623 (\$3.56 per capita). Using the 90% projection, the further increase in utilization would result in a total cost of \$44,263 (\$4.43 per capita).

Table 2: Projected costs by input for a health center serving 10,000 people (US\$)

	60% Need	60% & CSS 2010 Targets	90% Need
COST PER TYPE OF UNIT			
Staff Costs	11,587	15,449	17,380
Drugs, Clinical Supplies, Lab Tests	15,934	17,350	23,902
Other fixed costs (mostly operating costs)	2,746	2,824	2,981
Total cost	30,267	35,623	44,263
Staff costs per capita	1.16	1.54	1.74
Drug costs per capita	1.59	1.73	2.39
Other fixed costs per capita	0.27	0.28	0.3
Total cost per capita	3.03	3.56	4.43
Staff costs per service	0.7	0.79	0.7
Drug costs per service	0.96	0.89	0.96
Other fixed costs per service	0.17	0.15	0.12
Total cost per service	1.82	1.83	1.78
Staff costs as % of total cost	38.30%	43.40%	39.30%
Drug costs as % of total cost	52.60%	48.70%	54.00%
Other fixed costs as % of total cost	9.10%	7.90%	6.70%
Total costs	100.00%	100.00%	100.00%
STAFFING			
Number of Staff used in Scenario	6	8	9
Average number of services per employee per day	17.1	15	17.1
Average annual pay per employee	1,931	1,931	1,931

³¹ We do not have estimates for the actual expenditure on all health centers in 2007 due to the existence of multiple funding sources and so cannot calculate the incremental costs.

The costs are broken out according to type of input. For example, under the 90% scenario, \$17,380 would be spent on staff, \$23,902 on Drugs and \$2,981 on other fixed costs. These figures translate into \$1.74, \$2.39 and \$0.30 per capita, respectively. Under the 90% scenario, 39.3% of total cost would be for staffing, 54.9% for Drugs etc. and 6.7% for other fixed costs.

Other fixed costs would be \$2,746 for the 60% projection, \$2,824 for the CSS projection and \$2,981 for the 90% projection. The differences in these figures relate to employee management time and part of the delivery incentive paid to community members.

The average cost per service would be \$1.82 for the 60% projection, \$1.83 for the CSS projection and \$1.78 for the 90% projection. The CSS projection cost per service is not much higher than the cost of the straight 60% projection because it has a higher proportion of lower-cost preventive services, offset by slightly higher inefficiency in the use of staff. Economies of scale in the use of fixed costs can be seen in the figures for other fixed costs per service, which would be \$0.17 for the 60% scenario, falling to \$0.15 for the CSS scenario and \$0.12 for the 90% scenario.

Four nurses and two midwives³² would be required to provide the 16,613 services under the 60% projection, five nurses and three midwives for the 19,466 services under the CSS projection and six nurses and three midwives for the 24,919 services under the 90% projection. These figures are driven by the numbers of services (utilization rate and mix of services). The staffing for the 60% and 90% scenarios are slightly more efficient with an average of 17.1 services per employee per day.

Table 3 shows the same cost figures broken down by type of service. Using the 90% projection, the total cost of \$44,263 would comprise \$28,465 for curative services, \$12,592 for preventive services and \$3,206 for other services. The average cost per preventive service would be \$0.96, \$2.46 for a curative service, and \$12.72 for other services (mostly deliveries).

In terms of the major programs, RMNCH services would have the highest cost, with \$20,977 for the 90% projection. CD services would cost \$18,686, and NCD services \$4,600.

³² For the 60% scenario the health center actually needs 3.74 nurses and 1.83 midwives, which are rounded up to 4 nurses and 2 midwives.

Table 3: Projected costs by type of service for health center serving 10,000 people (US\$)

	60% Need	60% & CSS 2010 Targets	90% Need
COST PER TYPE OF SERVICE			
Total cost of curative services	19,414	21,482	28,465
Total cost of preventive services	8,633	11,115	12,592
Total cost of other services (delivery, etc)	2,220	3,025	3,206
Total cost of all services	30,267	35,622	44,263
Cost of curative services per capita	1.94	2.15	2.85
Cost of preventive services per capita	0.86	1.11	1.26
Cost of other services per capita	0.22	0.3	0.32
Total cost per capita	3.02	3.56	4.43
Average cost per curative service	2.51	2.59	2.46
Average cost per preventive service	0.99	1.01	0.96
Average cost per other service	13.22	15.97	12.72
Average cost for all services	1.82	1.83	1.78
COST BY MAJOR PROGRAMME			
Reproductive, Maternal, Newborn, and Child Health	14,418	19,083	20,977
Communicable Diseases (CDC)	12,667	13,124	18,686
Non-communicable Diseases (NCD)	3,182	3,416	4,600
Total cost of all programmes	30,267	35,623	44,263
COST OF SELECTED PRIORITIES			
Child Survival Scorecard (Included in RMNCH)	7,615	10,916	11,105
HIV/AIDS (included in RMNCH and CDC)	1,217	1,227	1,818
TB Treatment (included in CDC)	3,055	3,163	4,502
Total - Selected Priorities	11,886	15,306	17,425
Other RMNCH, CDC and NCD services	18,380	20,317	26,838
Total cost of all programmes	30,267	35,623	44,263

The cost of Child Survival Scorecard services would be \$7,615 for the 60% projection, \$10,916 for the CSS projection and \$11,105 for the 90% projection. These costs make up about one-quarter of the total costs for the 60% and 90% projections and around 30% of the total cost for the CSS projection. These services are all included under the RMNCH program costs shown above and make up over half the cost of the RMNCH services.

The cost of HIV/AIDS services would be \$1,818 under the 90% scenario and the cost of TB treatment would be \$4,502 under the same scenario.

All figures assume that the facility is not in an area that is endemic for malaria or dengue. If we change the model for the 90% projection to assume that the facility is in an area that is endemic for dengue fever the total cost would go up by roughly \$56 and if it is in an area endemic for malaria the total cost would increase by \$1,966, in both cases due to increases in Drugs and medical supplies.

C. STAFFING

The staffing needs estimated in this study can be compared with the projections in the Health Development Workforce Plan 2006-2015, which uses an estimated need of one nurse for 1,750 people and one midwife for 4,700 people. The report does not appear to provide estimates of the desired deployment between hospitals and health centers so we used the actual figures from Ang Roka and Kirivong OD to estimate deployment. In 2007 Ang Roka had 11 nurses and no midwives at the Referral Hospital (RH), 5 nurses and no midwives in the Operational District Office (ODO), and 23 nurses and 20 midwives in the health centers. Kirivong had 24 nurses and 5 midwives at the RH, 11 nurses and 2 midwives at a former district hospital, 6 nurses and 3 midwives at the ODO and 70 nurses and 39 midwives at the health centers. Using these figures we can estimate that 69% of the nurses and 88% of the midwives were employed in the health centers.

Assuming this deployment is optimal (which is probably not the case) a health center with a catchment population of 10,000 would need 69% of 5.7 nurses, which would be 4 nurses (3.9 to be exact). The same health center would need 88% of 2 midwives, which would be 2 midwives. This total of 4 nurses and 2 midwives would be the right number for the 60% scenario, but 1 more nurse and 1 more midwife would be needed for the CSS scenario and 2 more nurses and 1 more midwife would be needed for the 90% scenario.

Table 4 shows the composition of the average salary for the 60% and 90% scenarios, compared with the actual figures for 2007 at four of the sampled health centers. The total pay of \$1,931 used for the projections is similar to the figures for the contracting health centers (B, D and M) but much higher than the \$841 paid at the non-contracting health center (G). Under the 90% scenario, about 40% of the pay would come from the Government in the form of salary, overtime and mission payments. Around 25% would come from user fees (including health insurance and

health equity fund revenue), and the difference of around 35% would have to come from performance incentives.

Table 4: Average pay per employee

	Actual Health Centre B	Actual Health Centre D	Actual Health Centre G	Actual Health Centre M	Ideal Projection 60%	Ideal Projection 90%
Number of staff	6	5	7	5	6	9
Salary	368	365	592	667	417	417
Overtime	350	324	-	132	228	228
Mission	51	-	-	240	133	133
User fee share	614	605	194	265	346	346
Performance Incentive	354	450	-	560	598	623
Delivery Incentive	406	152	55	205	209	183
Total Average	2,144	1,895	841	2,069	1,931	1,931

D. FUNDING

Based on the user fee levels and the current contributions from the health equity fund and insurance in Ang Roka, these sources should contribute about 11% of total funding under the 90% scenario. The delivery incentive would contribute about 5% of total revenue. GOC salaries, overtime and mission funds will come to 16% of total revenue, and PAP contribution would be around 5%. The Drugs provided by CMS would come to about 48% of the total revenue and donated vaccines and medical supplies would contribute another 2%³³. We have assumed that donor assistance would be required to fund the performance incentives and this would come to 13% of the total funding. Note that the revenue figures are slightly higher than the cost figures because they include 1% of user fees that are sent to Treasury.

³³ We were unable to identify HIV/AIDS Drugs on the CMS supply invoices. If they are not included in the CMS invoices they should be added to the figure for donations.

Table 5: Revenue estimates for the projected services

	60% Need	60% & CSS 2010 Targets	90% Need
FUNDING			
User fees, HEF and health insurance	3,462	3,732	5,193
GoC Delivery Incentives	1,569	1,831	2,354
GoC Salary, Overtime, Missions	4,671	6,227	7,006
GoC PAP	2,275	2,275	2,275
CMS	14,111	15,408	21,167
Donated drugs and medical supplies - vaccines	473	486	710
Donor assistance	3,740	5,700	5,611
Total Funding	30,302	35,660	44,315
User fees, HEF and health insurance	11%	10%	12%
GoC Delivery Incentives	5%	5%	5%
GoC Salary, Overtime, Missions	15%	17%	16%
GoC PAP	8%	6%	5%
CMS	47%	43%	48%
Donated drugs and medical supplies - vaccines	2%	1%	2%
Donor assistance	12%	16%	13%
Total Funding and Revenue	100%	100%	100%

E. BUSINESS PLANNING

Business plans should cover three main elements: the services to be provided, the budget for those services and the sources of funding for the budget. The cost and revenue modeling provides all three sets of figures for a business plan by setting out the numbers of services to be provided, the cost of those services and the sources of funding. These can be based on overall targets, such as the coverage rate, or individual targets for priority services. An example of a business plan is shown in Annex 6.

F. COMPARISONS WITH COSTS ESTIMATED FOR HSP2

A costing of HSP2³⁴ was carried in early 2008. The study noted that the cost estimates are very broad – they are based on small samples and on a limited definition of the initiatives in question and involve a number of assumptions. It added that further work will be needed to refine these estimates, specify the details of the proposed interventions, and challenge the assumptions used. The average base cost per health center service used in projecting the cost of HSP2 was \$1.16, which was taken from the study by Pearson, and which is much lower than the figure of \$1.82 estimated here for the 60% scenario. However, it is not clear what costs were used for the HSP2 projections for future years.

The HSP2 costing used figures from the second child survival costing study for its baseline costs for health centers³⁵. The study used the 0.6 outpatient utilization rate for 2006 shown in HSP2 and assumed two scenarios regarding increases. One is a steady rate of increase to reach 1.5 contacts per year by 2015 (about 0.9 by 2010), and the other an accelerated rate of increase to reach 2.5 contacts by that year (about 1.1 by 2010). In the first case, this amounts to an increase of about 10% per year, and in the second about 17% per year. However, HSP2 notes that the overall rate for outpatient contacts declined from 0.60 in 2006 to 0.51 in 2007. Even taking into account the average estimated increase in population of 2.1% per year³⁶ this is a significant decline and makes the projections questionable.

G. COMPARISONS WITH SERVICE DELIVERY COSTS USED IN PREVIOUS CHILD SURVIVAL COSTING STUDIES

Estimates of the service delivery costs of the child survival scorecard interventions were made in the previous study by USAID/BASICS mentioned above. The study used average costs from all the health centers in Ang Roka and Kirivong Districts for 2006, which came to \$2.11 per service, including Drugs and medical supplies. This is slightly more than the projected costs from this study (e.g., \$1.82 for the 60% scenario) which indicates that some efficiencies and economies of scale may be possible. In determining the figures included in the child survival service delivery costing study, Drugs and medical supplies were deducted because they were already included under the national program costing.

³⁴ Costing of Health Strategic Plan (2008-2015). Mark Pearson. Health System Strengthening Cambodia Project, USAID. 2008.

³⁵ Scaling Up Child Survival Interventions in Cambodia: Service Delivery Costs. The BASICS Project/USAID

³⁶ Extrapolated from the national population estimates used in the first child survival costing study.

Comparisons are not easy for some interventions because they are grouped differently under the MPA study. The nutrition interventions, which were separate in the child survival study, were included under ante-natal and post-partum services in the MPA costing. Vitamin A for post-partum women was also included under post-partum services in the MPA study. Skilled birth attendance, including ante-natal and post-partum care, were not included in the child survival service delivery costing because they were included in the national program costing.

For the interventions that can be compared, the costs of curative services (ARI, diarrhea and malaria) are similar. However, the costs of some preventive services are significantly higher in the MPA study. For example, measles vaccination was costed at \$0.11 under the child survival costing study and \$0.91 under the MPA study (using the 90% scenario and ideal standards but excluding Drugs and supplies). The main reason for this is that under the MPA study the ideal standard time was set at 29 minutes, which includes counseling of 15 minutes, whereas under the child survival study only 4 minutes was assumed³⁷.

H. COMPARISONS WITH OTHER STUDIES

A recent evaluation of the Takeo contracting program showed figures for total recurrent spending per capita for 2007, which were \$4.30 for Ang Roka and \$4.60 for Kirivong. These figures include the hospitals and district office, as well as the health centers. An analysis of the spreadsheets where those figures were calculated indicates that the health center portion is around \$1.95 and \$2.39 for the two districts.

Previous studies (Fabricant, etc) have focused only on the total health center costs and an average cost across all services, calculated by dividing the total cost of the health center by the total number of services or population, thus producing an average across all services or per capita. The costs per capita estimated in 2001 by Fabricant³⁸ and inflated by Lane to 2007 prices were \$1.47 for a contracted-in health center and \$1.36 for a contracted-out health center³⁹.

These figures are all much lower than the average cost per capita under the 60% utilization scenario estimated in this study which is \$3.03.

³⁷ It should be noted that in the MPA costing time for IMCI consultation has been included under each curative child service and time for counseling has been included under antenatal, postnatal and each immunization service. This may result in some over-estimation of staff time where more than one service is provided during the same visit.

³⁸ Cost Analysis of Essential Health Services in Cambodia MOH/WHO Health Sector Reform Phase III Project, S. Fabricant, K. Thavary and S. Kanha, June 2003, WHO/Cambodia.

³⁹ Scaling Up for Better Health in Cambodia. WHO and Ministry of Health, Kingdom of Cambodia. WHO 2007.

4. CONCLUSIONS

Based on the need norms used in this study, a health center should provide 1.66 services per capita to meet 60% of the need and 2.49 services per capita to meet 90% of the need (the latter is considered as the maximum feasible). To meet the child survival targets for 2010 and 60% of the need for other services a health center should provide 1.95 services per capita. Around 60% of these services should be preventive: 1.31 services per capita under the 90% scenario. These projections represent significant increases from the average levels achieved for health centers across the country in 2007. For example, the rates of 2.49 overall services per capita and 1.31 preventive services per capita under the 90% scenario are roughly double the actual average 2007 rates of 1.16 and 0.68 services, respectively.

Using the standard costs, the total cost per capita would be \$3.03 for the 60% scenario, \$3.56 for the CSS scenario and \$4.43 for the 90% scenario. Under the 90% scenario, \$1.74 per capita would be spent on staffing, \$2.39 on Drugs and supplies and \$0.30 on other fixed costs. Four nurses and two midwives would be required for the 16,613 services under the 60% projection, five nurses and three midwives for the 19,466 services under the CSS projection and six nurses and three midwives for the 24,919 services under the 90% projection. An average annual pay figure of \$1,931 per employee was assumed, based on actual amounts paid in some of the contracting districts.

The average cost per service would be \$1.78 under the 90% scenario. Curative services would have an average cost of \$2.46 per service, preventive services would cost \$0.96 per service and other services would cost \$12.72 per service.

Most of the total cost would be related to curative services, which, as noted above, have a much higher average cost than preventive services. Under the 90% scenario, \$2.85 per capita would be spent on curative services, \$1.26 on preventive services and \$0.32 on other services (mainly deliveries). Under the 90% scenario, around 47% of the cost would relate to the RMNCH Program (\$20,977), 41% would relate to the CDC Program (\$18,686) and 12% to the NCD Program (\$4,600). Around 25% of the total cost would relate to child survival services, 4% to HIV/AIDS services and around 10% to TB treatment services.

In terms of funding, around 11% of total funding could come from user fees, health insurance and health equity funds under the 90% scenario, and the delivery incentive could contribute about 5%. GOC salaries, overtime and mission funds could account for around 16% of total revenue, and the PAP contribution around 5%. The Drugs provided by CMS would come to about 48% of the total revenue and donated vaccines and medical supplies would contribute another 2%. We have assumed that donor assistance would be required to fund the performance incentives and this would come to 13% of the total funding.

The cost and revenue model can be used to estimate the cost of implementing the MPA for different population levels and utilization rates. It can also estimate the amounts of funding required according to the likely sources. Given that the projected cost and funding can be related

to specific service targets, the model can be used to develop business plans for health centers and ODs. An example of the figures for such a business plan that can be developed with the model appears in Annex 7.

It should be noted that a review by the MOH of the norms and standards used in the model would be worthwhile before the models or specific figures produced by them are used for resource allocation, budgeting or business planning.

Based on the experiences of gathering information for developing and testing the models, it appears that financial information is not generally collected at the health center levels and is not often used for allocating and monitoring the use of resources. Strengthening the systems for the collection, management and use of financial information will be necessary to achieve the proposed national improvements in planning, budgeting and reporting.

ANNEX 1: NEED NORMS USED

Curative contacts	Relevant Population	Normative numbers of cases used in model	Normative number of visits per case	Source	Notes
Simple Diarrhea - Child	<5	105.00%	1	CH costing	105% = 3 diarrhea incidents a year * 35% need basic medical attention at HC
Simple Diarrhea - Adult	5+	1.79%	1	HIS	Norm calculated by assuming actual national utilization in 2007 is 90% of norm
Severe Diarrhea - Child	<5	9.00%	1	CH costing	9% = 3 diarrhea incidents a year * 5% need referral medical attention * 60% go to HC
Severe Diarrhea - Adult	5+	0.24%	1	HIS	Norm calculated by assuming actual national utilization in 2007 is 90% of norm
Dysentery - Child	<5	7.93%	1	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm
Dysentery - Adult	5+	2.02%	1	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm
Upper ARI - Child	<5	68.00%	1	CH costing	68% = care is sought for 0.68 episodes of upper ARI per child per year
Upper ARI - Adult	5+	25.68%	1	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm
Lower ARI - Child	<5	24.82%	1	CH costing	24.8% = care sought for 0.29 episodes of ALRI per child per year * 85.6% get treated at HC
Lower ARI - Adult	5+	12.36%	1	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm
Cough - Child	<5	0.05%	1	HIS	Norm calculated by assuming actual national utilization in 2007 is 90% of norm
Cough - Adult	5+	1.68%	1	HIS	Norm calculated by assuming actual national utilization in 2007 is 90% of norm
Malaria - Child - non-endemic areas	<5	0.19%	1	HIS	Norm calculated by assuming actual national utilization in 2007 is 90% of norm
Malaria - Child - endemic areas	<5	2.50%	1	WHO	Norm derived from WHO map of malaria cases by province in Cambodia. See Note 1.
Malaria - Adult - non-endemic areas	5+	0.61%	1	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm
Malaria - Adult - endemic areas	5+	2.50%	1	WHO	Norm derived from WHO map of malaria cases by province in Cambodia. See Note 1.
Dengue Fever - non-endemic areas	All	0.08%	1	HIS	Norm calculated by assuming actual national utilization in 2007 is 90% of norm
Dengue Fever - endemic areas	All	0.72%	1	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm. See Note 2.
Other (measles, diphtheria, pertussis, acute flaccid paralysis, neonatal tetanus, other tetanus, goiter, other)	All	35.56%	1	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm
High blood pressure	15+	2.53%	1	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm
Skin infection	All	3.14%	1	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm
Urethral discharge	Males 15+	0.51%	1	HIS	Norm calculated by assuming actual national utilization in 2007 is 90% of norm
Vaginal discharge	F 15-49	9.52%	1	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm
Genital ulcers and warts	15+) + (F 15-	0.06%	1	HIS	Norm calculated by assuming actual national utilization in 2007 is 90% of norm
Accidents	All	1.80%	1	CDHS	18 accidental injuries per 1000 people
Eye Diseases	All	1.45%	1	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm
Mental health	15+	0.39%	1	HIS	Norm calculated by assuming actual national utilization in 2007 is 90% of norm
Malnutrition	<5	43.00%	1	HSP2	Baseline prevalence of malnutrition in children

Preventive Contacts	Relevant Population	Normative numbers of cases used in model	Normative number of visits per case	Source	Notes
Deworming	<15	19.82%	2	HIS	Norm calculated by assuming actual utilization in Ang Roka in 2007 is 90% of norm
Antenatal Care (ANC)	F 15-49	10.53%	4	CH costing	ANC visits required = 10.03% pregnancy rate * 1.05 (not all pregnancies end in births)
Post-partum care (PPC)	F 15-49	10.03%	3	CH costing	Births are 2.68% of total population; birth rate for women of reproductive age is 10.03%
Deliveries at HC	F 15-49	4.01%	1	CH costing	10.03% of WRA give birth in a year * 40% target for Delivery at HC (Based on 80% deliveries by trained birth personnel for 2015 in HSP2) (CH costing)
Deliveries at home: Health staff	F 15-49	4.01%	1	CH costing	10.03% of WRA give birth in a year * 40% target for Delivery at home with Health Staff (Based on 80% deliveries by trained birth personnel for 2015 in HSP2) (CH costing)
Unpredicted abortions	F 15-49	2.45%	1	RH costing	% of women of reproductive age requiring Comprehensive Abortion Care (CAC)
Birth Spacing - Pill	F 15-49	7.38%	4	RH costing	number of WRA receiving pills / total WRA
Birth Spacing - Injection	F 15-49	4.62%	4	RH costing	number of WRA receiving injections / total WRA
Birth Spacing - Condoms	F 15-49	1.69%	1	RH costing	number of WRA receiving condoms / total WRA
Birth Spacing - IUD & Norplant	F 15-49	1.17%	1	RH costing	number of WRA receiving IUD or Norplant / total WRA
Immunization: BCG at birth	All * 2.68%	100.00%	1		Universal coverage norm
Immunization: HepB at birth	All * 2.68%	100.00%	1		Universal coverage norm
Immunization: OPV123 and DPT123-HepB123	All * 2.68%	100.00%	3		Universal coverage norm
Immunization: Rouvax (Measles)	All * 2.68%	95.00%	1		Universal coverage norm
Immunization: TT (pregnant women)	15-49 * 10.03%	90.00%	1	CH costing	Universal coverage norm
Immunization: TT (non-pregnant women)	15-49 * 13%	90.00%	2	CH costing	Universal coverage norm
Vitamin A Supplementation (Children)	<15	100.00%	2		Universal coverage norm
Dental health	<15	0.00%	1		Currently set at 0% due to lack of dental health facilities and training at HCs
Other services in MPA not in HIS					
VCT	All	1.10%	1	WHO	Total number of people receiving VCCT in 2005 / total pop in 2005. See Note 3.
HIV/AIDS treatment	All	1.47%	1	WHO	HIV prevalence in 2007
PMTCT	15-49 * 10.03%	1.10%	1	RH costing	% of pregnant women requiring PMTCT
TB treatment	All	0.67%	1	WHO	TB prevalence in 2007
Avian Influenza	All	0.00%	1	WHO	Total number of cases (2) in 2006 / total population
Diabetes	All	8.00%	1	WHO	Diabetes prevalence in Cambodia in 2005 estimated as between 5% and 11% (average 8%). See Note 4.

Note 1: Malaria incidence in endemic areas derived from WHO: Incidence Rate of Confirmed Malaria Cases by Province, Cambodia, 2003 (http://www.wpro.who.int/sites/mvp/epidemiology/malaria/cam_maps.htm). Provinces were considered endemic if rates were higher than or equal to 10 malaria cases per 1000 population. Average incidence in endemic provinces was approximated to be 25 cases per 1000 population, or 2.5%.

Note 2: Dengue fever is endemic in Ang Roka. The 2007 HIS figures for dengue treatment may be slightly higher than normal because there was a major dengue epidemic in 2007. However, the 2007 dengue hospital admissions in Ang Roka were only slightly higher than those for 2006.

Note 3: VCT incidence derived from WHO: Cambodia country profile for HIV/AIDS treatment (Available at:http://www.who.int/hiv/HIVCP_KHM.pdf). In 2005, there were 152,147 people who received VCT.

Note 4: An estimation of diabetes prevalence was obtained from a WHO bulletin: Volume 85, Number 11, November 2007 (Available at: <http://www.who.int/bulletin/volumes/85/11/06-036574/en/index.html#R3>). Prevalence obtained by WHO from a study by King H et al. in the Lancet: H King, L Keuky, S Seng, T Khun, G Roglic, M Pinget. Diabetes and associated disorders in Cambodia: two epidemiological surveys. Lancet 2005; 366: 1633-9.

ANNEX 2: SOURCES OF STANDARDS USED

Service	Source*	Comments/Assumptions
Simple Diarrhea - Child	1	Children undergo IMCI; ORS treatment
Simple Diarrhea - Adult	1	ORS treatment
Severe Diarrhea - Child	1,2	Children undergo IMCI; ORS treatment; assume 40% referral to hospital (CH study)
Severe Diarrhea - Adult	1	ORS treatment; 25% referral to hospital (Takeo stats)
Dysentery - Child	1	Children undergo IMCI; ORS treatment; difference between severe diarrhea and dysentery?
Dysentery - Adult	1	ORS treatment; difference between severe diarrhea and dysentery?
Upper ARI - Child	1,2	Children undergo IMCI
Upper ARI - Adult	1,4	Drug information from Rwanda CORE
Lower ARI - Child	1,2	Children undergo IMCI; assume 14.4% referral to hospital (CH study)
Lower ARI - Adult	1,4	2% referral to hospital (Takeo stats); drug information from Rwanda CORE
Cough >21 days - Child	1	Sputum test performed to check for TB; 15% referred to hospital (Takeo stats)
Cough >21 days - Adult	1	Sputum test performed to check for TB; 15% referred to hospital (Takeo stats)
Malaria - Child	1	Children undergo IMCI; 3% referral to hospital (Takeo stats)
Malaria - Adult	1,4	Some drug information from Rwanda CORE; 3% referral to hospital (Takeo stats)
Dengue Fever	1	Most dengue cases referred to hospital (72% from Takeo stats)
High Blood Pressure	1, 6 (Dr Mony)	Treatment at HC level mainly education; long-term hypertension drugs not provided; serious cases are referred to hospital
Skin Infection	1,4	Drug information from Rwanda CORE
Urethral Discharge	1,6	Information from Dr Lim Yi at NCHADS
Vaginal Discharge	1,6	Information from Dr Lim Yi at NCHADS
Genital Ulcer and Genital Warts	1,6	Information from Dr Lim Yi at NCHADS
Accidents	1	Includes landmine and road accidents; patients stabilized or referred to hospital (6% from Takeo stats)
Eye Disease	1	Assume 1% referral based on Takeo stats
Mental Health	1,6 (Dr Thida)	Includes mental health and substance abuse; treatment at HC mainly counseling and referral
Malnutrition	1	Vitamin A and mebendazole treatment for malnutrition are given in addition to the regularly scheduled Vitamin A and mebendazole given to children
Deworming: Mebendazole	1	Mebendazole given either at school (78%, no labor cost) or HC/outreach (22%, labor cost); to account for drug cost for mebendazole given at school, multiply drugs given at HC/outreach by a factor of 3.72
Antenatal Care	1	Assume 4 ANC visits required; TT vaccine given as a separate service; no pregnancy test currently included
Postpartum Care	1	Assume 3 PPC visits required; includes Vitamin A, mebendazole, and iron folate supplements
Deliveries at HC	1,4	Many deliveries take place during non-regular HC hours; divide staff times by half to compensate
Deliveries at home with Health Staff	1,4	Many deliveries take place during non-regular HC hours; divide staff times by half to compensate
PMTCT	1,6 (Dr Sathiarany)	HIV test performed and ARV treatment dispensed at HC
Spontaneous Abortion	1	Terminology about abortion?
Birth spacing: Pills	1,3	4 visits a year, pills provided for 3 months at a time; currently no pregnancy test; 10% of pills provided by CBDs so remove from total numbers
Birth spacing: Injections	1,3	4 visits a year, DMPA injection once every 3 months; pregnancy test performed on first visit
Birth spacing: Condoms	1,3	1 visit per year; 144 condoms per CYP
Birth spacing: IUD and Norplant	1,3	Norplant not commonly used

Immunization: BCG at birth	1	
Immunization: HepB at birth	1	
Immunization: OPV123 and DPT123-HepB123	1	3 visits--OPV drops, DPT and HepB vaccines administered at 6, 10, and 14 weeks
Immunization: Rouvax (Measles)	1	Administered at nine months
Immunization: TT (pregnant women)	1	Administered during ANC visit; minimal staff time
Immunization: TT (non-pregnant women)	1	Total of 5 TT vaccinations required for all WRA but timing may depend on pregnancies; use 2 per year in this model
Vitamin A Supplementation (Children)	1	Vitamin A given as outreach to children 0-14; service does not include pregnant and lactating women (part of ANC/PPC)
Dental Health	1	Only offered at HCs with dental health facilities/staff--very rare
Tuberculosis	1,5,6 (Dr Rathmony)	Service is for TB-DOTS; drug information taken from South Africa CORE
HIV/AIDS	1,7	Current treatment set for 30 days; assume ARV distributed at HCs; protocols from WHO
VCCT	1,4,7	Protocols from WHO; 12% of VCCT clients are HIV positive
Avian Influenza	1,6 (Dr Rathmony)	No treatment for avian influenza at HC; all cases referred to hospital
Diabetes	1,6 (Dr Mony)	No treatment for diabetes at HC; all cases referred to hospital
OTHER	1,5	Includes: Gastritis, general pain (South Africa CORE); measles, diphtheria, pertussis, acute flaccid paralysis, neonatal tetanus, other tetanus, goiter

* Sources:

1. Dr. Meas Pheng, Dr. Ly Khunbunarann, Dr. Dy Khoy, Dr. Thach Ly Khan and MPA Guidelines
2. Collins, D; Lewis, E; Stenberg, K. Scaling Up Child Survival Interventions in Cambodia: The Cost of National Program Resource Needs. FINAL REPORT. 19 June 2007.
3. Collins, D; Chuong, CK; Reth, K. Scaling Up Child Survival Interventions in Cambodia: Service Delivery Costs. FINAL REPORT. 25 February 2008.
4. RH costing
5. Rwanda CORE
6. South Africa CORE
7. Dr. Hong Rathmony, Dr. Khun Eng Mony, Dr. Chak Thida, Dr. Vong Sathiarany, Dr. Lim Yi
8. WHO country HIV/AIDS profile and standard treatment guidelines

ANNEX 3: SAMPLE OF HEALTH CENTERS USED

Province	OD	Health Center	Catchment type	Organization Type	Data provider	Costed
Takeo	Ang Roka	Ang Tasom	Urban	Contracting	SRC	Yes
		Tram Kak	Rural			Yes
		Trapeang Andeuk	Remote Rural			Yes
Takeo	Krivong	Ang Knol	Rural	Contracting	SRC	Yes
		Phnom Den	Urban			Yes
		Prey Yutakha	Remote Rural			Yes
Prey Veng	Mesang	Boeung Pras	Rural	Supported	UNICEF	Yes
Kampong Cham	O Rang OV	Chak	Remote Rural	GOC not supported	OD Director	Yes
		Thnal Kaeng	Rural			Yes
		Ampil Ta Pok	Urban			Yes
Kampong Cham	Chamkar Leu	Daunthy	NA	Contracting	BTC	Yes
		Ta Ong	NA			Yes
		Mesar Chrey	NA			Yes
Prey Veng	Pearang	Kampong Russey,	Urban	Contracting	HealthNet	Yes
		Chrey Khamum	Rural			Yes
Pursat	Sampov Meas	Tasas	NA	Supported	RACHA	Yes
		Boeung Kantuot	NA			Yes
		Wat Por	NA			Yes

ANNEX 4: COMPARISON OF UTILIZATION RATES

The following table provides a comparison of the utilization figures used in developing the costs in this study. All figures have been calculated for a catchment population of 10,000. The first column shows the national baselines which was the average for 2007 across all health centers in Cambodia. The remaining columns contain the figures for the 60%, CSS and 90% projections based on the need norms and targets. It should be noted that we could not get the actual utilization figures for TB, HIV/AIDS, VCCT, Avian Influenza and diabetes (these figures are not in the HIS).

One can see that certain services have high volumes and influence the total numbers of services. These are mostly the preventive services, such as de-worming, pill distribution, immunizations and Vitamin A supplementation. On the curative side ARI is generally the highest volume service. However, "Other" is the largest single category of all, which reportedly covers mostly minor ailments.

The main differences between the 60% projection and the CSS projection figures are the increases in Simple Diarrhea and Vitamin A supplementation.

Table A: Comparison of utilization figures used in this study

	National baseline	60% Projection	CSS Projection	90% Projection
Catchment population	10,000	10,000	10,000	10,000
Total	11,584	16,613	19,466	24,919
Simple Diarrhea - Child	76	783	1,109	1,174
Simple Diarrhea - Adult	141	94	94	141
Severe Diarrhea - Child	5	67	95	101
Severe Diarrhea - Adult	19	12	12	19
Dysentery - Child	48	59	84	89
Dysentery - Adult	155	106	106	160
Upper ARI - Child	306	507	634	761
Upper ARI - Adult	842	1,349	1,349	2,024
Lower ARI - Child	223	185	231	278
Lower ARI - Adult	410	649	649	974
Cough >21 days - Child	1	0	0	1
Cough >21 days - Adult	90	88	88	132
Malaria - Child	2	1	2	2
Malaria - Adult	32	32	32	48
Dengue Fever	7	5	5	7
High Blood Pressure	56	96	96	145
Skin Infection	153	189	189	283
Urethral Discharge	14	9	9	14
Vaginal Discharge	117	153	153	229
Genital Ulcer and Genital V	3	2	2	3
Accidents	20	108	108	162
Eye Disease	61	87	87	130
Mental Health	22	15	15	22
Malnutrition	2	321	321	481
Deworming: Mebendazole	1,208	870	870	1,305
Antenatal Care	594	676	788	1,013
Postpartum Care	184	483	563	724
Deliveries at HC	42	64	75	97
Deliveries at home with He	51	64	75	97
PMTCT	-	2	2	3
Spontaneous Abortion	3	39	39	59
Birth spacing: Pills	838	473	473	710
Birth spacing: Injections	384	296	296	445
Birth spacing: Condoms	58	27	27	41
Birth spacing: IUD and Nor	4	19	19	28
Immunization: BCG at birth	223	161	161	241
Immunization: HepB at birth	120	161	161	241
Immunization: OPV123 and	653	482	482	724
Immunization: Rouvax (Me	322	153	234	229
Immunization: TT (pregnar	241	152	203	228
Immunization: TT (non-pre	506	375	500	563
Vitamin A Supplementatio	1,424	4,389	6,217	6,583
Dental Health	14	-	-	-
Tuberculosis	-	40	40	60
HIV/AIDS	-	88	88	132
VCCT	54	66	66	99
Avian Influenza	-	0	0	0
Diabetes	-	480	480	720
OTHER	1,854	2,134	2,134	3,201

ANNEX 5: CHILD SURVIVAL – COVERAGE TARGETS 2007-2010

The child survival scorecard targets used in this costing (see table below) were only the ones for the health centers and so exclude those for ITNs and dengue vector control. There was no target for skilled birth attendance in that study and so we used the target of 70% from HSP 2. In this costing nutrition has been included as part of ante-natal and post-partum services which were set at the skilled birth attendance target of 70%. This is different from the individual nutrition coverage targets from the CSSP, which were shown in the service delivery costing as 60% for early initiation of breastfeeding, 80% for exclusive breastfeeding and 95% for complementary feeding.

Scorecard Interventions	2006 estimate	2010 target	Estimated actual 2006 coverage	Target 2007 coverage	Target 2008 coverage	Target 2009 coverage	Target 2010 coverage	Scale-up factor 2006 to 2010
Early initiation of breastfeeding	40%	60%	150,587	173,439	197,409	222,215	247,742	65%
Exclusive breastfeeding	62%	80%	233,410	250,524	276,372	303,021	330,323	42%
Complementary feeding	83%	95%	312,468	327,608	347,439	371,706	392,259	26%
Vitamin A	76%	85%	1,650,816	1,785,098	1,885,342	1,989,381	2,081,110	21%
Measles vaccine	84%	92%	316,680	331,462	347,439	363,625	379,872	20%
Tetanus toxoid	73%	80%	2,268,392	2,417,834	2,585,686	2,718,057	2,793,768	28%
Insecticide-treated nets	20%	80%	40,645	166,839	171,190	175,587	179,979	243%
Malaria treatment	31%	95%	62,999	177,267	203,289	208,510	213,725	139%
Dengue vector control	80	10	530,834	544,747	824,077	967,391	991,589	87%
Oral rehydration therapy	59%	85%	1,017,657	1,338,884	1,447,069	1,540,600	1,636,909	61%
Antibiotic for pneumonia	57%	75%	991,563	1,097,884	1,208,944	1,324,540	1,444,331	46%

Copied from “Scaling Up Child Survival Interventions in Cambodia: Service Delivery Costs”.

ANNEX 6: EXAMPLE OF A POSSIBLE BUSINESS PLAN FOR A HEALTH CENTER (US\$)

EXAMPLE OF A BUSINESS PLAN

HEALTH CENTRE A	Catchment population	10,000
	Target utilization rate	90%

SERVICE DELIVERY TARGETS	
Curative services	11,591
Preventive services	13,077
Other services	252
Measles vaccination services	229
Vitamin A services	6,583
Ante-natal services	1,013
PMTCT services	3
TB services	60
Deliveries	193

BUDGET BY INPUT		
Staff	5 nurses and 3 midwives	17,380
Drugs etc		23,902
Other fixed costs		2,981
Total		44,263

BUDGET BY MAJOR PROGRAMME	
Reproductive, Maternal, Newborn, and Child Health	20,977
Communicable Diseases (CDC)	18,686
Non-communicable Diseases (NCD)	4,600
Total	44,263

FUNDING	
User Fees	4,102
Health Equity Funds	571
Health Insurance	519
GoC Delivery Incentives	2,354
GoC Salary, Overtime, Missions	7,006
GoC PAP	2,275
CMS	21,167
Donated drugs and medical supplies - vaccines	710
Donor assistance	5,611
Total Funding	44,315
Less share if user fees paid to PHD	52
Total available to health centre	44,263

ANNEX 7: PEOPLE CONSULTED

MINISTRY OF HEALTH

H.E. Nuth Sokhom, Minister

Dr. Hong Rathmony, Vice Director, Communicable Disease Control Department

Dr. Ly Khunbunarann, Coordinator for Policy Research, Communicable Disease Control Department

Dr. Sok Srun, Deputy Director, Department of Hospital Services

Mr.s Khout Thavary, Deputy Head of Department of Budget and Finance

Mr. Ork Vichit, National Immunization Program

Dr. Chhorn Veasna, National Program for ARI/CDD and Cholera Control

Dr. Bun Sreng, Communicable Disease Control Department / IMCI

Dr. Sok Kanha, Deputy Director, Dept of Planning and Health Information

Dr. Tung Rathavy, Deputy Director Maternal and Child Health Program and Manager National Reproductive Health Program

Dr. Lo Veasnakiry, Director, Department of Planning and Health Information

Mr. Ros Chhun Eang, Department of Planning and Health Information

Dr. Heng Limtry, Deputy Director, National Center for Health Promotion

Dr. Keo Narith, Director, Operational District - Oreang OV

Dr. Khuon Eng Mony, Deputy Director, Preventive Medicine Department, MOH

Dr. Chak Thida, Deputy Director – National Program for Mental Health

Dr. Lim Yi, Deputy Director, National Center for HIV/AIDS, Dermatology, and STDs

Dr. Ou Kevanna, Program Manager, National Nutrition Program

Dr. Sun Sammang, Officer, Bureau of Health Economics and Financing

Dr. Vong Sathiarany, PMTCT Program Coordinator, National Maternal and Child Health Center

Dr. Duong Lot OD Deputy Director Kirivong

Dr. Chan Neary Dep OD Dir Ang Roka

Dr. Nov Kadal NIP Coordinator – Kirivong OD

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Dr. Sek Sopheanarith, Development Assistance Specialist, Child Health and Nutrition

Dr. John Quinley, Strategic Information Advisor for HIV/AIDS

WHO, CAMBODIA COUNTRY OFFICE

Dr. Niklas Danielsson, Medical Officer -- Child and Adolescent Health

Ms. La-ong Tokmoh – Technical Officer for Nutrition

Ms. Maryam Bigdeli, Health Economist

Dr. Benjamin Lane, Macroeconomics and Health Project Advisor

Dr. Susan Jack, Child Health and Nutrition Advisor

Mr. William Mfuko, Technical Officer - Essential Medicine Advisor

UNICEF/CAMBODIA

Dr. Viorica Berdaga, Project Officer – Child Survival

Dr. Rasoka Thor, Project Officer – Child Survival

Dr. Sorya Chan, Coordinator for Prey Veng

WORLD BANK

Dr. Toomas Palu, Lead Health Specialist

BELGIAN TECHNICAL COOPERATION

Dr. Dirk Horemans, PBHS Project Co-Director

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ANNEX 8: BIBLIOGRAPHY

1. National Strategic Development Plan 2006-2010. Ministry of Planning.
2. Cambodia Demographic and Health Survey 2005. Preliminary report. National Institute of Public Health, National Institute of Statistics, and MEASURE DHS Project, ORC Macro, July 2006.
3. Cost Analysis (Part 2) of Essential Health Services in Cambodia MOH/WHO Health Sector Reform Phase III Project Steve Fabricant, Sok Kanha, and Khout Thavary. Final Dr.aft 11 December 2003.
4. Cost Analysis of Essential Health Services in Cambodia MOH/WHO Health Sector Reform Phase III Project Final Report of Data Analysis Prepared by Steve Fabricant, MBA, Ph.D.
5. External Resource Flows to the Health Sector in Cambodia, Catherine Michaud, WHO, May 2005. (WHO external_resources_cambodia.pdf)
6. Financing and Cost of Child Health Care in Cambodia, circa 2004: Are We Out of Balance? David W. Dunlop, URC.
7. Scaling Up Child Survival Interventions in Cambodia: Service Delivery Costs. The BASICS Project/USAID. 25 February 2008. David Collins, Chan K. Chhuong and Kun Reth.
8. Scaling Up Child Survival Interventions in Cambodia: The Cost of National Program Resource Needs. The BASICS Project (USAID) and WHO. 19 June 2007. David Collins, Elizabeth Lewis and Karin Stenberg.
9. Study of financial access to health services for the poor in Cambodia. Phase 1: Scope, design, and data analysis. Dr. Peter Leslie Annear, David Wilkinson, Men Rithy Chean and Maurits van Pelt. 30 April, 2006.
10. Cost and Revenue Analysis in Six Rwandan Health Centers: 2005 costs and revenues. Thomas McMennamin and Gyuri Fritsche. USAID/Rwanda. 2007.
11. CORE Plus. A generic version of the tool can be found at <http://erc.Ms.h.org/mainpage.cfm?file=5.11.htm&module=toolkit&language=English>
12. Guidelines on Minimum Package of Activities for Health Center Development, 2008-2015. Ministry of Health, Kingdom of Cambodia, December, 31, 2007.
13. National Strategy for Reproductive and Sexual Health in Cambodia, 2006-2010. National Reproductive Health Program, Ministry of Health, Kingdom of Cambodia. February 2006.

14. Contracting of Health Services: Ang Roka and Kirivong Operational Districts, Takeo Province, Cambodia – Final Evaluation Report. Sheryl Keller, Jean-Marc Thome and Jean-Yves Dekestier. Swiss Red Cross. April 2008.
15. Health Strategic Plan, 2008-2015. Department of Planning and Health Information, Ministry of Health, Kingdom of Cambodia. 1st April, 2008.
16. Costing of Health Strategic Plan (2008-2015). Mark Pearson. Health System Strengthening Cambodia Project, USAID. 2008.

ANNEX 9: LIST OF PROJECTED SERVICE NUMBERS, UNIT COSTS AND TOTAL COSTS UNDER THE 90% SCENARIO (RIELS)

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REPORT: Cost per service	Average Cost	Total Number of services	Simple Diarrhea - Child	Simple Diarrhea - Adult	Severe Diarrhea - Child	Severe Diarrhea - Adult	Dysentery - Child	Dysentery - Adult	Upper ARI - Child	Upper ARI - Adult	Lower ARI - Child	Lower ARI - Adult	Cough >21 days - Child
Cost (Riels) per service for 90% scenario													
Number of services		24,919	1,174	141	101	19	89	160	761	2,024	278	974	1
Drugs and clinical supplies cost per service			3,537	7,597	19,478	21,797	5,925	11,021	1,685	7,708	1,699	5,820	8,476
Direct staff cost per service			2,634	2,461	2,945	2,720	2,635	2,462	2,634	2,634	2,684	2,641	6,270
Indirect staff cost per service			186	174	208	192	186	174	186	186	190	187	444
Other fixed operating costs per service			1,087	1,016	1,215	1,122	1,087	1,016	1,087	1,087	1,107	1,090	2,587
Total cost per service		7,283	7,444	11,248	23,846	25,832	9,834	14,674	5,592	11,615	5,680	9,738	17,776
Total cost for all services		181,477,413	8,743,312	1,583,439	2,400,605	481,835	872,596	2,340,587	4,253,329	23,507,943	1,577,011	9,485,794	9,879

REPORT: Cost per service	Cough >21 days - Adult	Malaria - Child	Malaria - Adult	Dengue Fever	High Blood Pressure	Skin Infection	Urethral Discharge	Vaginal Discharge	Genital Ulcer and Genital Warts	Accidents	Eye Disease	Mental Health
Cost (Riels) per service for 90% scenario												
Number of services	132	2	48	7	145	283	14	229	3	162	130	22
Drugs and clinical supplies cost per service	12,288	21,291	50,988	3,995	374	11,499	4,678	9,674	11,351	6,814	12,637	584
Direct staff cost per service	5,752	4,067	4,067	2,105	3,411	3,152	2,893	2,893	2,893	6,282	2,724	5,225
Indirect staff cost per service	407	288	288	149	241	223	273	273	273	444	193	370
Other fixed operating costs per service	2,373	1,678	1,678	869	1,408	1,301	1,194	1,194	1,194	2,592	1,124	2,156
Total cost per service	20,820	27,324	57,021	7,118	5,434	16,174	9,038	14,034	15,711	16,132	16,677	8,334
Total cost for all services	2,748,606	58,071	2,741,365	51,251	786,056	4,576,360	125,280	3,213,740	50,101	2,613,385	2,173,068	186,526

REPORT: Cost per service	Malnutrition	Deworming: Mebendazole	Antenatal Care	Postpartum Care	Deliveries at HC	Deliveries at home with Health Staff	PMTCT	Spontaneous Abortions	Birth spacing: Pills	Birth spacing: Injections	Birth spacing: Condoms	Birth spacing: IUD and Norplant
Cost (Riels) per service for 90% scenario												
Number of services	481	1,305	1,013	724	97	97	3	59	710	445	41	28
Drugs and clinical supplies cost per service	944	1,135	3,336	1,067	17,648	17,648	67,160	8,510	3,551	5,001	3,139	10,550
Direct staff cost per service	4,016	173	3,012	4,145	26,653	31,273	7,600	9,133	2,785	4,685	5,009	10,622
Indirect staff cost per service	284	12	285	392	2,518	2,955	718	863	263	443	473	1,004
Other fixed operating costs per service	1,657	71	1,243	1,710	10,997	12,904	3,136	3,768	1,149	1,933	2,067	4,383
Total cost per service	6,901	1,392	7,875	7,314	57,817	64,780	78,613	22,274	7,749	12,062	10,688	26,558
Total cost for all services	3,319,051	1,815,386	7,979,413	5,293,918	5,579,614	6,251,596	208,631	1,312,664	5,502,123	5,361,909	434,477	747,441

REPORT: Cost per service	Immunizati on: BCG at birth	Immunizati on: HepB at birth	on: OPV123 and DPT123- HepB123	Immunizati on: Rouxax (Measles)	Immunizati on: TT (pregnant women)	Immunizati on: TT (non- pregnant women)	Vitamin A Supplement ation (Children)	Dental Health	Tuberculosis	HIV/AIDS	VCCT	Avian Influenza	Diabetes
Cost (Riels) per service for 90% scenario													
Number of services	241	241	724	229	228	563	6,583	0	60	132	99	0	720
Drugs and clinical supplies cost per service	2,417	2,317	3,981	259	1,760	1,414	1,379	259	209,525	43,867	9,705	259	259
Direct staff cost per service	1,814	1,814	2,936	2,504	173	2,418	259	0	65,116	288	2,893	432	2,116
Indirect staff cost per service	171	171	208	177	16	171	18	0	4,607	20	205	31	150
Other fixed operating costs per service	748	748	1,212	1,033	71	998	107	0	26,867	119	1,194	178	873
Total cost per service	5,150	5,050	8,337	3,974	2,020	5,000	1,763	259	306,115	44,294	13,996	900	3,398
Total cost for all services	1,242,279	1,218,176	6,032,381	910,602	460,643	2,814,576	11,606,682	0	18,458,746	5,860,098	1,385,606	1	2,446,225