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A GENERAL ECONOMIC ASSESSMENT MANUAL FOR MATERNAL AND CHILD HEALTH SERVICES

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List of Abbreviations

ACER – Average Cost-effectiveness Ratio
ANC – Antenatal Care
ARI – Acute Respiratory Infection
CBA – Cost-Benefit Analysis
CCT – Conditional Cash Transfers
CEA – Cost-Effectiveness Analysis
CHNs – Community Health Nurses
CHWs – Community Health Workers
DALYs – Disability-Adjusted Life Years
DEA – Data Envelopment Analysis
DR Congo – the Democratic Republic of the Congo
HMIS – Health Management Information System
ICER – Incremental Cost-effectiveness Ratio
ITNs – Insecticide-Treated Nets
LMIC – Low- and Middle-Income Countries
M&E – Monitoring & Evaluation
MDGs – Millennium Development Goals
MCH – Maternal and Child Health
NGO – Non-Governmental Organization
NPB – Net Present Benefits
NPC – Net Present Costs
NPV – Net Present Value
P4P – Pay-for-Performance
PBF – Performance-Based Financing
PI – Principal Investigator
PIN – Price-Based Index Numbers
PPP – Purchasing Power Parity
QALYs – Quality-Adjusted Life Years
RBF – Results-Based Financing
SFA – Stochastic Frontier Analysis
TBAs – Traditional Birth Attendants
TE – Technical Efficiency
TEA – Technical Efficiency Analysis
TT – Tetanus Toxoid
WHO – World Health Organization
WTP – Willingness-to-pay

I. Introduction

The purpose of this manual is to provide background theory and implementation guidance to research teams who have the intention to conduct an economic evaluation, and to do so, we provide the example of a maternal and child health (MCH) intervention utilizing conditional cash transfers or performance-based financing. In particular, the theory and guidance included here should successfully lead to the robust collection and tracking of information necessary to conduct an economic evaluation within an impact evaluation framework. Together, the collection and analysis of this information will help program implementers and decision makers select services for scale-up by costs and effects contingent on available resources and current conditions, in turn helping to improve MCH services, as well as the efficiency and possible expansion of services over time. Produced for country PIs and research teams, this manual was produced based on the following objectives:

- To outline **analysis strategies** for an economic evaluation
- To distinguish among **pertinent costs and other data needed to conduct cost-benefit analysis (CBA), cost-effectiveness analysis (CEA), and technical efficiency analysis (TEA)** for MCH services utilizing conditional cash transfers or performance-based financing and to provide supporting theory
- To identify specific **data sources** where costs and other data can be located, in addition to other possible data sources that have been used in the past
- To advise **data collection** activities
- To offer sufficient **background information** on how to guide the design of country-specific adaptations to the costing protocols for existing surveys through examples that can be adjusted based on specific intervention characteristics

An economic evaluation assists in social decision-making. Because resources are limited and it is desirable to use existing resources efficiently, decisions must be made on how to prioritize and allocate resources in a way to maximize project

objectives. This is particularly the case in the health sector where the self-interests of individuals in a population do not tend to result in an efficient allocation of healthcare resources. When a market does not result in an efficient allocation of resources, economists refer to it as a market failure, which usually calls for governmental intervention, regulation, or participation. As we will see, an economic evaluation can provide a systematic framework for assessing efficiency by identifying resources and outcomes of interest; measuring resource quantities and health statuses; valuing costs and preferences; comparing programs of interest with alternatives; accounting for uncertainties; and presenting and interpreting findings – all of which are aimed at guiding the appropriate allocation of resources. In essence, the purpose of implementing an economic evaluation will be to facilitate program decisions with evidence and to provide implementers and decision makers with information on how to best transform future investments more efficiently toward the MCH outcomes of interest to a program.

This manual will begin with background information regarding financial incentives (e.g. conditional cash transfers and performance-based financing), followed by a description of CBA, CEA, and TEA, including corresponding reviews of related literature. Since both CBA and CEA involve the collection of costs, one section will detail how to collect and analyze costs, followed by sections explaining additional data needs to perform CBA, CEA, and TEA. For these analyses, data collection can occur at three levels: program, household, or health facility. Depending on the perspective[1] of the economic evaluation, data collection at some levels may not be necessary as detailed in the next section. Additionally, a glossary of terms can be found in Annex I, and the list of data and data sources corresponding to each analysis can be found in Annex II. We advise that the approaches mentioned in this manual should be tailored and adapted to specific programs, while focusing on the global objectives of the program.

[1] See glossary for definition. Only societal, program, and health service provider perspectives are provided in this manual.

Literature Review on the Effectiveness and Efficiency of Conditional Cash Transfers and Performance-based Financing in Social Programs[2]

As the world approaches the 2015 deadline for the Millennium Development Goals (MDGs) developed in 2001 by the United Nations to improve the social and economic conditions in the world's poorest conditions, enhancing the potential for sustainable programs and maximizing the benefits for targeted communities will become even more crucial. In the context of MCH, the corresponding MDGs 4 and 5 (to reduce the child mortality rate by two-thirds and to reduce the maternal mortality ratio by three quarters, respectively) are not globally on track as nearly 10 million children die annually before reaching their fifth birthdays, and 500,000 women each year do not make it through pregnancy or do not survive childbirth. As a potential solution, programs with financial incentive mechanisms are being designed to contend with the largest challenges in preventing these deaths. To ensure that the most effective interventions are channeled from funders into the health system so that direct benefits reach mothers, newborns, and children, the proper chain of events, or cascade of services, needs to be supported and strengthened to ensure equitable access across the continuum of care. This chain requires addressing several issues, including financing, regulatory frameworks for private-public collaboration, governance, insurance, logistics, provider payment and incentive mechanisms, information systems, well-trained personnel in adequate supply, basic infrastructure and supplies. Integrating an economic assessment into impact evaluations will help increase accountability throughout programs, while providing valuable guidance for flexible financing and aid effectiveness.

Evidence of programs with financial incentives has been documented for Bangladesh (Beith 2007), Brazil (Lagarde 2007), Cambodia (CORT 2007), Colombia (Lagarde 2007), Haiti (Eichler 2007), Honduras (Lagarde 2007), India (CORT 2007; Beith 2007), Kazakhstan, Malawi (Lagarde 2007), Mexico, Nepal, Nicaragua (Lagarde 2007), Russia (Beith 2007), Rwanda (Soeters 2006), and Tajikistan (Beith 2007). A tabled description of the programs by country is provided in Table 1 of Annex VII, and summaries of the articles reviewed for programs with financial incentives can be found by author in Table 2 of Annex VII. Although most of these country programs have been documented in

[2] Articles can be found in Annex VII, Tables 1 and 2.

systematic reviews, the majority of quantitative evidence from impact evaluations of financial incentives are related to conditional cash transfer (CCT) programs in Latin America for prevention interventions (Oxman 2008). This section will review the effects of CCT programs, the limited research on performance-based financing (PBF), and the gaps in knowledge that have an opportunity to be filled through further research.

CCTs have been successful at reducing child mortality, anemia, diarrhea, acute respiratory infections (ARIs), and stunting. Colombia's demand-side incentive program *Familias en Acción* increased the proportion of children under age 6 enrolling in growth monitoring by 37 percentage points (Rawlings 2005). Nicaragua's *Red de Protección Social* had over 90% of children participating in nutrition monitoring within treatment areas compared to 67% in control areas (Rawlings 2005). Eighteen percent of total annual per capita household expenditures were provided for through RPS, and Maluccio et al. (2005) reported that most of this additional income was spent on food. Immunization rates for children 12-23 months of age also increased by 18 percentage points, but it was found that children beneficiaries were not more likely to visit health clinics for growth monitoring nor did the mental health or parenting of mothers improve, and the potential for CCT programs to function well under different conditions has been questioned (Rawlings 2005). Similarly, Paxson and Schady (2007) examined a cash transfer program in Ecuador that improved the nutrition of children and the chances they were treated for helminth infections.

In Mexico's *Oportunidades* CCT program, child morbidity, mortality, and anemia were reduced, and child height increased on average (Barber 2007). All transfers were given directly to the mother or the female head of household, which was a unique characteristic of the program. Compared with women not receiving cash transfers, *Oportunidades* beneficiaries received 12.2% more prenatal procedures (Barber 2009). Using vital statistics data, Barham et al. reported that rural infant mortality decreased by 11% in households in program municipalities (2005). Additionally, financial incentives evoked improvements in quality on the supply-side of heath services, because women were provided with more information that allowed them to become more active in consuming health care services (Barber 2008). Gertler and Boyce used a difference-in-difference model in assessing the program impact of *Oportunidades* (2001). The outcome investigated was "visits to public health clinics", and the authors controlled for

secular trends and characteristics they thought would confound the impact. Utilization of public health clinics for preventative care significantly increased, and children had a 23% reduction in the incidence of illness, a 1-4% increase in height, and an 18% reduction in anemia.

In a systematic review for CCT programs, Das et al. assessed the literature to see whether or not CCTs increased levels of investment (2005). In order for a program to achieve its objective, two issues need to be addressed. Participation, which is related to the size of the transfer and the cost of the condition, is the first. For example, it was found that an extra 100 kilogram of rice increased the probability of school enrolment for both boys and girls by 15% (Ravallion and Wodon 1999). Additionally, Fernald et al. assessed that the doubling of cash transfers was associated with higher height-for-age, a lower prevalence of stunting, lower body-mass index by age, a lower prevalence of being overweight, as well as children doing better on motor, cognitive, and language development (2008). The second issue is fungibility, or the ability for individuals to offset the conditionality with a close substitute for the conditioned-on commodity. Two suggested ways of measuring fungibility in a program are estimating the impact of the program on possible substitutes or to analyze an outcome related to the substitutes and conditioned-on resource. Therefore, CCTs would only be successful if targeted individuals are forced to take actions that they would not naturally.

Other factors can also determine the success of a financial incentive program. In Nepal, the Safe Delivery Incentive Program (SDIP) was introduced in 2005. SDIP provided cash incentives to both women to encourage utilization of health facilities for childbirth and health providers to encourage their attendance at households and facilities during delivery. However, uptake for the program was low, and Powell-Jackson et al. used key informant interviews and focus group discussions to determine the factors that may have contributed (2009). They found that bureaucratic delays in the disbursement of funds, difficulties in communicating policy to implementers and general public, and the complex design of the program had caused constraints on the program's implementation and absorption.

De Janvry et al. suggest that CCT programs can be made more effective by "calibrating transfers to the level needed to induce response and by targeting

children according to the risk that they may not be going to school but will go with a transfer" (de Janvry 2004). An efficiency assessment of *Oportunidades* noted two sources of inefficiency: (1) paying individuals for a behavior that they already performed made the program unnecessarily more expensive and (2) offering transfers that may have been too high or too low to induce the behaviors conditioned upon (de Janvry 2006). If the program were to reduce these sources of inefficiency, the program costs could be largely reduced.

"Regarding PBF programs, fewer efforts have been made to rigorously evaluate their impact. From the experience in the United Kingdom, where a PBF program was first implemented, we have some documentation of the effects of this type of intervention, mainly on behavior of health professionals (focused on general practitioners)" (Technical Proposal). One article in our review details the effects of PBF: Soeters et al. investigated the experiences of PBF in Rwanda by implementing two household surveys (2006). Out-of-pocket health expenditures were found to have decreased by 62%, and the proportion of women delivering in a health facility increased from 25% to 60%. Local community groups verified health facility performances and were able to monitor consumer satisfaction. Apparently, PBF programs have the potentiality of producing perverse effects such as "cream skimming". More work is urgently needed to document the impact of PBF programs on the behavior of health providers, but also on the utilization of health services and on the health status of beneficiaries" (Technical Proposal).

Morris et al. assessed the effects in Honduras of making direct payments to households to invest in preventive health services compared to transferring resources to the health system (2004). Seventy municipalities based on high prevalence of malnutrition were randomly assigned to four groups: money to households, resources to local health teams combined with a community-based nutrition intervention, both, and neither. The household intervention resulted in a significant impact on antenatal care (ANC), growth monitoring coverage, and child checkups. However, the study was not able to transfer resources to the local health teams, so an adequate comparison was not determined. "Moreover, there is no evidence so far on what could be the impact of [PBF and CCT] programs combined. Intuitively, it is difficult to think of a better alternative to improve the health of poor households in developing countries" (Technical Proposal).

"Even though CCT programs have been evaluated with respect to their impact on health and education outcomes – that is, with respect to their ***effect***; there is no information documented regarding ***efficiency*** and ***equity*** aspects related to CCT programs and even less so regarding PBF programs. We know for instance that children beneficiaries of *Oportunidades* increased 1 centimeter at age 2 on average, compared to those children in control localities. What we do not know is what the cost of such improvement was. This information is crucial for its efficiency and equity implications. *Oportunidades* worked, but is that the most efficient way to obtain similar results?" (Technical Proposal).

Given the dearth of information on evaluation research on the simultaneous impact of demand- and supply-side interventions, there is a unique opportunity to evaluate the implementation and effects of CCT and PBF programs in different contexts. Combining the expertise achieved in impact evaluation analysis and in economic evaluation methods, the additional evidence on the costs and benefits of such programs in order to conduct CBAs and CEAs will fill knowledge gaps regarding the efficiency of such programs.

II. Background on Economic Analyses

This section will provide an overview of economic evaluations. The overview will describe three types of economic analyses (CBA, CEA, and TEA), in addition to major steps involved in the evaluation process. Annex II describes data needs organized by the different types of economic analyses. The overview will conclude with a literature review summarizing how the following types of economic analyses have been applied for MCH interventions.

The three types of analyses described here are CBA, CEA, and TEA.

- A **cost-benefit analysis** measures costs and social benefits both in monetary terms for an intervention. **Cost-benefit** is expressed as a difference, where total costs are subtracted from total benefits, and so an intervention that is cost-beneficial has a **net present value** greater than 0 (i.e. the net monetary value of the benefits exceeds the costs).
- A **cost-effectiveness analysis** provides information on the cost per unit of outcome achieved by the program, expressing the costs in monetary terms and the effects in terms of health summary measures, such as QALYs or DALYs[3]. The **cost-effectiveness** is expressed as a ratio of costs to effects.
- **Technical efficiency analyses** can be performed to test whether the intervention is being implemented at the most efficient level compared to other contexts. The term **technical efficiency** refers specifically to using inputs in the most efficient way to produce services.

In an economic evaluation, these analyses can be approached in four ways relative to the program of interest: *ex ante, in medias res, ex post*, and a combination of the three. If an economic analysis is performed during a project or while a policy is being considered (before initiation or implementation), it is referred to as an *ex ante* analysis. The purpose of an *ex ante* evaluation is to provide decision makers with information on whether resources should be allocated to the particular program of interest or its alternatives. If an economic analysis is performed at the completion of a project, it is called an *ex post* analysis. This type of analysis is excellent for learning the actual value of the program; however, its results are the most difficult to apply towards resource

[3] See glossary for definitions.

allocation decisions since decisions have already been made. An interesting exception to this case is when an *ex post* analysis evaluates a pilot or trial project. Even though external validity of the results certainly will be debatable in this case, these are likely to be more valuable and applicable than if an *ex ante* evaluation were performed instead. The third approach is when an analysis is performed *in medias res*. This type contains characteristics of both *ex ante* and *ex post*, and its main benefit – if at all feasible – is that resources can be shifted as conclusions are reached; however, this suggests that the tools need to be constantly altered to consider the various alternatives as different allocation decisions are made. *Ex post* analyses are generally more accurate than *in medias res* analyses, and analyses performed *in medias res* are more accurate than analyses performed *ex ante*. The last approach represents any combination of the aforementioned three.

Even though CBA, CEA, and TEA answer different questions regarding efficiency, a general set of steps can be outlined for the purpose of this manual, especially to conduct CBA and CEA[4]. In the end, the goal will be to compare the relative efficiency of different alternatives of implementing a program and probably include the status quo (the situation without the program) among those alternatives. Table 1 below presents a hypothetical example of the type of results that are ideal. We will use this hypothetical example to walk through the following nine basic steps of conducting an economic evaluation.

[4] For an excellent overview of CBA theory and practice, see Boardman et al.'s *Cost Benefit Analysis: Concepts and Practice, 2nd ed.*, 2001.

Table 1. Hypothetical example of CBA and CEA data needs and results.					
		Supply-side PBF program		*Supply-side PBF program plus demand-side CCT program*	
		A Program Perspective	B Societal Perspective	C Program Perspective	D Societal Perspective
CBA example	*Project Benefits:*				
	Deaths averted[1]	292.3	292.3	517.8	517.8
	Illnesses averted[1]	153.3	153.3	343.3	343.3
	Direct out-of-pocket costs savings (e.g. transportation, treatment expenses)	0	0	0	38.9
	Indirect opportunity costs savings (e.g. travel and waiting time)	0	10.4	0	25.2
	Facility benefits (e.g. health worker retention)	14.6	14.6	12.5	12.5
	Total Benefits	460.2	470.6	873.6	937.7
	Project Costs:				
	Transfers to Facilities (PBF)	338.1	338.1	338.1	338.1
	Transfers to Households (CCT)	--	--	723.1	723.1
	Monitoring Costs	1.5	1.5	7.3	7.3
	Administration Costs	2.5	2.5	8.6	8.6
	Total Costs	342.1	342.1	1077.1	1077.1
	Net Social Value (CBA)	**118.1**	**128.5**	**-203.5**	**-139.4**
CEA example[3]	*DALYs resulting from deaths averted*[2]	60	60	110	110
	DALYs resulting from illnesses averted[2]	45	45	96	96
	Cost Effectiveness Ratio (CEA)	**3.3**	**3.4**	**5.2**	**5.5**

[1] Monetary amounts calculated from data collected through Willingness-to-pay modules.
[2] Summary measures calculated with DALY calculator.
[3] The project costs used for the CEA example are exactly the same as those used in the CBA.

a) Specify the set of alternative projects.

The first step in conducting an economic evaluation is to establish a framework for the evaluation. Establishing the set of alternative programs (including the "no-program" alternative) is the most important element of the framework. In

the context of some studies, the set of alternatives will most likely be defined by the evaluation design and will include all the "arms" of the study. Additionally, the **target audience**, **target population**, and **comparison group** of the economic analyses should be aligned with the objectives of the impact analysis. In our example in Table 1, the set of alternatives includes the following two options: (1) a supply-side PBF program and (2) a supply-side PBF program plus demand-side CCT program. Each one of these alternatives will yield different results in terms of health benefits and will also imply different levels of costs.

b) Define whose effects, benefits, and costs count.

Next, a **perspective**, or viewpoint of the evaluation must be selected. The perspective must be relevant for those with "standing" in the evaluation, since it has implications regarding the range of costs and health effects that should be included in the analysis. In other words, one perspective may consider the costs of one resource when another perspective may not. Economic evaluations are commonly performed from one or more of the following perspectives: program, health systems, and societal. There are more perspectives that can be taken, but we will only be concerned with these three in this manual. Selecting a perspective will depend on the design of the program and its **target audience**. Annex II notes the particular perspectives according to different levels of data collection from which data will be extracted. For a study with both demand-side and supply-side incentive mechanisms, it is suggested that the societal and one other perspective be adopted to gain valuable insight. If the **societal perspective** is chosen, both direct and indirect costs, benefits, and effects should be included in the analysis. In contrast, if the evaluators wish to reflect on costs, benefits, and effects from the **program perspective**, then only direct costs borne by the program should be taken into account[5]. In our example in Table 1 above, we consider both program and societal perspectives to illustrate hypothetically demonstrated differences in costs and benefits and costs and effects. Additionally as a helpful aid, Annex III contains operation-related questions that may surface during the collection of costing data and relevant answers to assist the research team.

c) Catalogue the outcomes and select measurement indicators.

5 At this point, it is also useful to think about an appropriate analytic horizon, or the period of time where benefits and costs could be measured and/or modeled. The analytic horizon must be sufficient to measure important costs or benefits that may occur after the time frame, or duration of the evaluation. If the economic assessment is nested into a larger impact evaluation, the time frame of the economic assessment will occur within the time frame of the impact evaluation.

In the analyses mentioned above, it is important to make a list of the outcomes of interest in both the program to be evaluated and its relevant alternatives. If the economic evaluation is nested in an impact evaluation, this step ought to take into account the objectives of the impact evaluation. For programs implementing supply-side interventions, examples would be improvements of MCH outcomes, increased numbers of MCH services, and better quality of MCH services. For programs implementing demand-side interventions, examples would be improvements of MCH outcomes, increased access of MCH services, and increased utilization of MCH services related to the outcomes of interest (see Annex II). The benefits listed in Table 1 above have been simplified, but they capture the outcome measures for mortality, morbidity, direct and indirect costs to households, and direct benefits for the health facilities.

d) Predict or measure the impacts quantitatively over a relevant period of time.

In many cases, the period of time considered in a CBA or a CEA is determined by the design of the studies from which effectiveness or efficacy data are derived. However, an ideal analysis would typically consider all impacts (e.g. costs and benefits for CBA) of a program over its entire life. This is only feasible if the impacts are not only measured, but also modeled or predicted to capture the period where effects still occur without the evaluation (as examples of economic and impact evaluations covering 20 years are few and far between). If an economic assessment is conducted within an impact evaluation, then the time frame of the impact evaluation will define the period of time over which we will measure impacts. In the case that an important medium-term or long-term impact is expected to result from the program in mind, it should be predicted and accounted for in the evaluation.

e) Monetize all outcomes (CBA) or aggregate all outcomes into composite measures (CEA).

For CBA, measured outcomes should be monetized (i.e. dollar values should be attached to the outcomes). During CBA, we monetize benefits such as lives saved, illnesses averted, or time and money saved. On the other hand, for CEA, we translate effects into a summary measure such as disability-adjusted life years (DALYs) or quality-adjusted life year (QALYs). In the example presented in Table 1, we present the hypothetical results of a CBA in the top section of the table and the results of a hypothetical CEA in the bottom section of the table, as labeled.

f) Discount benefits and costs to obtain all present values.

In order to estimate the NPV of the different alternatives under evaluation, we discount both costs and benefits. Discounting acknowledges the fact that people (and societies) are not indifferent between present and future. In general, people have a preference to consume now rather than later, and societies, a preference (and an obligation) to spend resources and save lives in the present rather than in the future; however, neither individuals or societies are completely focused in the present as both think about the future. An accepted rate at which items are discounted is a contentious topic usually mollified by scrutinizing a selected rate and range of rates to sensitivity analysis.

g) Compute the net present value in a CBA or the cost-effectiveness ratio in a CEA for each alternative.

After the costs and benefits have been converted into monetary units and discounted, a decision must be made for which alternative is most efficient. In order to do this, an NPV of each alternative should be calculated for CBA – in other words, the difference between the NPV of benefits and the NPV of costs. In the example in Table 1, the alternative of PBF only is more efficient than the alternative of PBF+CCT and slightly more cost-effective when the societal perspective is considered. In the case of the CEA, the evaluation is based on the incremental cost-effectiveness ratio (ICER), which is computed for each of the alternatives. The ICER is the result of the ratio of the incremental cost of each alternative to their incremental effectiveness, and the lowest ICER, that is the lowest cost per unit of outcome, is the best option. In our example, the most cost-effective alternative is PBF alone, and as with the CBA, it is slightly better when the societal perspective is adopted.

h) Perform sensitivity analysis.

CBA and CEA involve uncertainty. Uncertainty may be characteristic of several assumptions for several reasons, including: statistical variability of the estimates (impacts or costs), because of measurement issues (e.g. willingness-to-pay estimates); methods used in the estimation of some assumptions in the framework (e.g. QALYs or DALYs); or even from unknown parameters (e.g. discount rate). The standard way to deal with uncertainty in CEA and CBA is through sensitivity analysis. The basic idea in sensitivity analysis is to

systematically analyze how changing the values of relevant variables can influence results. The sensitivity analysis should not include every variable involved in the analysis, but those corresponding to the most important explicit or implicit assumptions.

i) Make a recommendation based on the NPV or ICER and sensitivity analysis.

With the NPV or ICER results from Step 7, the *basic* decision rules can be applied: adopt the project with a positive NPV or the largest NPV in a CBA; adopt the intervention that dominates over the alternatives after comparing the effect difference against the cost difference. In reality, the decision is often more complex, involving more factors, but this is where it becomes evident that evaluation results are as informative as the alternatives selected in Step 1.

1. *Economic Analyses addressing Maternal and Child Health Interventions*

Economic analyses addressing MCH interventions are quite plentiful in the literature, and effective interventions for reducing maternal and neonatal mortality rates exist. However, accessibility and availability of these proven interventions have hindered the receipt of proper care in developing countries (Adam 2005). In the following, we briefly describe the literature for costing, cost-benefit, and cost-effectiveness analyses found in the literature.

1.1 Costing analyses on MCH interventions[6]

An analysis by Borghi et al. (2003) evaluated the costs of maternal health services in Rosario, Argentina. Hospitals were organized to cover both inpatient and outpatient maternity services at the time of research; whereas, health centers were providing outpatient ANC services. Provider and patient perspectives were adopted to evaluate the costs for delivery and outpatient ANC services only. On the provider side, staff salaries drove 72-94% of the total costs. From the patient perspective, direct costs were minimal compared to indirect costs of travel and waiting time.

6 Articles can be found in Annex VII, Table 3.

Bryce et al. (2005) estimated the running costs for the universal delivery of child survival interventions in 42 countries contributing to 90% of the annual child deaths. Running costs were determined by summing the unit costs for drugs and materials, delivery costs, program management and support costs, and supervision costs for interventions proven to be efficacious. The epidemiological profile for each country was taken into consideration when calculating the costs for the interventions. It was determined that US$5.1 billion would be needed for new resources to prevent six million deaths each year in the 42 countries, and the average cost per child life saved was US$887.

To investigate the administration and private costs within a CCT program in Nicaragua, Caldes and Maluccio (2005) created a cost-transfer ratio (CTR) to disaggregate the cost analysis and to measure cost efficiency. For the pilot the CTR was 0.629, which represents the cost to deliver one unit of transfers to a beneficiary. In the program, running costs were halved when fixed costs were removed. Caldes et al. (2006) utilized the CTR to perform a comparative analysis of poverty alleviation programs in Mexico, Honduras, and Nicaragua. The program in Mexico resulted in an average CTR of 0.106, where 10.6 cents were spent on administrative costs for every dollar transferred to households; the program in Honduras had an average CTR of 0.499; and the program in Nicaragua averaged a CTR of 0.629.

Ensor and Ronoh (2005) reported that few financing schemes for maternal health services ever address transportation costs, which they found to make up 50% of the direct costs for care from the household perspective. On the supply side of health services, they found that the largest concern for incentives is how remuneration based on procedures encourages more and excessive treatment.

Johns et al. (2007) produced an incremental costing model estimating resource needs in 75 countries according to WHO guidelines for maternal and neonatal health services. To evaluate the capacity for a country's health system to adopt the interventions, a health-systems constraint index was created, and the percentage of births attended by skilled health personnel was tagged as the most suitable indicator for the ability to scale up. It was determined that at least US$3.9 billion was needed on average, but this figure increases when a more rapid rate of scale-up is assumed.

Ogunbekin et al. (1996) reported that generating revenue through health services is more dependent on the supply of essential drugs and consumables than uneconomic fee scales. Utilization of health services increased in public health facilities in Nigeria when a combination of increased fees and improvements in quality of care occurred. This increase occurred most for the poorest segments of the population.

1.2 Cost-benefit analyses on MCH interventions[7]

The costs borne to women when accessing services during pregnancy are often negated from the design of conventional funding mechanisms; however, these costs (e.g. transport costs, user fees) heavily affect the decision to seek care and utilize health services (Ensor 2005). If a financing scheme afforded women to reduce or ignore these costs, the scheme would function as an economic benefit. Although this is a strategic way to increase demand on MCH services, few articles investigating the costs and benefits of MCH interventions exist compared to those in the literature covering CEAs.

Alderman and Lavy assessed whether individuals would pay more for higher quality services, what quality improvements matter more, and if it were possible to recover the costs for evaluated improvements (1996). Distance and travel time can cause a delay in seeking care, and sometimes even constrain the decision to seek care for the demand-side of health services. Households in Ghana reported that they were willing to pay 2.6% of their monthly income to reduce the distance or travel time to the nearest clinic by half (Alderman 1996). In terms of quality of care, the amount a household in Ghana is willing to pay increases with income.

A contingent valuation survey was conducted to evaluate the total economic value or a women's group program for maternal and newborn health in rural Nepal (Borghi 2007). Several aggregation techniques were used to analyze the data, and equity weights were utilized to adjust willingness-to-pay (WTP) results for income differences among those surveyed. When husband WTP values for the community-based participatory interventions were combined with women WTP values, total WTP increased by over twofold.

[7] Articles can be found in Annex VII, Table 4.

When values for non-group members (women) were added, total WTP increased by more than tenfold. Bärnighausen et al. (2007) assessed the WTP for basic health insurance among informal health sectors in China and found that individuals were willing to pay 4.6% of their incomes for basic health insurance. WTP values were lower for males, migrants, and those without permanent employment.

1.3 Cost-effectiveness analyses on MCH interventions[8]

Although there is a large amount of evidence demonstrating cost-effective MCH interventions, evidence on their feasibilities are still needed (Bryce 2005). Additionally, actual data on the costs of maternal care are absent in the literature as the majority of studies make conclusions based on very broad assumptions and cost estimates, often times drawn from modeling instead of specific program details (Fox-Rushby 1996). Because of these issues and many other contextual issues that are unique to situations, decision makers in countries must take caution when implementing programs based on these studies.

1.4 Literature Review Summary

Economic evaluations in the context of a CCT and/or PBF program for MCH could assist in filling the following gaps in current knowledge by responding to the following questions:

- Are CCT cost-effective compared to other traditional interventions that improve MCH?
- Is PBF cost-effective compared to other traditional interventions that improve MCH?
- What is the relative cost-effectiveness of CCT versus PBF?
- Is the combination of CCT and PBF cost-effective?

[8] Articles can be found in Annex VII, Table 5.

III. Costing Analysis

Regardless of which type of efficiency analysis is elected for an economic evaluation, it will be necessary to measure the costs of the intervention or program of interest. In order to implement a program, different types of resources and infrastructure need to be used. All those resources cannot be used to produce a different intervention at the same time, so the society forgoes the services that could be produced had all those inputs been used to produce the next best alternative program. The value of those services forgone reflects the real costs of the inputs. Economists use the term **opportunity costs** to capture this real value of inputs.

The use of the concept of opportunity costs has a few practical implications for this evaluation. One is that using budgetary information from the program will generally be useful as a data source for costing information[9]. Second, it implies that voluntary work or any other donated input should be considered as part of the costs and valued. Third, it places the focus of the costing exercise on the incremental costs of the project.

An economic assessment will analyze **incremental costs**, which will detail the costs of adding an intervention to already-existing infrastructure. In order to evaluate an MCH program with financial incentives, we do not want to measure all costs involved in the production of MCH services. Most of the services produced in the context of a financial incentive intervention include those produced by the health system regardless of the existence of the MCH program. So if we wanted to evaluate a financial scheme, we want to only include the costs directly attributed to the program. In the case of the impact evaluation we do not want to count all the prenatal visits produced in a clinic as the effect of economic incentives introduced by the program, but rather, we are interested only in the additional prenatal visits that can be attributed to the program. The same idea applies for the side for costs. We want to include only the incremental costs attributable to the intervention in the costing exercise.

[9] The important assumption here is that no inputs used in the production of MCH services are traded in highly inefficient markets (i.e. with market failures).

1. Categories of Costs

Costs can be categorized in many different ways. A few principles can be followed to decide which classification makes sense for each specific purpose. First, the categories should be relevant for the specific project. Second, the categories should be mutually exclusive so that no duplication of costs can occur. Third, the categories should be comprehensive so that the total relevant costs are included in the exercise.

The most standard way to think about types of costs comes from microeconomic theory where cost categories relate to the scale of the intervention. **Fixed costs** are those incurred only once (at least once for a given range of production scales – usually defined as the "short run") and do not depend on the size of the program (in the short run). **Variable costs**, on the other hand, include all inputs that are dependent on the scale of production, and as the program grows, more of those inputs will be necessary. There are many analytical advantages in thinking about costs in this way, since different types of efficiency and optimization analyses can be performed using this perspective.

Besides classifying costs as fixed or variable, there are multiple ways to create secondary classifications of costs that correspond with practical reasons related to the purpose of the costing exercise. In particular, a useful secondary classification of costs follows functions or types of activities of the program. Here, we describe three relevant categories of cost for a program with CCT or PBF (see Figure 1):

a) Administrative costs - costs attributable to the administration of the programs. Any CCT and PBF program requires a new bureaucratic component that will be in charge of the management of the program, and in many cases, this component is substantial.

b) Implementation costs – costs attributable to the implementation of the programs (e.g. the monetary incentives, additional staff and training needed, as well as additional equipment required for the programs to exist).

c) Monitoring costs – costs attributable to the monitoring system required by the programs.

CCT and PBF programs rely heavily on a monitoring system that helps to ensure that households and health providers comply with the requirements of the programs. In many cases, these monitory systems take advantage of existing M&E systems; however, any additional requirements should be considered in the costing component.

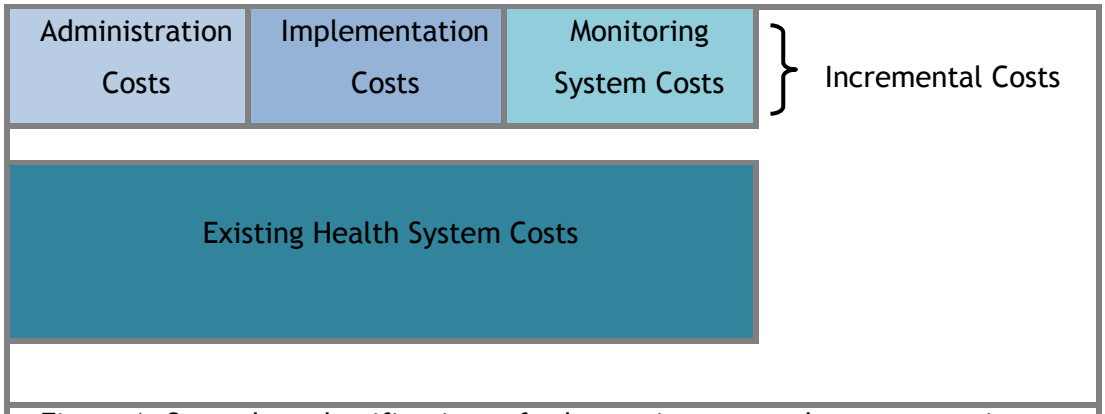

Figure 1. Secondary classifications of relevant incremental cost categories.

Collecting direct, indirect, and intangible costs is essential if a societal perspective is adopted for the evaluation. Costing analyses will be tailored to the structure and available data of administrative records and budgets; however, the guidelines below present an outline on how to measure and analyze the costs.

2. Measuring relevant costs

All relevant costs should be captured ("relevance" is determined by the perspective of the study) if they occur during the duration of a substantial period of time – usually one year. In the case of a CCT and PBF programs, the first year of implementation is probably the best alternative to perform an incremental cost analysis for the program. Collecting the relevant incremental cost data for a CCT or PBF program can be performed in two approaches: top-down or bottom-up (see Figure 2). The **top-down approach** utilizes administrative surveys or budgets, records at payer level, and service provider surveys or budgets as sources of valuation. Cost data from the **bottom-up approach** are collected from facility or service provider surveys and community-level project coordinator surveys. In many cases, the bottom-up approach can be used to validate the cost data collected top-down. Both approaches can be used, and this section outlines the different data sources that can be used.

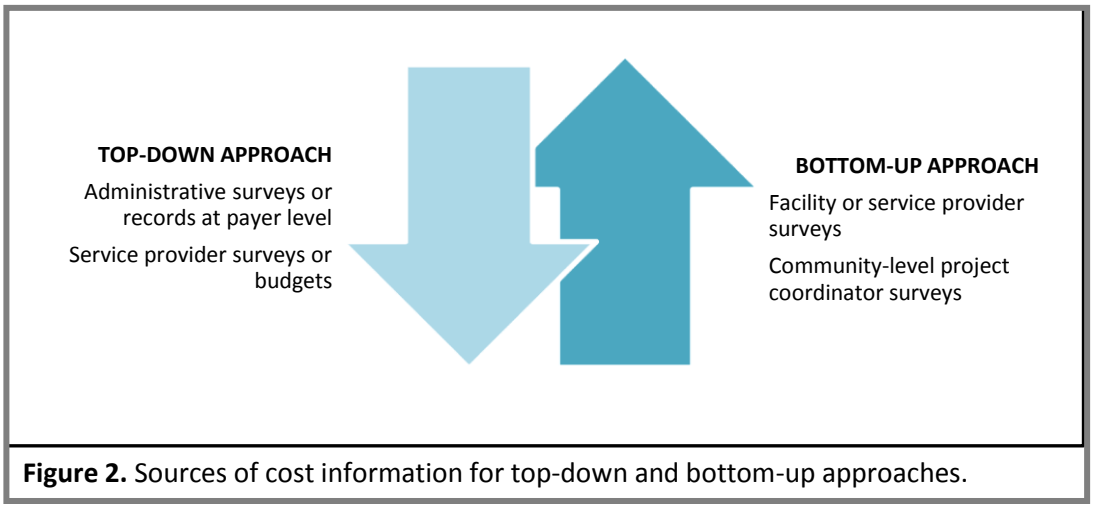

Figure 2. Sources of cost information for top-down and bottom-up approaches.

In order to collect the relevant data, collection should occur at three levels to inform the evaluation: program, household, and health facility levels. Each different level will require accessing different sources of information.

2.1 Program Level

At the program level, important costs to include for CCT and PBF programs in data collection are (1) the value of the **program's money transfers (from supply and/or demand sides)**; (2) costs associated with the **activities executed by the program to make transfers** to either the supply or demand side of the services (e.g. MCH services) and costs of the money transfer system put in place because of the program (in many cases, especially in supply-side programs, this will already exist); (3) costs for **additional information systems** and/or software upgrades that were purchased for the CCT or PBF program; and (4) **additional resources** that needed to be acquired for the program to be added to the existing system.

An additional classification of costs that is not relevant for analytical reasons, but rather for practical reasons, has to do with the frequency with which disbursements are made by the program. This is important because it will probably determine the types of records, files, and documents needed as data sources. For these purposes, we will distinguish between **recurrent costs** – those expenses made regularly during the implementation of the program (e.g. monthly or bimonthly) – and **initial/eventual costs** – those only made on specific, rare occasions. Table 2 provides examples of categories of costs at the program level. Note that in this table we use our primary (conceptual/analytical)

classification of costs, our secondary (functional) categorization, and the third (practical for data collection) classification. This costing component constitutes the most important part of the costing exercise, since we expect the bulk of total program costs to exist here.

Table 2. Examples of fixed and variable costs and recurrent and initial/eventual costs at the program level.

	Examples of Items to Collect for Fixed Costs	Examples of Items to Collect for Variable Costs
(1) Monetary value of program transfers		Recurrent - Cash transfers to households - Cash transfers to health facilities or health care workers
(2) Costs associated with the activities executed by the program to make transfers to either the supply or demand side (core costs of the program)	Recurrent - Rent (if building not owned) - Utility costs[2] Initial/eventual - Property costs (if building not owned) - Vehicle costs	Recurrent - Staff needed to deliver payments
(3) Additional health management information systems	Initial/eventual - Information servers purchased once - Sophisticated information systems - Upgrades to existing software	Recurrent - Additional staff needed to operate the information system and to provide technical support - Additional staff needed to perform audits or other monitoring activities
(4) Additional resources[1]	Initial/eventual - Large equipment for health services purchased once - One-time purchases for implementation	Recurrent - Administration Costs - Supervision Costs - Treatment Costs[3] - Staff needed to perform health services[4] - Supply costs[5]

[1] See Annex II for advice on integrating cost-per-unit columns into the facility questionnaire to measure any additional health facility expenditures on staff, equipment, laboratory or other services, and drug and medicine solely due to the program of interest, if this is not collected elsewhere. It may be appropriate for some items to be collected for each month for an entire year.
[2] Water bills, maintenance fees, new equipment monitoring, building, and vehicle operations
[3] Drugs/medical consumables; laboratory tests; treatment supplies
[4] Training costs and salaries (traditional birth attendants, midwives, community health workers, health care professionals)
[5] Routine supplies, stationery, and office supplies

2.2 Household Level

In addition to the costs borne by the program, for some analyses (e.g. CEA with a societal perspective), it might be relevant to measure costs borne by households because of illnesses. The average amount a household pays for each episode of an ailment or disease can be quantified by asking the head of a household (or the

household member with the most household health information) about health matters such as how much is spent **directly** or **indirectly** when an individual in the household becomes sick or for when a member of the household uses preventive health services. Below in Table 3 are examples that fit into each of these cost categories, and sample questions that should be asked at the household level are provided in Annex IV. This information can be used for two purposes: firstly, to estimate the savings attributable to CCT or PBF schemes for illness episodes averted; secondly, to estimate households' additional out-of-pocket expenditures linked to the implementation of the program.

Table 3. Examples of direct and indirect costs at the household level	
Examples (all refer to the last episode or the last *x* months)	
Direct Costs	Out-of-pocket expenses: transportation, treatment costs, drugs and medicine, diagnostic tests
Indirect Costs	Productivity costs: opportunity costs of missing work days due to illness or due to caring for a household member who was sick; (any cost associated with loss of productivity or impaired ability work due to morbidity or death)

2.3 Health Facility Level

Because health facility expenditures on staff, equipment, drugs, and medicines are assumed to have been integrated into the impact evaluation (See (4) in Table 2), the only additional cost information needed for the economic analyses at this level should answer the question, "*How much payment did each health facility receive for specific health services associated with a program over the past 12 months?*" Collection should only occur if this type of cost information is not available at the central level. This information could be useful to perform technical efficiency analyses.

3. How to Analyze Costs

3.1 Discounting and Net Present Value

Discounting is used when the impacts of an intervention occur throughout the course of several years and intertemporal comparisons have to be made. This is done by adjusting impacts for differential timing by bringing them to a common metric: the present value (Petitti 2000). The discount rate is chosen to represent the rate at which people or societies would forgo present payments for future payments, or future costs for present costs. In other words, the future costs and benefits that will be measured across the course of several years should be translated into present values through discounting.

To calculate the NPV of a project, both costs and benefits must be discounted and brought to their present value. The present value of benefits less the present value of the costs is the NPV:

NPV = PV(B) - PV(C)

or

$$NPV = \sum_{t=0}^{n} \frac{B_t}{(1+i)_t} - \sum_{t=0}^{n} \frac{C_t}{(1+i)_t}$$

where *i*=discount rate, *t*= period of time, and *n*=total number of periods.

Figure 3 below presents an example in which *i*=3% and *n*=10.

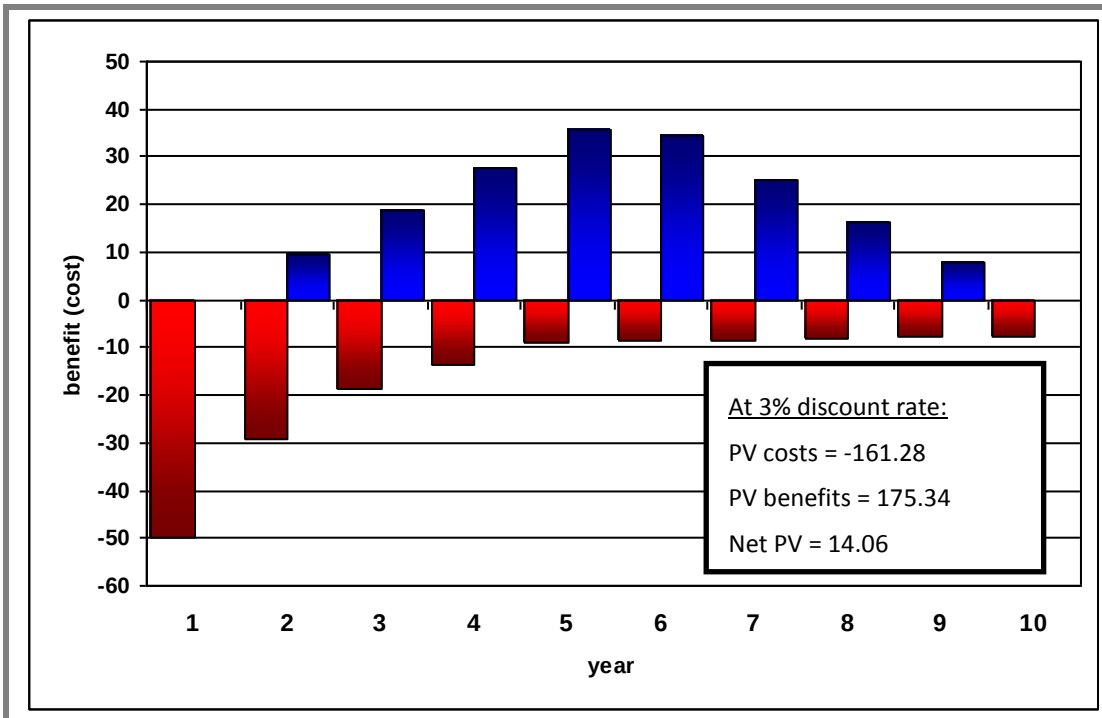

Figure 3. Costs and benefits of a program discounted at a rate of 3% over 10 years.
(Blue refers to net present benefits for each year; red refers to net present costs for each year.)

3.2 Sensitivity Analysis

Uncertainty in an analysis can come from many different sources, including: areas of methodological disagreement, parameter uncertainties (e.g. unknown parameters, disagreements about appropriate values, uncertainty surrounding the estimation process, data from a specific population, sampling variability), and modeling uncertainty (particularly in *ex ante* evaluations). The objective of the sensitivity analysis is to test the robustness of the base-case results against the most important assumptions behind it. There are different ways to perform sensitivity analysis, but the most commonly used in the field of CEA and CBA include one or more of the following options. The first approach is to investigate how the results change as a result of changing the value of an important assumption while holding everything else constant. A second alternative investigates the effects of best- and worst-case scenarios of assumptions on the results. This tests whether a reasonable combination of assumptions changes the conclusions of the analysis significantly. The third alternative involves statistically testing the effect the distributions of key parameters have on the distribution of results, which is a systematic way to analyze the probable outcomes of the project.

To show the need to perform a sensitivity analysis, Figure 4 demonstrates the variation of costs and benefits of a program not discounted, discounted at 3%, and discounted at 10%. In this case, the program changes from a positive NPV in the first two examples, to a negative NPV in the last one. Depending on how certain the analyst feels regarding the value of the discount factor, these results are important to consider when presenting the results of the evaluation and, more importantly, the policy recommendations that stem from the evaluation.

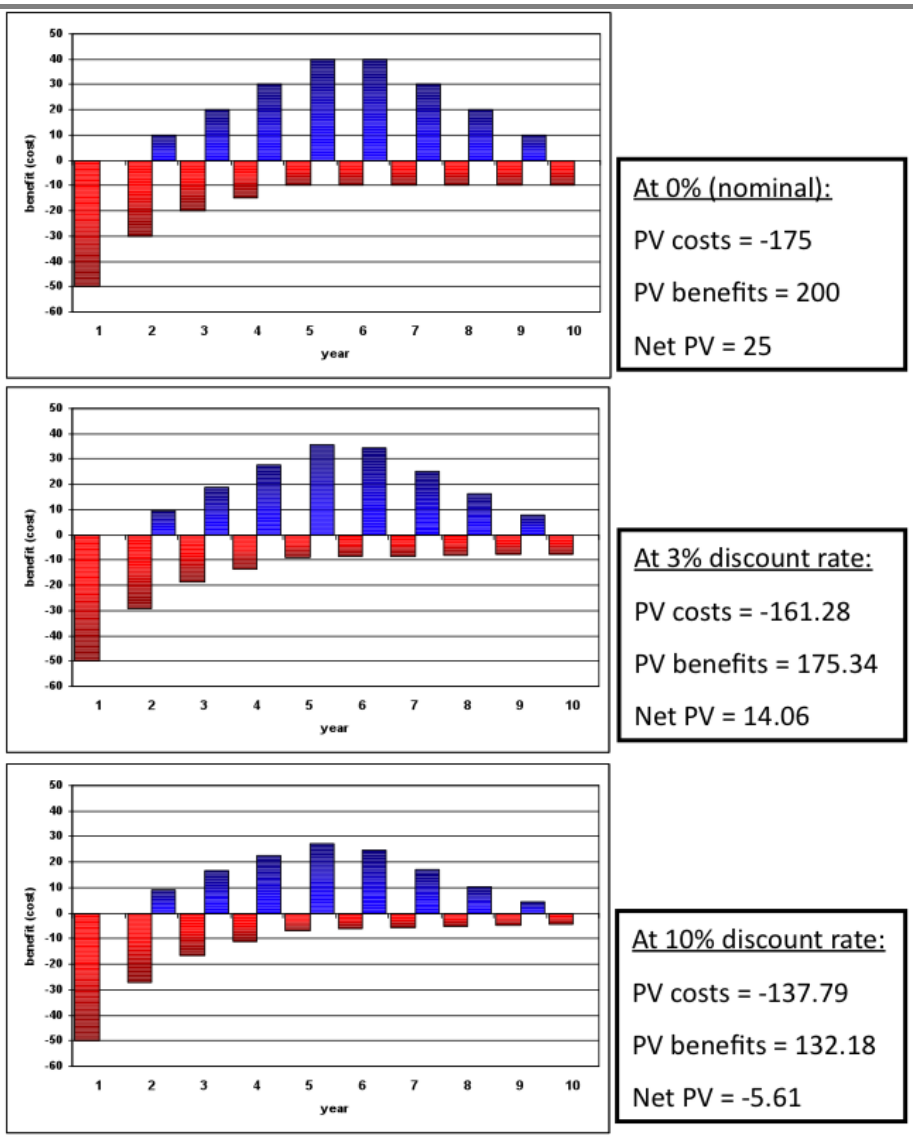

Figure 4. Net present value sensitivity of costs and benefits of a program when discount rates are varied: not discounted (top), discounted at 3% (middle), and discounted at 10% (bottom).
(Blue refers to net present benefits for each year; red refers to net present costs for each year.)

Table 4 presents several types of sensitivity analyses with their corresponding definitions as well as the main questions that each type of analysis attempts to

explore. To analyze the impact of methodological disagreements, Gold et al. provide an example of an agreed 'reference case' of methods by analysts through specific guidelines, which we detail here. To analyze the impact of parameter uncertainty, two methods exist: the deterministic sensitivity analysis and the probabilistic sensitivity analysis and statistical methods. Deterministic sensitivity analyses include one-way (univariate) sensitivity analysis, threshold analysis, multi-way (multivariate) sensitivity analysis, and analysis of extremes (max-min analysis).

Table 4. Different types of sensitivity analyses, the questions each attempts to answer, and their descriptions.

Type of Sensitivity Analysis	Question[1]	Description
One-way sensitivity analysis / Partial sensitivity analysis	*How do net benefits change as we vary a single assumption while holding all others constant?*	One-way sensitivity analyses can be single or multiple and are conducted by varying assumptions – generally the most important or uncertain ones – one at a time. The limitation of this method is that it is not possible to observe how net benefits change as a result of modifying more than one variable at the same time. A tornado diagram visualizes the varying effects of different parameters.
Threshold analysis	*Is there a particular value an assumption can have where none of the alternatives is favored?*	A threshold analysis varies the size of an assumption over a range to determine the 'threshold' point where none of the intervention alternatives is favored over others. This analysis is meaningful when the value of the parameter is known, but difficult to interpret if variables used are dependent on each other (e.g. a graph of $ per DALY averted vs. vaccine efficacy against mortality in children (%) with several vaccine dose costs plotted).
Two-way sensitivity analysis	*How do net benefits change as we vary two assumptions while holding all others constant?*	Two-way sensitivity analyses are similar to one-way sensitivity analyses, except two parameters are simultaneously varied.
Worst- and best-case scenario	*Does any combination of reasonable assumptions reverse the sign of net benefits?*	In this approach, the base-case scenario (or most likely scenario) is compared with both the best-case scenario (the assumptions which would collectively produce the highest estimate of net benefits), and the worst-case scenario (the assumptions which would collectively produce the lowest estimate for net benefits). This method may not be appropriate if there is a nonlinear relationship between net benefits and a given explanatory variable. In other words, if there is a

		quadratic relationship between the net benefits and a given parameter, the analysis may not reflect the true worst and best case scenario.
Monte Carlo simulation	*What distribution of net benefits results from treating the numerical values of key assumptions as draws from probability distributions?*	In this method, the net benefits are calculated by taking random draws for each explanatory assumption. Monte Carlo simulation allows for the manipulation of more than one assumption at a time. To perform this method, the analyst begins by choosing which assumptions to hold constant and which to vary. For each assumption that varies, a range may be specified from which to draw the random values. Next, a random draw of the variable assumptions is taken, and net benefits are calculated. After numerous successive random draws, a distribution of values for the net benefit is calculated. This method is useful because it allows the analyst to gain information on the shape of the distribution for net benefits – for example, whether the distribution is skewed or bimodal. When using Monte Carlo simulation, it is recommended to differentiate between uncertainty regarding the magnitude of costs and benefits versus the uncertainty regarding the occurrence of key events. It is recommended that only one type of uncertainty be considered at a time.
Using a decision tree to account for uncertainty	*How do varying assumptions in a sequence of decisions influence the decision?*	When constructing a decision tree, uncertainty can be accounted for by assigning probabilities to each occurrence. Costs are multiplied by their respective probabilities of occurrence and then discounted by dividing by (1+d) to the power of t, where 'd' represents the discount rate, and t, the time in years.

[1]Several questions derived from Boardman et al., 2001, p. 167.

The results of a sensitivity analysis can provide some indication of how sensitive results might be to a substantive, but not implausible, change in an assumption. If the results are insensitive to a reasonable variation, it can generally be concluded that results are insensitive to the working assumptions.

IV. Cost-Benefit Analysis

The nine basic steps to perform a CBA were described in Section II. The costs will be collected as described above, and we will assume that health impacts will be measured through an impact evaluation attached to the program. In this section we describe the methods and data needs of a technique commonly used to elicit the weights to transform health outcomes to monetary values.

1. Willingness-to-pay for MCH services

One technique used to value specific health outcomes in monetary terms is the contingent valuation method called "willingness to pay" (WTP). The integration of this method into the ongoing evaluation activities will provide information on how health service recipients value services, thus allowing us to estimate the weights needed to perform Step 5 described in Section II of this manual. Through a series of questions presenting hypothetical scenarios related to a health outcome of interest, the basic idea is to elicit the monetary value that households place on such outcomes. The monetary value is measured indirectly by asking how much individuals would be willing to pay for a technology that improves their health status related to the particular program dimensions of interest. The maximum amount that a household is willing to pay indirectly measures the monetary value that a household places on associated health outcomes. In order to do this estimation, WTP questions can be added to the household survey. The following question shows the basic information we will try to elicit from household members in order to assess WTP:

✓ *How much would you be willing to pay for having access to a program that ensures that you receive timely preventive care during pregnancy, so that you and your child are healthy after birth?*

Benefits will not necessarily be captured by questions focusing on services. For example:

X *How much would you be willing to pay for having access to three antenatal care visits during pregnancy?*

We developed two examples of instruments to elicit WTP: one related to health

outcomes associated with receiving a tetanus shot for pregnant women and one related to health outcomes associated with family planning services (see Examples 1 and 2 in Annex V, respectively). Similar instruments can be used to develop scenarios for different outcomes. If a program involves CCT or PBF, it is very important to appropriately word WTP survey questions to reflect the desired incremental benefits gained by the related interventions. Three techniques are suggested for use:

- The **open-ended pilot WTP** probes enough interviewees with an open-ended question to produce a range of WTP prices. The question will ask respondents for their WTP for a specific health outcome associated with health services. Step by step, the respondent will be reminded of more and more benefits of the service so the differences between the responses can be attributed to an estimate of the importance of each marginal advantage. The range of WTP prices will then be used to generate a range of initial bidding points for a larger number of interviewees in the next two methods. The range of values obtained through this method can also be compared with actual market price of similar or related health services, whenever they exist.

- The **closed-ended iterative bidding method**[10] asks individuals whether they would be willing to pay a specific dollar (e.g. RwF, the Rwandan franc, or ZMK, the Zambian kwacha) amount (randomly selected from the range determined by the pilot) for the selected health outcome. If the individual is willing to pay the first mentioned amount, he or she will be probed with a higher dollar amount to assess WTP; if not, a lower amount. This bidding process is repeated until the interviewer determines the individual has reached his or her WTP threshold – when the respondent is indifferent to purchasing the health outcome with either an increase or decrease in amount.

- The **take-it-or-leave-it** method will be designed to complement and validate the bidding method. The design of this technique will utilize a similar strategy as the closed iterative bidding method – to assess WTP, interviewees will be provided with a randomly generated value within the range established by the pilot. What differs between this approach and the closed-ended iterative bidding method is that this method does not attempt to determine, at the individual level, the

[10] This method creates the potential of starting point bias if participants use the first initial bidding amounts as a reference point in their response. To mediate the potential for this bias, the initial bidding value can be randomly selected from the range determined by the pilot survey.

precise amount respondents are willing to pay.

2. How to Analyze WTP

Bidding method – A mean WTP and corresponding distribution can be estimated directly from the bidding method, taking the maximum WTP of respondents.

Take-it-or-leave-it – A demand curve can be constructed from the take-it-or-leave-it data, which will indicate the probability a respondent is willing to pay for the health outcome at a given price. The mean WTP can be estimated by assuming the maximum WTP for an individual offered price can be estimated by: **P (*nv*) - P ((*n* + 1) * *v*)**, and the expected WTP will be calculated by the formula,

$$Nv*P\{Nv\} + (N-1)v*(P\{(N-1)v\}-P\{Nv\}) + (N-2)v(P\{(N-2)v\}-P\{(N-1)v\})\ldots$$

where *nv* = bidding amount, *v* = width of the interval, *n* = positive integer (with maximum value *N*), and *P* is the probability of accepting a given bid.

For example, suppose that four prices were offered to respondents, and that the interval between prices (*v*) is $10. Therefore, for *n* = 1,2,3,4, price = *nv* = $10, $20, $30, and $40, respectively. Suppose that 70% of respondents are willing to accept a bid of $10; 50% of respondents a bid of $20; and 20% of respondents a bid of $30; 5% a bid of $40. The expected WTP would be

$$E[WTP]= (\$40)(.05) + (\$30)(.2-.05) + (\$20)(.5-.2) + \$10(.7-.5) = \$15$$

2.1 Sensitivity Analysis

The basic principles to consider in a sensitivity analysis for a CBA were presented above. One example is the selected discount rate for benefits. However, a few additional points should be considered when conducting the sensitivity analysis of the CBA. Poulos and Whittington (2000) measured individuals' time preferences for saving lives in Bulgaria, Ethiopia, Indonesia, Mozambique, Uganda, and Ukraine using a stated-preference method. They found that households attach much less value to lives saved in the future than to lives saved today. Additionally, the relationship between time preference and income, life expectancy, and education is not consistent across countries. Borghi et al.

included methods for aggregating WTP (mean, median, or weighted values); the inclusion or exclusion of the values of female non-members; the unit of aggregation (women, men, or women and men combined); the method of dealing with non-respondents; varied discount rates between 0% and 6%; and the impact of including equity weights in a sensitivity analysis on a CBA for resource allocation in a health sector (2008). Non-use values and the unit of aggregation had the strongest effects on the results.

V. Cost-Effectiveness Analysis

CEA is a common alternative used to compare alternative programs or policies in terms of their relative efficiency[11]. Especially in the field of health interventions, policy makers accept CEA as a valid tool to inform decisions. In some contexts, CEA can help us understand how much it costs for a unit of effect (or health outcome) averted or gained in relation to different alternatives using similar amounts of resources for implementation. The basic steps to perform a CEA are described in Section II. Unlike CBA where both the costs and the benefits are monetized, for CEA, the costs, but not the benefits, are expressed in monetary terms. Because of this, in some cases, it can be advantageous for the analyst to conduct CEA instead of CBA. Three of these reasons are: (1) it is sometimes not possible or just too controversial to assign monetary values to health results – particularly when *valuing* lives saved; (2) sometimes the health impact captures most of the benefits but not all of them, and those not captured are difficult to monetize; and (3) when the selected effectiveness measure is an intermediate outcome that is not easy to value.

CEA compares different program or policy alternatives in terms of their cost-effectiveness ratio, which can be thought of as the average cost per unit of impact or benefit (e.g. cost per life year saved or cost per infection averted). The alternative exhibiting the lowest cost-effectiveness ratio is considered to be the most efficient intervention. A particular case of CEA is one that takes into consideration not only years of life gained with an intervention, but also quality-adjusted life years (QALYs) gained with an intervention. In most cases, CEA is used to determine whether or not a new alternative policy is better than the status quo. In such cases, the **incremental cost-effectiveness ratio (ICER)** is used, which takes the ratio between the incremental costs of the new program (with respect to the status quo) to the incremental benefits of the new program (with respect to the status quo). If an impact evaluation will already be gathering data on the effects linked to the program of interest, it will only be necessary to collect cost information following the aforementioned steps in Section II in order to perform CEA.

[11] In this section, we refer to both cost-effectiveness analysis and cost-utility analysis with the term CEA. Since CUA can be seen as a particular case of CEA, we include both in this section.

When the alternative programs included in the CEA have the same (or very similar) costs or effects, then the CEA is very straightforward, since it is unlikely that issues related to comparing different scales of programs would arise. This is an inherent problem of CEA given that when making comparisons based on the ratio of costs to effects, the scales of the programs are often not taken into consideration. In the case when the alternatives have similar costs, then the problem of the CEA becomes effectiveness maximization. Similarly, when the alternatives have equal effectiveness, then the CEA problem is cost minimization. However, in both cases, determining the **dominated alternatives** or the dominant one is easy. When the policies under revision include alternatives, which are very different in terms of scale, the cost-effectiveness ratio may lead to more questionable decisions. Boardman et al. illustrate this problem with the following example (2001):

	Alternative A	*Alternative B*
Costs	$1,000,000	$100,000,000
Effectiveness (Lives Saved)	4	200
CE Ratio	$250,000	$500,000

According to this example, using the basic rule of choosing the most cost-efficient alternative, then *Alternative A* should be adopted since it has the lowest CE ratio. However, given the enormous difference in scale of the two alternatives, this conclusion is probably wrong. *Alternative B* could save many more lives at a still relatively low cost per lives saved. According to Boardman et al., the best alternative to address this scale problem is to perform CEA imposing constraints to costs (i.e. maximize effectiveness subject to a maximum level of cost acceptable) or to benefits (i.e. minimize costs subject to a minimum level of effectiveness acceptable).

1. Allocation of Costs to Specific Outcomes or Aggregation of Outcomes

A disadvantage of CEA is that frequently some of the impacts – especially benefits, are omitted from the analysis. This is inevitable since the analysis considers only one measure of effectiveness. In practice, there are a few alternatives to address this weakness. One alternative is to perform an adjusted CEA in which the other social benefits are monetized and subtracted from the

costs of the program when computing the cost-effectiveness ratio. The problem with this alternative is that it requires all other social benefits to be monetized. A second alternative often used in cost-effectiveness studies consists of allocating costs to specific outcomes. This is problematic most of the time since, inevitably, arbitrary decisions must be made to determine such allocation rules. A third option is to aggregate different health outcomes that result from a single intervention into a composite measure of effectiveness. QALYs or disability-adjusted life years (DALYs) are two examples of such measures. For instance, when using QALYs, it is possible to transform each individual health outcome into QALYs and then aggregate them. This third alternative represents a good compromise between CBA and CEA.

2. Data Needs to Perform CEA: QALYs and DALYs

QALYs and **DALYs** are two summary measures of health benefits that have been constructed to account for both morbidity and mortality. Performing CEA with QALYs or DALYs as the effectiveness measure implies comparing alternative policies in terms of their costs and the number of quality-adjusted life years gained or disability-adjusted life years averted in relation to the alternatives.

QALYs are calculated by adjusting the years of life gained by quality of life. Quality of life is measured on a scale of 0 to 1, where a value of 1 usually represents perfect health, and 0, death. Quality of life is multiplied by the years of life gained to yield a measure that incorporates both quantity and quality. *DALYs* are calculated by summing the morbidity and mortality averted by an intervention. Averted years of life lost are added to the years of life that would have been spent in disability in the absence of the intervention. Compared to QALYs, DALYs are more commonly used, particularly in literature discussing health in LMIC.

In general, these types of summary measures are produced using preference elicitation techniques based on questionnaires. It is important to note that problems could arise depending on the sample of population used in the study: two common approaches include using a population-based sample or a panel of experts to elicit preferences for different health statuses. A second issue regards the technique used to elicit preferences, and it has been shown that in some

cases, different techniques yield significantly different results[12]. For a project focusing on MCH services, given the types of outcomes of interest, it is very unlikely that new estimations of QALYs or DALYs are needed, and different sources can be used to find the weights already estimated[13].

3. How to Analyze Costs and Effects

3.1 The cost-effectiveness plane

To compare the costs and effects of an intervention to the comparator, the cost difference of an intervention and its comparator can be graphed against the effect difference. This graph is called the **cost-effectiveness plane**. How to select the more (or most) cost-effective intervention depends on which quadrant the intervention falls, as demonstrated below in Figure 5 where a hypothetical *Intervention A* is evaluated against *Intervention C*, at the origin (modified from Drummond 2003, 2nd ed., p. 40). In quadrants II and IV, the decision is straightforward, since there is no possibility of facing scaling issues: *Intervention A* is less effective and more costly than *Intervention C*. In quadrants I and III, the decision is less obvious, since problems related to scale could arise and some constraints on effects or costs could be used.

[12] The discussion of the different techniques used goes beyond the scope of this manual. The most common and most widely used in the literature are: the "health rating method", the "time trade-off method" and the "standard gamble method".

[13] See World Health Organization. National Burden of Disease Manual and Supplementary Files. http://www.who.int/healthinfo/global_burden_disease/tools_national/en/index.html.
Also, World Health Organization. The Global Burden of Disease, 2004 Update. World Health Organization, 2008. http://www.who.int/healthinfo/global_burden_disease/2004_report_update/en/index.html.

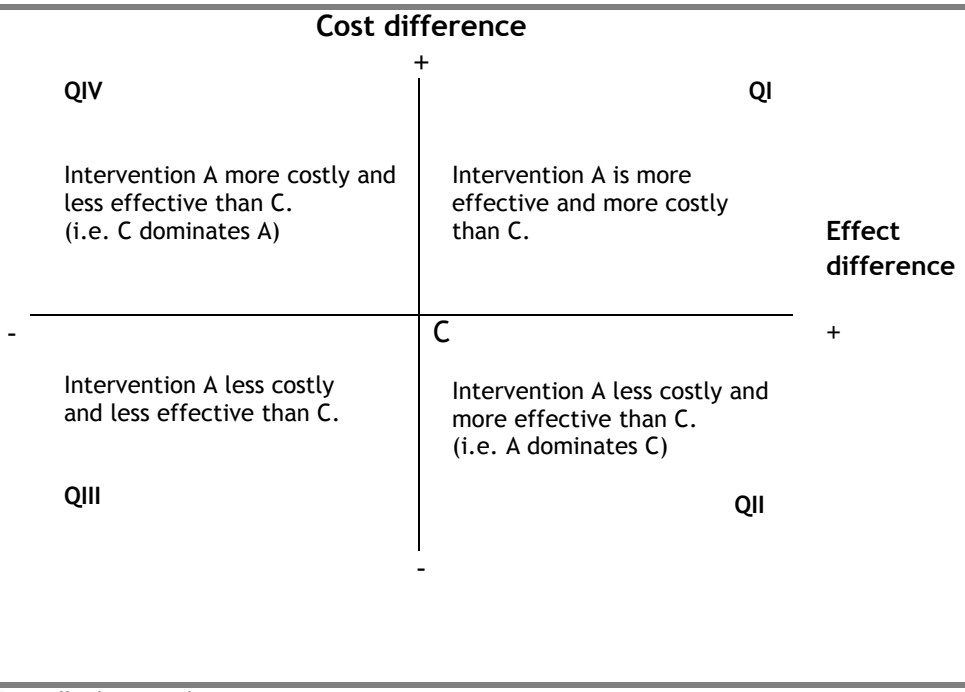

Figure 5. Cost-effectiveness plane.

3.2 Discounting

For CEAs, it is common to discount future costs, but economists disagree on whether or not health outcomes should be discounted. By discounting both costs and benefits in CBAs, we can find the NPV of the project; however, in the discounting of effects, it is debated whether the same discount rate, a smaller rate, or none at all should be used as in cost discounting. Some argue that health effects should not be discounted as heavily as costs. However, at the extreme, this may produce a bias in favor of projects with very short time spans. In a 2005 review of discounting practices, it was found that the majority of countries presented guidelines for health effects to be discounted to the same degree as costs, generally between 3 and 5%. One requested a 0% discount rate to be explored in a sensitivity analysis, and two allowed the method to be justified on an individual basis (Boss et al. 2005).

VI. Technical Efficiency Analysis[14]

So far, we have discussed CBA and CEA, which deal with the relative efficiency of different programs or interventions. CBA and CEA evaluate efficiency by calculating average values of impacts (costs and benefits) per alternative and then comparing the alternatives amongst each other.

Table 5. Definitions of efficiency.

Technical efficiency - **a facility's ability to achieve maximum output given its set of inputs**
Scale efficiency - **a measure of the degree to which a facility is optimizing the size of its operations**
Input mix allocative efficiency - **a facility's ability to produce its output by selecting the least-costly mix of inputs**
Output mix allocative efficiency - **a facility's ability to produce the optimal mix of outputs given the output prices the facility faces**

However, there is a growing interest among the international community of donors, governments, and decision makers to approach efficiency in a different sense. Once the most cost-effective intervention or program has been chosen, there is a second level of efficiency, which is concerned with the level of results (measured in terms of specific **outputs,** e.g. health services) that can be achieved using a given level of resources (measured by different types of **inputs,** e.g. health staff, equipment, supplies) and a given **technology** (e.g. specific health programs, interventions). In maternal health interventions, for instance, it has been shown that countries having the same levels of inputs lead to very different maternal health outcomes using very similar interventions (Campbell 2001; Parkhurst 2005). Other studies have shown that within a country, there is great heterogeneity among different health facilities in transforming inputs to outputs. Using TEA, it is possible to analyze the variability in efficiency across facilities and the characteristics that explain such heterogeneity in efficiency. By "facilities" we mean the units of the lowest level of implementation of the program at which allocative decisions are made (See Table 5). In TEA, we will call these different units "production units" (e.g. facilities, localities, districts)

[14] This section only applies to those programs with PBF schemes. Because TEA provides clues on inefficiencies at selected levels of the health system, it is advised not to perform TEA for CCT schemes in TEA.

and the levels at which they are selected “production unit levels” (e.g. facility level, locality level, district level).

There are many reasons why facilities could produce less services than they should. According to microeconomic theory, there are four basic aspects that firms must optimize in order to be efficient, given the technology they use: the size of the firm (scale), the correct mix of inputs it uses, the correct mix of outputs it produces, and the ability to use the technology and the inputs at its disposal to produce outputs. More distal reasons behind inefficiencies can be related to organizational issues, poor management, corruption, amount and capacity of service demand, excessive bureaucracy, amongst others. For the TEA to provide value to the economic assessment, the data collection instruments must probe the facilities (or other production units at a different production unit level) for characteristics that may predict inefficiency. In the countries implementing PBF schemes, a TEA[15] could be performed for the most cost-beneficial or cost-effective program at the health facility level, or at another specified production unit level where the intervention occurs.

1. Measuring and analyzing technical efficiency

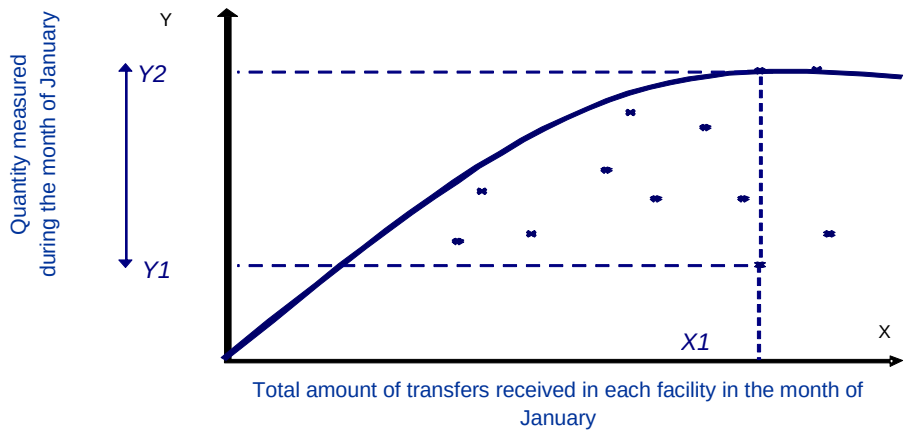

Figure 6. Example TEA graph for an intervention where a health facility provides tetanus shots for women during pregnancy. Each point represents the production level and the amount of transfers received of a given facility. The production frontier defines the maximum level of production “reachable” for any given amount of transfers. Efficiency scores can be measured using the distance of any point with respect to the frontier.

[15] The term “technical efficiency” will be defined to capture all forms of efficiency included in the table on this page. Strictly speaking, the reason why a given firm produces lower levels of output than it should, given the levels of input and the technology used, may not only be technical, but could also be scale, allocative, or a mix. This is a much broader definition than the more commonly used definition for technical efficiency displayed in the table.

A TEA can be performed to assess the heterogeneity of efficiency levels at which the intervention is being implemented by comparing all (or a sample) of the health facilities that provide the intervention. To do this, we have to know the total amount of transfers received and the total number of services produced **by each facility,** preferably at a monthly or bimonthly level (depending on the frequency with which the transfers are made) and for a long period of time (for instance, the entire duration of the impact evaluation). Figure 6 presents a hypothetical example of a TEA of a tetanus shots program to pregnant women (a maternal health outcome described in Part TE1 of Annex VI). The vertical axis of the graph measures the number of tetanus shots given in a month and the horizontal axis measures the amount of transfers received by the clinic through a PBF program. The curve represents the production frontier, which defines the maximum levels of production "reachable" for any given amount of transfers. Each point represents the production level and the amount of transfers received by a given facility. More efficient facilities are closer to the production frontier. Conversely, inefficient facilities are farther from the frontier, which implies that they are producing less than they could, given the amount of CCT or PBF transfers received. Efficiency scores can be measured using the vertical distance of any point with respect to the frontier.

In the example, the health facility at point (X1, Y2) is considered to operate at full efficiency, while the health facility at (X1, Y1) is implementing the intervention at a suboptimal level of efficiency, because it should be producing more outcomes for the level of resources used. An efficiency score, which ranges from 0 to 1, can then be estimated as the proportion of the level of outputs produced with respect to the level of output expected, according to the production frontier. A value of 1 refers to full efficiency and any value less than 1 is attributed to operations below the production frontier (i.e. with some level of inefficiency). It is important to note that our example considers the simplest case of one output and one input facility, and realistically, multiple outputs can be analyzed using econometric techniques.

2. Understanding technical (in)efficiency

Once the level of relative efficiency across facilities is assessed, a second important consideration to make regards the determinants of efficiency.

Gathering facility characteristics related to efficiency (e.g. organizational structure of task flow, staff composition, decision-making process flow related to assignment of tasks, distribution of additional resources) can provide us with enough contextual information to interpret the results. To obtain appropriate and sufficient information, new questions can be inserted into the health facility questionnaire as provided in Annex VI, Part TE2; however, the TEA can utilize many questions regarding staff motivation and working conditions. In the end, results from TEA should create an opportunity to increase the level of efficiency of a given program by creating incentives or regulations to effect an environment where less efficient implementers are encouraged to follow implementation practices characteristic of the most efficient group, which in turn could lead to an improvement of overall efficiency.

3. How to Analyze Technical Efficiency

There are many different methods to perform TEA. We briefly present here two of them, which have been widely used in the health literature (see Table 6 below).

Table 6. Technical efficiency analysis methods.

Method	Data needs	Advantages	Disadvantages
Stochastic frontier analysis (SFA)	For a production frontier or distance function: quantity data on inputs and outputs for a sample of facilities, ideally over a number of years. For a long-run cost frontier: total costs, input prices, and output quantities. For a short-run cost frontier: variable costs, variable input prices, and fixed input quantities and output quantities.	Attempts to account for noise; Environmental variables are easier to integrate; Allows for the conduct of traditional statistical tests of hypotheses; Easier to identify outliers; Cost frontier and distance function can deal with multiple outputs	The decomposition of the error term into noise and efficiency components may be affected by the particular distributional forms specified and by the related assumption that error skewness is an indication of inefficiency; Requires large sample size for robust estimates, which may not be available early on in the life of a program

Data envelopment analysis (DEA)	Quantity data on inputs and outputs for a sample of facilities, ideally over a number of years. However, if price data are available, you can also use it to calculate allocative efficiency.	Identifies a set of peer firms (efficient firms with similar input and output mixes) for each inefficient term; Can easily handle multiple outputs; Does not assume a functional form for the frontier or a distributional form for the inefficiency error term	May be influenced by noise; Traditional hypothesis tests are not possible; Requires large sample size for robust estimates, which may not be available early on in the life of a program

VII. Conclusion

With theory and practical examples, this manual should be used to help guide economic assessment field activities during an impact evaluation's data collection. We have introduced issues relating to the analysis of data and results, in addition to focusing on the most important aspects of data collection. Integrating CBA, CEA, and TEA into an existing impact evaluation not only can provide valuable information for evaluators, program implementers, and decision makers, but it can also facilitate efficiency improvements to parts of the program based on available or scarce resources.

As more and more research is conducted and evidence accumulates for health conditions in low-income countries, it will become more necessary to integrate cost estimations into programs while attempts are simultaneously being made to measure program impact. What can be learned from this opportunity will help inform evaluators and decision makers on how to fold an economic evaluation into the structure of an already-existing impact evaluation. We hope that the results will be also helpful in future evaluations since many economic evaluations found in literature are based on modeling and unlinked to rigorous impact evaluations.

Additionally, integrating an economic evaluation into existing activities can assist in filling other key gaps in knowledge, for example, in improving the continuum of care and MCH services, such as improving modes of transportation or communication for women needing emergency attention. This can be more carefully looked at a CCT scheme in Zambia where transportation subsidies are provided to pregnant women to reduce the direct costs and physical barriers of obtaining care. Also, if a fair country-to-country comparison is to be performed, it will be critical to make notes of the differences among the programs and the contexts of implementation.

Strategies to improve the health personnel and human resource conditions in low-income countries have been tried, and with the positive impact that conditional cash transfers have demonstrated in Latin America (e.g. *Oportunidades* program in Mexico) and the positive preliminary results from the

PBF schemes (e.g. general health and HIV/AIDS services in Rwanda), there is a new wave of interest in tying incentives to outputs.

It will be important to explore a few characteristics of any CCT or PBF program, which have been noted in prior studies, such as the role of women receiving transfers, especially if a program focuses on MCH. Also, when incentives are provided to households, whether or not the households shift spending or other behaviors because of the introduction of a conditioned-on commodity should be explored. Where health service quantity can be more easily achieved (e.g. vaccination) than for other services that require a stronger structure for delivery (e.g. birth with skilled attendant), further research must be conducted to understand the underlying factors that prevent service utilization. If a CCT or PBF program aims to be successful, it must evolve over time and integrate evaluation findings into improving and adapting its structure.

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Annex I. Glossary of Terms

Glossary of Economic Evaluation Terms	
Administrative costs	Costs attributable to the administration of the program.
Annualization[16]	The conversion of capital items and start-up costs into annual equivalent costs, so that the time metric for these items matches other cost items.
Bottom-up approach	Method of collecting data from facility or service provider surveys and community-level project coordinator surveys.
Conditional cash transfers (CCTs)	Incentives tied to utilization of health services for potential health service recipients (demand-side).
Disability-adjusted life years (DALYs)	Primarily used in CEA; a summary measure of health benefits calculated by summing the years of life lost and the years of life lived with a disability. Averted years of life lost are added to the years of life that would have been spent in disability in the absence of the intervention. DALYs are more commonly used, compared to QALYs, when discussing MCH issues in low- and middle-income countries.
Discounting	The process for adjusting the costs for differential timing, which is helpful when the cost of an intervention is spread across the course of several years.
Fixed costs	Costs linked to resources where total costs are independent on the quantity of services produced. Generally, these resources are purchased one time. They may also require maintenance or operation costs considered as variable. Also *capital costs*.
Implementation costs	Costs attributable to the implementation of the program (e.g. the monetary incentives, additional staff and training needed, as well as additional equipment required for the programs to exist).
Incremental costs	Costs as associated with the addition of particular interventions to already-existing infrastructure.
Incremental Cost-effectiveness Ratio	Ratio of incremental costs to incremental effects where costs and effects are measured relative to the status quo or another alternative.
Input mix allocative efficiency	A facility's ability to produce its output by selecting the least-costly mix of outputs
Monitoring costs	Costs attributable to the monitoring system required by the program. For example, CCT and PBF programs rely heavily on a monitoring system that helps to ensure that households and health providers comply with the requirements of the programs. In many cases, these monitory systems take advantage of existing M&E systems; however, any additional requirement should be considered in the costing component.
Output mix allocative efficiency	A firm's ability to produce the optimal mix of outputs given the output prices the facility faces
Performance-based financing (PBF)	Incentives tied to health service outputs for health service providers (supply-side) viewpoint.

[16] Johns et al, JHU-IIP, p. 38

Perspective	The viewpoint selected for the evaluation, which must be relevant for those interested in the results. The perspective has implications regarding the range of costs and health effects that should be included in the analysis. Common perspectives include: government, donor, health service provider, program, or societal.
Program Costs	The costs associated with running the program, such as administration, supervision, and training. (See *implementation costs* for costs associated with implementing the program.)
Quality-adjusted life years (QALYs)	A summary measure of health benefits calculated multiplying the number of years of life that would be added by the intervention times the measure of their quality, which is measured on a scale of 0 to 1, where a value of 1 represents perfect health and 0, death.
Scale efficiency	A measure of the degree to which a facility is optimizing the size of its operations
Sensitivity analysis	An analysis performed to model uncertainty and impact of particular items in an economic evaluation.
Technical efficiency	A facility's ability to achieve maximum output given its set of inputs
Top-down approach	Method of collecting data from administrative surveys or budgets, records at payer level, and service provider surveys or budgets as sources of valuation.
Variable costs	Costs linked to resources where total costs are dependent on the quantity of output produced. Also *recurrent costs*.

Annex II. Data and data sources by type of analysis

	Levels (perspective)	*Data*	*Data Source*
CEA	Household *(societal perspective)*	Costs: What is the difference in costs between a household who receives an intervention and one that does not (i.e. are there household level costs that occur only when the intervention is present? e.g. costs incurred to access extra preventive care services? How much money household saves per episode - money household spends per episode?)	Household survey and impact evaluation
		Effects: What is the difference in health effects (measured in natural health units, which can then be transformed to DALYs or QALYs) between having the intervention and not having the intervention?	Impact Evaluation
	Program *(program perspective)*	Costs: How much does the program spend on providing the transfers to the population and/or health service providers that will produce a particular health outcome?	Administrative data; budgets
		What starting costs were there in implementing the program? - Costs of information systems purchased for a CCT or PBF program itself or to manage the finances - Cost of upgrades to information systems - Cost of delivery systems for payments	
		How much is spent on providing transfers to health care providers and/or households? How much is spent on providing transfers to the population?	Administrative data; budgets
		How much did additional resources cost for the program? Cost of improving health facilities Cost of purchasing additional equipment Cost of additional human resources	
		Effects: What is the difference in health effects (measured in natural health units, which can then be converted into DALYs or QALYs) between having the intervention and not having the intervention?	Impact Evaluation
CBA	Household *(societal and program perspectives)*	Benefits (WTP): How much is the household or person in charge of health matters in the household willing to pay for specific health outcomes?	WTP questions in household survey
TEA	Health Facility *(health service provider perspective)*	Technical Efficiency: How much does each facility receive from the program? How much of each type of service did the facility produce?	Administrative, facility surveys or budgets
		Context for Technical Efficiency: What is the context and characteristics of each health facility that can help explain differences in efficiency?	Facility survey
		For Deeper Context: How many resources are lost to leakage at different levels of the health system?	Public Expenditure Tracking Surveys (PETS)

Annex III. Operational Questions and Answers for the Collection of Costing Data[17]

- ***Who** should be empowered/tasked to collect the data in sites across the program? How should this process be staffed, organized and managed?*

  Household and facility level data should be collected as part of the data collection efforts for the impact evaluation. Data should be collected with the follow-up surveys by the same staff who will apply the questionnaires. In fact, most of this information only represents additional questions to these questionnaires.

  Program level data is different. Collecting this data will require the top-down approach. In this case, we are interested in reviewing administrative files, budgets, coverage records, etc. at the highest level possible. Most likely, the standard data collection teams will not be appropriate for this task. We recommend putting together a special team to collect this information. Two characteristics can be extremely helpful when deciding how to put together the team for this: (1) knowledge/experience with the public financial systems of the country in which the program exists, and (2) if possible, the team leader should be someone known by high-level managers in charge of the program. These could facilitate access to the appropriate sources of information. Additionally, these data can be collected retrospectively when the follow-up surveys are in the field, and the team in charge of this task should be managed directly by the PI of the research team.

- ***Where** will the program level data likely be housed in the context of a CCT or PBF program?*

  Most likely, the program level data will be housed in the Ministry of Health, especially in the case of supply-side incentives; however, it could also be located in other government agencies, or even in NGOs, faith-based organizations, or multilateral agencies. For instance, in Mexico, all the administrative and financial information of the national CCT program *Oportunidades* is located in a governmental office created to manage the program. Data should be collected from the highest level possible at the organization in which the program is being managed.

[17] Below are general recommendations. Specific questions and answers will differ across countries and across supply-side or demand-side schemes.

- ***How** often should data be collected? Is there a need for ongoing/regular data collection? When should the data be collected?*

  Household and facility level data should be collected only once, particularly during the time when follow-up surveys are being implemented and as a part of the follow-up data collection efforts. Collecting these data only once is enough.

  Program level data can also be collected only once; however, the financial information collected should cover both initial investment(s) to start the program and the flow of relevant costs covering the period of time between baseline and follow-up. This information will usually exist in the administrative records at a monthly or bi-monthly level.

- ***What** is the best way to collect the data at different levels? What type of instruments should be used in the top-down approach in the context of a CCT or PBF program?*

  Household and facility level data should be collected only once, particularly during the time when follow-up surveys are being implemented, as part of these data collection efforts. Collecting these data only once at this point is enough.

  Program level data can also be collected only once; however, the financial information collected should cover both the relevant initial investment to start the program(s) and the flow of relevant recurrent costs. Usually spreadsheets are used to collect and organize this type of data where *ad hoc* templates can be created based on the relevant categories of costs and by time period.

Annex IV. Sample Questions – Costing[18]

Household Level Costing

Sample Questions (average cost per episode)		
Direct Costs Out-of-pocket expenses: transportation, treatment costs, drugs and medicine, diagnostic tests; cost of injuries		
	In the past month, have you visited a health facility without being hospitalized?	(Yes, No)
	In the past month, have you visited a health facility and were hospitalized?	(Yes, No)
	Have separate skip patterns for those hospitalized and those who were not hospitalized… Did you pay for care at the health facility? If so, how much did you pay for each of the following? a. Appointment and registration b. Consultation c. Medicines or drug(s) d. Diagnostic test(s) e. Vaccination f. Other, please specify _____ g. Total cost of visit If so, how did you pay for each of the above? If no, why not?	 (Yes, No, Don't Know, N/A) _____(in local currency) _____(in local currency) _____(in local currency) _____(in local currency) _____(in local currency) _____(in local currency) _____(in local currency) Health insurance, voucher, etc. Health insurance, voucher, etc.
	If hospitalized, how many nights were you hospitalized?	_____ nights
	If hospitalized, did you receive any of the following a. Laboratory exam b. Surgery c. X-rays d. Ultrasounds e. Prosthetics f. Serum (IV fluids) g. Other, please specify _____ If so, how much did you pay for each service? If so, how did you pay for each of the above? If no, why not?	 (Yes, No, Don't Know, N/A) (Yes, No, Don't Know, N/A) (Yes, No, Don't Know, N/A) (Yes, No, Don't Know, N/A) (Yes, No, Don't Know, N/A) (Yes, No, Don't Know, N/A) _____ (in local currency) Health insurance, voucher, etc. Health insurance, voucher, etc.
	When you or a member of your household is sick, do you seek attention from any of the following…[19] If so, how much did it cost to travel there? If so, how much did the service cost?	(Yes, No, Don't Know) Hospital Health clinic Pharmacy or drug vendor Local shop Traditional healer Other, please specify _____ _____(in local currency) _____(in local currency)
	Which one of the following health services do you normally access at a nearby health facility? (multiple answers	List services (Yes, No, Don't Know)

[18] Below are example questions. Specific questions that can be inserted in the general questionnaires might differ from these.
[19] Question can also be inserted in Exit Interviews as "Before visiting this health facility, did you seek attention from any of the following…"

	possible)	
	What kind of transportation do you use when you or a member of your household has an episode of one of the following…[20]	Walking Riding a bicycle Personal vehicle Public Transportation Taxi Other, please specify _____
	How much did it cost for transportation to the clinic today? (one-way)[21]	_____ (in local currency)
	How many minutes or hours does it take you to reach the health facility?[7]	_____ hours _____ minutes
	How many miles or kilometers are you from the health facility?[7]	_____ kilometers _____ miles
Indirect Costs Productivity costs: opportunity costs of missing work or sick days; average distance per person, speed assumption, total walking time, value; (any cost associated with loss of productivity or impaired ability work due to morbidity or death)		
	How many days have you or other family members been sick in the past month with each of the following diseases?	*List of diseases* _____ month(s)
	How much income have you or other family members lost due to being sick in the past month?	_____(in local currency)
	How many days have you or other family members spent taking care of a sick child with each of the following diseases instead of working in the past month?	*List of diseases* _____ month(s)
	How much income have you or other family members lost in taking care of a sick child in the past month?	_____ (in local currency)
	To what extent did the illnesses in the past month affect your family financially? (on a scale of 0 to 5)	0 (no effect), …, 5 (serious effect)

Program Level Costing

Each of these tables should be replicated separately for each activity of interest on supply-side (e.g. PBF) and demand-side (e.g. CCTs) incentives.

PC**1. Costs of CCT or PBF program money transfers** *(Separate table for each activity in PBF and CCT schemes)*.

Variable Costs (Payment received for each line item) Data Source _____					
	Financial Incentive Scheme Type	*Cost per Transfer*	*Quantity or Frequency of Spending **per Month***	*Usage Levels per Service*	
				Service(s)	*Percentage (%) of time for service*

[20] Question can also be inserted in Exit Interviews as "What was the mode of transport used today to get to the clinic?"

[21] Question constructed for exit interviews only.

PC2. **Costs associated with activities associated by the CCT or PBF program to make transfers.**

(Separate table for each activity in PBF and CCT schemes).

Fixed Costs Data Source _____				
	Resource	*Total Cost*	*Usage Levels per Service*	
			Service(s)	*Percentage (%) of time for service*
	(List building costs)			
	(List one-time vehicle costs)			
	Property value (if own land)			
	(List items purchased once for delivering payments)			

Variable Costs (Actual amount spent for each line item) Data Source _____					
	Resource	*Cost per Unit*	*Quantity or Frequency of Spending* ***per Month***	*Usage Levels per Service*	
				Service(s)	*Percentage (%) of time for service*
	(List types of staff needed to deliver payments)				
	Supervisors needed for additional staff				
	Cost of Rent (if renting property)				

PC3. **Costs associated with additional CCT or PBF health management information systems**

(Separate table for each activity in PBF and CCT schemes).

Fixed Costs Data Source _____				
	Resource	*Total Cost*	*Usage Levels per Service*	
			Service(s)	*Percentage (%) of time for service*
	Information servers solely purchased for the program			
	Additional sophisticated information systems solely purchased for the program			
	Upgrades to existing software			

Variable Costs Data Source _____					
	Resource	*Cost per Unit*	*Quantity or Frequency of Spending* ***per Month***	*Usage Levels per Service*	
				Service(s)	*Percentage (%) of time for service*
	Staff needed to provide technical support				

PC4. Costs associated with additional resources for the CCT or PBF program[22]. *(Separate table for each activity in PBF and CCT schemes).*

Fixed Costs Data Source _____					
	Resource	*Total Cost*	*Usage Levels per Service*		
			Service(s)	*Percentage (%) of time for service*	
	Large equipment for health services purchased once				
	One-time purchases for implementation				
Variable Costs Data Source _____					
	Resource	*Cost per Unit*	*Quantity or Frequency of Spending **per Month***	*Usage Levels per Service*	
				Service(s)	*Percentage (%) of time for service*
	(List types of additional administration costs)				
	(List types of additional supervision costs)				
	(List types of additional treatment costs)[1]				
	(List types of additional staff needed to perform CCT- or PBF-related MCH services)[2]				
	(List types of additional utility costs)[3]				
	(List types of additional supplies)[4]				

[1] Drugs/medical consumables; laboratory tests; treatment supplies
[2] Training costs and salaries (traditional birth attendants, midwives, community health workers, health care professionals)
[3] Water bills, maintenance fees, new equipment monitoring, building and vehicle operations
[4] Routine supplies; stationery and office supplies

Health Facility Level Costing

See Annex VI for collecting costs from the facility level.

[22] Cost-per-unit columns can be integrated to a facility questionnaire to measure any additional health facility expenditures on staff, equipment, laboratory or other services, and drug and medicine solely due to a program, if this is not collected elsewhere. It may be appropriate for some items to have these collected for each month for one year.

Annex V. Sample Questions – CBA, Willingness-to-Pay for MCH outcomes

Household Level

Note: Areas have been designated within sample questionnaires that are appropriate for integrating WTP questions associated with certain interventions. Below are two WTP examples, which are suggested frameworks to use to construct other WTP questions specific to certain CCT- or PBF-related interventions. The first, which could be directed to women who are either pregnant or desire more children, assesses the WTP for outcomes associated with receiving a tetanus shot during pregnancy. The second assesses the WTP for outcomes associated with receiving family planning interventions, and it could be directed to both men and women above the ages of 15 who want more children.

These are not final questions as edits are likely to be made in the field. Since WTP offers a technique for the valuation of a hypothetical scenario, the impact of a health service in this case, it is advised that these questions be tailored to all health outcomes of global or country-specific interest in a program. It is expected that variations will occur across program sites. Suggestions for MCH are below and have been marked within the sample questionnaires. For each example, we developed three different techniques to measure the maximum WTP. In a specific application, one or more of them could be used (which is what most recent literature suggests). For a discussion of potential biases of each technique please refer to the Costing Manual.

Maternal Health: Considering the global indicators and the country-specific indicators, each program could perform a WTP for the following services: antenatal care, institutional delivery, postnatal care. Similar to the WTP example for outcomes associated with receiving tetanus shot during pregnancy, these can be inserted into a household questionnaire directed for females.

Child Health: It is advised for a MCH program that WTPs be conducted for services related to the following health indicators: diarrhea, acute lower respiratory infections, anemia, and malaria (if applicable). These can be inserted into a household questionnaire for children.

The question of who responds the WTP modules is an important one. In theory, questions should be asked to a representative sample of the entire population, since the objective is to obtain the *social value* of the intervention. However, in many examples of the literature, we

can observe that these questions are directed to specific sub-populations, which are especially relevant for the intervention (e.g. the group that will potentially demand the intervention for instance, or the potential funders). For a deeper discussion of these issues, please refer to the Costing Manual.

Example 1. WTP for outcomes associated with receiving a tetanus shot during pregnancy.[23]

Note: The following WTP sample questions model the type of questions that should be integrated into the household survey for the health outcomes associated with receiving a tetanus shot during pregnancy. The way these questions are worded, imply that the respondent is a pregnant woman.

WTP1. Open-ended questions for tetanus shots given to pregnant women.

Example prompt regarding the health outcome of interest, which should be altered to fit the context of the respondents at the household and the health outcome associated with the CCT- or PBF-related MCH service: **Interviewer:** Now I am going to ask you some questions to know your opinion on some measures that will improve your and your baby's health. "Tetanus is acquired through exposure to a bacterium (*Clostridium tetani)* which are universally present in the soil. The disease is caused by the action of a potent neurotoxin produced during the growth of the bacteria in dead tissues, e.g. in dirty wounds or in the umbilicus following non-sterile delivery. People of all ages can get tetanus. But the disease is particularly common and serious in newborn babies. This is called neonatal tetanus. Most infants who get the disease die. Neonatal tetanus is particularly common in rural areas where most deliveries are at home without adequate sterile procedures."[24]		
1	**Interviewer:** Receiving a tetanus shot during pregnancy is a proven method that guarantees that if you use it, you can prevent your expected baby from contracting neonatal tetanus. The shot does not have negative consequences for your health, and it will guarantee that your baby will not become infected from unclean delivery, like cord contamination, which is the cause of many deaths of newborns. Now thinking about this, and equally considering your income and expenses, watch the amount that appears in the card and tell me how much would be the maximum you would be willing to pay for this tetanus shot?	*Create 18 reasonable price options from 0 to a very high value in local currency* _____ in local currency
2	**Interviewer:** There are several other benefits of receiving a tetanus shot as a pregnant woman besides preventing your baby from contracting tetanus. In addition to preventing your baby from becoming infected during delivery, it could prevent preterm delivery (delivery before 37 weeks of gestation), which is also a risk factor for perinatal mortality. The tetanus shot will improve your conditions surrounding birth and reduce the risk of preterm delivery. Thinking about this, and equally considering your income and expenses, of the amounts that appear in the card, how much would be the maximum you would be willing to pay for a tetanus shot?	*Create 18 reasonable price options from 0 to a very high value in local currency* _____ in local currency
3	**Interviewer:** In addition to preventing infection to your baby during delivery, potential preterm delivery, and your baby from contracting tetanus, a woman who receives a tetanus shot during pregnancy can help protect herself from getting	*Create 18 reasonable price options from 0 to a very high value in local currency*

[23] Could be inserted into a main household questionnaire for females.
[24] WHO website, http://www.who.int/immunization_monitoring/diseases/neonatal_tetanus/en/index.html. The language used in the survey should be less technical. The objective is that the respondent should understand the most important aspects of the health problem.

	infected from cuts or tears that can occur during labor and delivery. Thinking about this, and equally considering your income and expenses, of the amounts that appear in the card, how much would be the maximum you would be willing to pay for a tetanus shot?	_____ in local currency
4	**Interviewer:** Now think of the people with whom you live and that you encounter daily will benefit from your health: your partner (husband), your other children, your other family. Thinking about this, and equally considering your income and expenses, of the amounts that appear in the card, how much would be the maximum you would be willing to pay for a tetanus shot during pregnancy that would prevent all the aforementioned health complications?	*Create 18 reasonable price options from 0 to a very high value in local currency* _____ in local currency
Instructions: The next question will probe as to why a respondent is not willing to pay any amount for the tetanus shot benefits stated above. If "0" was provided as a value for questions 1, 2, 3, and 4, then please have the respondent answer question 5. If a value other than "0" was provided for at least one of the above questions, then question 5 should be skipped and question 6 should be asked.		
5	Why could it not be arranged for you to pay for the tetanus shot during pregnancy to improve your and your expected baby's health?	1= It would have to be free 2= I do not want to pay for something like this 3=I do not need it 4= I cannot afford it 5= Other, please specify _____
6	From where would you obtain money to receive a tetanus shot during pregnancy?	1=My income 2=I would borrow 3=Another source 4= Other, please specify _____

WTP2. Closed-ended iterative bidding for tetanus shots given to pregnant women.

Interviewer instructions: The aim is to obtain the maximum willingness to pay through a bidding process. In theory, this will happen when the respondent is indifferent between purchasing the health outcome and keeping the money. In practical terms, this means determining the maximum amount from the list of values that the respondent would be willing to pay for the health outcome. In this circumstance, increasing the value will mean that the respondent prefer to keep her money than purchasing the health outcome.

An amount is selected from a distribution of amounts ranked or from a list of amounts pre-defined, for example, between US$1 and US$200. Once the respondent answers the question, the interviewer can initiate a negotiation process randomly selecting an amount from the list. If the interviewee responds yes, then she is asked for a higher amount. If she responds no, then she is asked for a smaller amount. The amounts should change by significant increments within the list of values.

Example prompt regarding the health outcome of interest, which should be altered to fit the context of the respondents at the household and the health outcome associated with the CCT- or PBF-related MCH service: **Interviewer:** Now I am going to ask you some questions to know your opinion on some measures that will improve your and your baby's health. "Tetanus is acquired through exposure to a bacterium (*Clostridium tetani)* which are universally present in the soil. The disease is caused by the action of a potent neurotoxin produced during the growth of the bacteria in dead tissues, e.g. in dirty wounds or in the umbilicus following non-sterile delivery. People of all ages can get tetanus. But the disease is particularly common and serious in newborn babies. This is called neonatal tetanus. Most infants who get the disease die. Neonatal tetanus is particularly common in rural areas where most deliveries are at home without adequate sterile procedures."		
1	Would you be willing to pay A (in local currency) for a tetanus shot that will guarantee that your expected baby will not contract neonatal tetanus?	Yes (>>WTP2, q2) No (>>WTP2, q3) Don't Know
2	Would you be willing to pay A+B (in local currency) for a tetanus shot that will prevent your expected baby from contracting neonatal tetanus?	Yes (repeat WTP2, q2) No (>>WTP2, q4) Don't Know
3	Would you be willing to pay A-B (in local currency) for a tetanus shot that will prevent your expected baby from contracting neonatal tetanus?	Yes (>>WTP2, q4) No (>>WTP2, q5) Don't Know
4	Would you be willing to pay X+[a fraction of B] (in local currency) for a tetanus shot that will prevent your expected baby from contracting neonatal tetanus?	Yes (>> repeat WTP2, q4 with a larger fraction of B) No (>>WTP2, q5) Don't Know
5	Would you be willing to pay X- [a fraction of B] (in local currency) for a tetanus shot that will prevent your expected baby from contracting neonatal tetanus?	Yes (>>WTP2, q5 with a smaller fraction of B) No (>>WTP2, q5 with a larger fraction of B) Don't Know

WTP3. Take it or leave it for tetanus shots given to pregnant women.

Interviewer instructions: The aim will be to understand whether or not the interviewee would be willing to pay a specific amount of money for a particular health outcome associated with an CCT- or PBF-related MCH service. For this example, amount *A* is an amount randomly selected from a previously agreed upon range.

Example prompt regarding the health outcome of interest, which should be altered to fit the context of the respondents at the household and the health outcome associated with the CCT- or PBF-related MCH service: **Interviewer:** Now I am going to ask you some questions to know your opinion on some measures that will improve your and your baby's health. "Tetanus is acquired through exposure to a bacterium (*Clostridium tetani)* which are universally present in the soil. The disease is caused by the action of a potent neurotoxin produced during the growth of the bacteria in dead tissues, e.g. in dirty wounds or in the umbilicus following non-sterile delivery. People of all ages can get tetanus. But the disease is particularly common and serious in newborn babies. This is called neonatal tetanus. Most infants who get the disease die. Neonatal tetanus is particularly common in rural areas where most deliveries are at home without adequate sterile procedures."		
1	Would you be willing to pay A (in local currency) for a tetanus shot that will prevent your expected baby from contracting neonatal tetanus?	Yes No Don't Know

Example 2. WTP for outcomes associated with receiving family planning[25]

WTP1. Open-ended questions for family planning strategies.

Example prompt regarding the health outcome of interest, which should be altered to fit the context of the respondents at the household and the health outcome associated with the CCT- or PBF-related MCH service: **Interviewer:** Now I am going to ask you some questions to know your opinion on some measures that will improve family planning, which can allow men and women of reproductive age to have the ability to space and limit pregnancies through contraceptives.		
1	How long would you wait from now until the birth of your next child? *If respondent selects 01, 03, 05 or 96, proceed to the following questions. If not, then skip following questions.*	01 Doesn't want more 02 Infertile 03 Years 04 Soon/Now 05 After marriage 96 Other
2	Family planning services can help you space the number of children you have by using contraceptive methods, which are a safe and effective way to protect against pregnancy. Imagine that family methods that include contraceptives are available to you and that they will not have any negative consequences to your health, and they will additionally guarantee that you can prevent any unwanted pregnancies. Now thinking about this, and equally considering your income and expenses, watch the amount that appears in the card and tell me how much would be the maximum you would be willing to pay for this intervention?	*Create 18 reasonable price options from 0 to a very high value in local currency* _____ in local currency
3	**Interviewer:** There are several other benefits of family planning. In addition to being able to prevent unwanted pregnancies and to control the space between children, it could prevent a woman from having unsafe pregnancies, which are particularly risky for very young women (because their bodies may not yet be developed enough to bear the stress of pregnancy), older women (because their bodies may not be as able to deal with the physical stress of childbirth), women with more than four children (because the risk of maternal death increases with successive births), and women with existing health problems (because risks of death during childbirth increases for women with anemia, hepatitis, heart disease, malaria, cholera, etc.).[26] Family planning will improve the woman's (if male) or your (if female) conditions surrounding birth and reduce the risks of complicated pregnancies. Thinking about this, and equally considering your income and expenses, of the amounts that appear in the card, how much would be the maximum you would be willing to pay for family planning?	*Create 18 reasonable price options from 0 to a very high value in local currency* _____ in local currency
4	**Interviewer:** In addition to spacing out your children, preventing unwanted pregnancies, and reducing the risk for complicated pregnancies, family planning can improve	*Create 18 reasonable price options from 0 to a very high value in*

[25] To be addressed to both males and females of reproductive ages. It is strongly advised to have both genders of the household answer.
[26] WHO. Health Benefits of Family Planning. Family Planning and Population Division of Family Health, WHO, 1995.

	the health of your future children. When births are spaced less than two years apart, it is more likely for premature birth and low birth weights of the child – both increase the chances they could die. Additionally, family planning not only can avoid these situations, they can also improve the survival of the child before. Thinking about this, and equally considering your income and expenses, of the amounts that appear in the card, how much would be the maximum you would be willing to pay for family planning?	*local currency* _____ in local currency
5	Now think of how important having children is to you and how important the woman (if male) or your health, as well as your future and/or current children's health are to you. Family planning can lead to having smaller healthier families and reducing the economic and emotional burden of parenthood. "Families with fewer and healthier children can devote more resources to providing their children with adequate food, clothing, housing, and educational opportunities."[27] Thinking about this, and equally considering your income and expenses, of the amounts that appear in the card, how much would be the maximum you would be willing to pay for family planning?	*Create 18 reasonable price options from 0 to a very high value in local currency* _____ in local currency
Instructions: The next question will probe as to why a respondent is not willing to pay any amount for the tetanus shot benefits stated above. If "0" was provided as a value for questions 2, 3, 4 and 5, then please have the respondent answer question 6. If a value other than "0" was provided for at least one of the above questions, then question 6 should be skipped and question 7 should be asked.		
6	Why could it not be arranged for you to pay for family planning?	1= It would have to be free 2= I do not want to pay for something like this 3=I do not need it 4= I cannot afford it 5= Other, please specify _____
7	From where would you obtain money for family planning?	1=My income 2=I would borrow 3=Another source 4= Other, please specify _____

[27] WHO. Health Benefits of Family Planning. Family Planning and Population Division of Family Health, WHO, 1995.

WTP2. Closed-ended iterative bidding for family planning strategies.

Example prompt regarding the health outcome of interest, which should be altered to fit the context of the respondents at the household and the health outcome associated with the CCT- or PBF-related MCH service: **Interviewer:** Now I am going to ask you some questions to know your opinion on some measures that will improve family planning, which can allow men and women of reproductive age, to have the ability to space and limit pregnancies through contraceptives, leading to having smaller healthier families and reducing the economic and emotional burden of parenthood. "Contraceptive use reduces maternal mortality and improves women's health by preventing unwanted and high-risk pregnancies and reducing the need for unsafe abortions. Additionally, families with fewer and healthier children can devote more resources to providing their children with adequate food, clothing, housing, and educational opportunities", which can improve the health of both current and future children.[28]		
1	Would you be willing to pay A (in local currency) for family planning that will improve the ability to space your children and limit the number of pregnancies?	Yes (>>WTP2, q2) No (>>WTP2, q3) Don't Know
2	Would you be willing to pay A+B (in local currency) for family planning that will improve the ability to space your children and limit the number of pregnancies?	Yes (repeat WTP2, q2) No (>>WTP2, q4) Don't Know
3	Would you be willing to pay A–B (in local currency) for family planning that will improve the ability to space your children and limit the number of pregnancies?	Yes (>>WTP2, q4) No (>>WTP2, q5) Don't Know
4	Would you be willing to pay X+[a fraction of B] (in local currency) for family planning that will improve the ability to space your children and limit the number of pregnancies?	Yes (>> repeat WTP2, q4 with a larger fraction of B) No (>>WTP2, q5) Don't Know
5	Would you be willing to pay X– [a fraction of B] (in local currency) for family planning that will improve the ability to space your children and limit the number of pregnancies?	Yes (>>WTP2, q5 with a smaller fraction of B) No (>>WTP2, q5 with a larger fraction of B) Don't Know

WTP3. Take it or leave it for family planning strategies.

Example prompt regarding the health outcome of interest, which should be altered to fit the context of the respondents at the household and the health outcome associated with the CCT- or PBF-related MCH service: **Interviewer:** Now I am going to ask you some questions to know your opinion on some measures that will improve family planning, which can allow men and women of reproductive age, to have the ability to space and limit pregnancies through contraceptives, leading to having smaller healthier families and reducing the economic and emotional burden of parenthood. "Contraceptive use reduces maternal mortality and improves women's health by preventing unwanted and high-risk pregnancies and reducing the need for unsafe abortions. [Additionally,] families with fewer and healthier children can devote more resources to providing their children with adequate food, clothing, housing, and educational opportunities", which can improve the health of both current and future children.[29]		
1	Would you be willing to pay A (in local currency) for family planning that will improve the ability to space your children and limit the number of pregnancies?	Yes No Don't Know

[28] WHO. Health Benefits of Family Planning. Family Planning and Population Division of Family Health, WHO, 1995.
[29] WHO. Health Benefits of Family Planning. Family Planning and Population Division of Family Health, WHO, 1995.

Annex VI. Sample Questions – TEA

Health Facility Level

Note: The following sample questions model the type of questions that should be integrated into the health facility survey. It is advised that these questions be tailored to all health outcomes of interest, and it is expected that variations will occur across program sites.

TE1. Payments received at the health facility for a PBF program.

	Health Facility No. _____ Health Facility Name _____ Data Source _____ Year of Data Collection _____											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total payment received per month												
Total number of services (by type of service) produced per month. *Only for RBF-related services.*												

TE2. Sample Questions to interpret technical efficiency

TE2, Section 1. Characteristics of facility and the environment.

1. When was this facility founded?
2. Why was this facility opened here? (List up to 3 reasons)
3. Do you know how this facility compares to other facilities of similar urban or rural areas?
4. How does this facility compare to other facilities of similar urban or rural areas?
5. Have there been any district-wide changes in reporting data that has affected this facility?
6. Have there been any district-wide changes in management that has affected this facility?
7. Have there been any changes in reporting data at this facility?
8. Have there been any management changes at the facility?
9. Do you feel as though the staff at this facility are skilled enough to perform the necessary duties to function properly for the population?
10. Does this facility have difficulty paying recurrent bills (e.g. water, electricity) on time?

TE2, Section 2. For each of the groups that you serve: Most important group; 2nd most important target group; 3rd most important target group; 4th most important target group

11. What is your target population?
12. Can you estimate how many people there are in the facility's catchment area for each group?
13. How many among this group are women? (percent)
14. How many among this group are pregnant women? (percent)
15. How many among this group are children under the age of five? (percent)
16. How many among this group are children under 15 years of age? (percent)

17. How did you make these estimates?

    TE2, Section 3. Health worker burnout. *This section can be integrated into both the vignettes and community health worker questionnaire*. On a scale of 1=Never to 5=Always, how often does a health worker feel the following at work:

18. I feel tired
19. I have no energy for going to work in the morning
20. I feel physically drained
21. I feel emotionally drained
22. I feel burned out
23. My thinking process is slow
24. I have difficulty concentrating
25. I feel I'm not thinking clearly
26. I feel I'm not focused in my thinking
27. I feel I am not capable of being sympathetic to coworkers
28. I feel I am not capable of being sympathetic to patients

    TE2, Section 4. CCT or PBF scheme characteristics at the facility

29. When did this facility begin providing CCT or PBF services at this location?
30. How frequently are payments received at this facility?
31. Has there been an increase in demand after the facility began receiving payments?
32. How does the facility make decisions on how to spend payments?
33. If applicable, are doctors aware of how the PBF scheme works?
34. If applicable, are nurses aware of how the PBF scheme works?
35. If applicable, are assistants aware of how the PBF scheme works?
36. If applicable, is the laboratory staff aware of how the PBF scheme works?
37. If applicable, is the administrative staff aware of how the PBF scheme works?

    TE2, Section 5. For <u>each of the following services provided in the program</u>:

38. Have you ever provided this service in this facility? (Yes, No (<u>>>Skip to next service</u>), Don't know, N/A)
39. Do you still provide this service (Yes, No, Don't know, N/A)
40. Do you pay for any organization outside your facility to provide these services (Yes, No, Don't know, N/A)
41. In what year did you begin providing this service?
42. If "No" to q8: In what year did you stop providing this service?
43. If "No" to q8: Why did you stop providing this service? (<u>>>Skip to next service</u>)
44. If "Yes" to q8: Do you provide services here, elsewhere, or both?

    TE2, Section 6. Additional Facility Outputs

45. What services does your facility provide, not including those already recorded regarding maternal and child health interventions? (Prompt list below)
    a. Medical: Outpatient visits, inpatient days, surgeries, lab tests, diagnostic procedures (e.g. x-rays)
    b. Maternal health services: (insert types)
    c. Child health services: (insert types)
46. How often were each of these services provided in each month in the past year?
47. How often were each of these services provided in the most recent fiscal year?
    a. Most recent fiscal year _____, by quarter (1=Quarter 1, 2=Quarter 2, … , 4=Quarter 4)
    b. Most recent fiscal year _____, by month (1=Jan, 2=Feb, …, 12=Dec)

TE3. Existing questions from a sample impact evaluation that could help interpret technical efficiency

Community Health Worker Questionnaire

1. Do you receive incentives from an NGO or Ministry of Health
2. What type of incentives do you receive from the MOPH or NGO
3. Do you receive payment other than money from patients
4. Do you supervise traditional birth attendants in area?
5. How many times have you supervised all them during the past six months (cumulative visits for all TBAs)?
6. What is the number of households that you are responsible for?
7. How many households did you visit in the past month?
8. Do you have a supervisor?
9. On the last visit from supervisor did the supervisor write his or her recommendations in a supervision book that you keep?
10. What did the supervisor do when he/she came on the last visit?
11. Does your area have a community development council?
12. Which ones of the following drugs and supplies do you currently have?
13. What are the biggest difficulties that you face in doing your job?
14. In what ways has the general community supported you in the past 3 months?
15. In what ways have other CHWs in the community supported you in the past three months?
16. In what ways has the health center or NGO supported you to do your job better in the past 3 months?
17. Do you know of any CHWs who have dropped out or who have stopped working as CHWs
18. What is the reason they no longer provide service?
19. In the past 3 months has there been any incidence that made you feel threatened or afraid to continue providing services

20. Could you specify the circumstances?
21. What is the distance between the health facility and your village (in km)?
22. How much time does it usually take you to travel to the health facility?
23. How many days a week do you provide health services
24. How do they address you in the community?

Additional Questions from Community Health Worker Questionnaire

1. Questions regarding CHW satisfaction with current job, where 1=very unsatisfied and 4=very satisfied. These include working relationships, community support, availability of supplies, training opportunities, ability to meet the needs of the community, employment benefits, living accommodations, supervisor recognition of work, promotion opportunities, and overall satisfaction.
2. Questions regarding CHW motivation to work in the community, where 1=strongly disagree and 4=strongly agree, including feeling good, pride, gladness, inspiration, efficient and effective work, etc.

Health Facility Questionnaire

1. Records of if protocols are present
2. Do all facility workers have written job descriptions?
3. In the last 12 months, how many times was staff performance of this facility internally assessed?
4. In the last 12 months, how many times was staff performance of this facility externally assessed?
5. Is patient opinion obtained through client surveys or other method?
6. Is patient opinion reviewed/reported to staff?
7. In the last 12 months, have any changes occurred as a result of patient opinion?
8. In the last 12 months, how many new staff were hired?
9. In the last 12 months, how many staff resigned?
10. For the staff listed, how many positions are possible?
11. For the staff listed, how many positions are filled?
12. For the staff listed, how many positions are vacant?
13. In the last 3 months, did the Community Health Supervisors do any of the following CHW activities: participate in meetings, supervise activities, replace kits, support or provide training, collect monthly reports, etc.

Annex VII. Literature Reviews

Table 1. CCT- and PBF-related Literature Review of Programs by Country

COUNTRY Reference	DESCRIPTION
BANGLADESH **Beith 2007**	A community-based approach to the DOTS strategy that included an incentive for CHWs achieved higher detection rates than the rest of the country (90% to 82%). It is not possible to assess the contribution of RBF to this apparent improvement
BRAZIL **Lagarde 2007**	*Bolsa Alimentação* program was targeted to improve MCH among low-income populations. Mothers received capped transfers based on the number of beneficiaries in the household. Transfers were conditional on attendance at preventive health checkups and nutrition workshops for the women and adherence to vaccination schedules for children.
CAMBODIA **CORT 2007**	Performance targets were identified for MCH, and performance-based incentives were directed at health workers and health centres. Some positive impacts were reported for contracting, but none of these effects can be attributed to RBF per se and it is not possible to quantify what, if any effects RBF had.
COLOMBIA **Lagarde 2007**	*Familias en Acción* targets the poorest households in disadvantaged municipalities by providing monetary transfers to mothers on the condition that their children younger than 7 years of age attend preventive health examinations. Another transfer is available if their children aged 7-17 years attend school regularly. Mothers are also encouraged to attend health education courses.
HAITI **Eichler 2007**	NGOs reimbursed for expenditures and ones that adopted an RBF scheme (indicator data available from 5+ years). Project staff hypothesized that one of the reasons NGOs were not achieving adequate performance was due to a payment system that required transparent documents for reimbursements while not emphasizing the need for attainment of results. NGOs were expected to improve management and their information systems in response to the combined risk losing and the opportunity for the bonus. Management in turn passed some of the financial incentives on to staff as bonus schemes to motivate them. The change from 100% reimbursement-based financing with heavy demands for documenting expenditures to 95% flexible fixed price contract both reduced the burden on organizations to document expenditures and may have motivated them to use the fixed price funds more efficiently.
HONDURAS **Lagarde 2007**	*Programa de Asignación Familial* provided households (in municipalities with high prevalence of malnutrition) with access to two types of monetary incentives: one conditional on school attendance for children between 6 and 12 years of age and the other conditional on undergoing monthly preventive health examinations for children and prenatal care attendance for pregnant women.
INDIA **CORT 2007**	*Janani Suraksha Yojana* is a safe motherhood intervention for reducing maternal and neonatal mortality. Accredited Social Health Activists (ASHAs), or female honorary volunteers, receive performance-based compensation for promoting a variety of primary health care services in general and reproductive and child health services, such as universal immunization, referral and escort services for institutional deliveries, construction of household toilets, and other health care delivery interventions. Cash assistance packages are available for JSY beneficiaries (mothers and ASHAs) of interventions of which RBF is a small component. By comparison the compensation package of ASHA was for: motivation for sterilization, motivation for night delivery, directly observed therapy providers, attending bi-monthly meetings.
INDIA **Beith 2007**	In Pune, India a private provider payment scheme for referral of suspects to microscopy centers and subsequent DOTS found improvements in detection and cure rates. These findings were attributed to a variety of factors that include RBF.
KAZAKHSTAN	Monetary payment vs. hot meals vs. nurse home visit to TB patients in 20 DOTS corners in one oblast. Patients must complete treatment, but if they default, they are responsible for refunding benefits for all drugs taken. No intervention was significantly more effective; however, the combined contribution of the three interventions improved treatment success by 4.7%.
MALAWI **Lagarde 2007**	A pilot program tested whether financial incentives would increase the collection of HIV test results in rural areas
MEXICO **Lagarde 2007**	*Oportunidades* (called *Progresa* originally) aimed to improve health and education outcomes of low-income children by giving cash to households selected on socioeconomic status criteria provided that children regularly attended both school and appointments for preventive health care.
MULTI, GAVI Alliance **Oxman 2008**	The GAVI Alliance provided support to country immunization programs and continued support is conditional upon improved performance and high quality coverage data. 22 LICUS and 29 non-LICUS were included in the regression models to assess the scheme. Reward funding is contingent upon both increasing the number of children immunized with DTP3 and on achieving a verification factor of 80% on a one-time Data Quality Audi (DQA). If a country did not achieve the 80% verification factor on its DQA, it may work to improve data quality and receive reward funding if it passed a subsequent DQA. ISS investment funding was paid in instalments over three years, based on each country's self-projected number of children to be immunized with DTP3 in the first year after application. The reward funding is calculated at $20 per additional child receiving DTP3 above the number of children targeted the first year after application
NEPAL	A national incentive program promoting safe delivery in 2005 was aimed at improving uptake of maternal health services. Women were provided with cash to give birth in a health

Powell-Jackson 2009	facility, and health providers were provided with incentives for each delivery they attended in the community or health facility.
NICARAGUA **Lagarde 2007**	*Red de Protección Social* granted cash transfers to disadvantaged households in low-income areas as long as they brought their C<5 to preventive health examinations (anti-parasitic drugs, vitamins, iron supplements, vaccinations) and attended health education workshops
RUSSIA **Beith 2007**	Food parcel, hot meal, hygienic kits, and bus tickets are part of an intervention package for all TB patients in the oblast who adhere to treatment norms. Food parcel (for outpatients only), travel expenses, clothing and hygienic articles (for all patients) are provided to patients who do not interrupt treatment.
RWANDA **Soeters 2007**	Initiated PBF schemes scaled nationwide
TAJIKISTAN **Beith 2007**	Food support if provided to DOTA patients who adhere to treatment and their families who are determined to be vulnerable using criteria. Cure rates were higher for the vulnerable group that received food support.

Table 2. CCT- or PBF-related Literature Review of Programs by author

Author	Barber SL, Gertler PJ. Empowering women: how Mexico's conditional cash transfer program raised prenatal care quality and birth weight. Draft 2007.	Barber SL, Gertler PJ. Empowering women to obtain high quality care: evidence from an evaluation of Mexico's conditional cash transfer program. *Health Policy Plan* 2009; 24(1): 18-25.	Barham T. Providing a healthier start to life: the impact of conditional cash transfers on infant mortality. 2005. Available at SSRN: http://ssrn.com/abstract= 1023786.
Objective	To assess the effects of OPORTUNIDADES on quality through empowering women to insist on better care by informing them of what context to expect, and by giving them skills and social support to negotiate better care from healthcare providers.	To evaluate the impact of Mexico's conditional cash transfer program on the quality of health care received by poor women to improve birth outcomes through better maternal nutrition and use of prenatal care. Quality is measured by maternal reports of prenatal care procedures received that correspond with clinical guidelines.	To evaluate the impact of Mexico's conditional cash transfer program, PROGRESA, on infant mortality. PROGRESA is unique in that it combines two traditional methods of poverty alleviation: cash transfers and free provision of health and education services by relaxing the household budget constraints.
Methods	The data describe retrospective reports of care received from 892 women in poor rural communities in seven Mexican states. The women were participating in an effectiveness study and randomly assigned to incorporation into the program in 1998 or 1999. Eligible women accepted cash transfers conditional on obtaining health care and nutritional supplements, and participated in health education sessions.	The data describe retrospective reports of care received from 892 women in poor rural communities in seven Mexican states. The women were participating in an effectiveness study and randomly assigned to incorporation into the program in 1998 or 1999. Eligible women accepted cash transfers conditional on obtaining health care and nutritional supplements, and participated in health education sessions.	Vital statistics data to determine municipality-level, rural infant mortality rates, and panel dataset covering the period 1992-2001. The treatment effect of PROGRESA on rural infant mortality is identified using the phasing-in of the program over time in rural Mexico. Econometric model employs municipality and time-fixed effects, and includes variables associated with the program phase-in rule to control for program timing bias. Analysis also explicitly controls for changes in the supply of health care in rural areas. The identification strategy takes advantage of the face that PROGRESA was not provided in urban areas prior to 2000, and uses the urban IMR to test whether unobservable municipal time-variant variables are biasing the results.
Estimates and assumptions		Quality scores are defined as the proportion of prenatal procedures received. The criteria were developed by the Mexican Population Council, who identified aspects of evidence-based care that were considered important in this setting, and correspond with the national clinical guidelines. Whether or not the differences in quality are clinically significant is not examined.	Database lacks a sufficient sample size to measure the effect on infant mortality.
Findings	Study showed the program increased birth weight by 127.3 g and reduced the incidence of low birth weight by 4.6 percentage points, which represents a 44.5% reduction in low birth weight. Improvements in birth weight were shown to be entirely attributable to the program's impact on quality. In terms of theory, one's sense of self can affect payoffs and economic outcomes. In the case of poverty and social exclusion, if poor and minority families view themselves as undeserving and those that provide them services hold similar views, then the less well off will not fully benefit from public services such as health and education. This is the first paper to document the impact on birth weight, and to examine women's empowerment and quality of care as mechanisms.	Oportunidades beneficiaries received 12.2% more prenatal procedures compared with non-beneficiaries (adjusted mean 78.9, 95% Confidence Interval (CI): 77.5-80.3; $P < 0.001$). The Oportunidades conditional cash transfer program is associated with better quality of prenatal care for low-income, rural women in Mexico. This result is probably a manifestation of the program's empowerment goal, by encouraging beneficiaries to be informed and active health consumers.	PROGRESA led to an 11% decline in rural infant mortality among households treated in PROGRESA municipalities. Reductions are as high as 36% in those communities where, prior to program interventions, the population all spoke some Spanish and had better access to piped water. The study makes an important contribution to the literature on health impacts of cash transfer programs by investigating a different and important children's health indicator, infant mortality, compared to nutrition indicators in other studies. It is also the first study to use government administrative data to investigate outcomes of conditional cash transfer programs that could not have been studied otherwise.

Author	Bhutta ZA, Ali S, Cousens S, Ali TM, Haider BA, Rizvi A, Okong P, Bhutta SZ, Black RE. Alma-Ata: Rebirth and Revision 6, Interventions to address maternal, newborn, and child survival: what difference can integrated primary health care strategies make? *The Lancet* 2008; 372: 972-89.	Bhutta ZA, Darmstadt GL, Haws RA, Yakoob MY, Lawn JE. Delivering interventions to reduce the global burden of stillbirths for improving service supply and community demand. *BMC Pregnancy Childbirth* 2009; 9(Suppl 1): S7.	Bryce J, el Arifeen S, Pariyo G, Lanata CF, Gwatkin D, Habicht J-P, the Multi-Country Evaluation of IMCI Study Group. Reducing child mortality: Can public health deliver? *The Lancet* 2003; 362(9378): 159-164
Objective	This article systematically reviews new evidence and potentially useful interventions and delivery strategies for maternal, newborn, and child health and mortality with the potential to reduce deaths and disability.	Although a number of antenatal and intrapartum interventions have shown some evidence of impact on stillbirth incidence, much confusion surrounds ideal strategies for delivering these interventions within health systems, particularly in low-/middle-income countries where 98% of the world's stillbirths occur. Improving the uptake of quality antenatal and intrapartum care is critical for evidence-based interventions to generate an impact at the population level. This concluding paper of a series of papers reviewing the evidence for stillbirth interventions examines the evidence for community and health systems approaches to improve uptake and quality of antenatal and intrapartum care, and synthesizes program and policy recommendations for how best to deliver evidence-based interventions at community and facility levels, across the continuum of care, to reduce stillbirths.	This is the third paper in the Lancet series on child survival. The second paper in the series, published last week, concluded that in the 42 countries with 90% of child deaths worldwide in 2000, 63% of these deaths could have been prevented through full implementation of a few known and effective interventions. Levels of coverage with these interventions are still unacceptably low in most low-income and middle-income countries. Worse still, coverage for some interventions, such as immunizations and attended delivery, are stagnant or even falling in several of the poorest countries. This paper highlights the importance of separating biological or behavioral interventions from the delivery systems required to put them in place, and the need to tailor delivery strategies to the stage of health system development.
Methods	37 key promotional, preventive, and treatment interventions and strategies were identified for delivery in primary health care. Some are especially suitable for delivery through community support groups and health workers, whereas others can only be delivered by linking community-based strategies with functional first-level referral facilities.	A systematic search of PubMed and the Cochrane Library for abstracts pertaining to community-based and health-systems strategies to increase uptake and quality of antenatal and intrapartum care services. Abstracts were also sought which reported impact on stillbirths or perinatal mortality. Searches used multiple combinations of broad and specific search terms and prioritized rigorous randomized controlled trials and meta-analyses where available. Wherever eligible randomized controlled trials were identified after a Cochrane review had been published, new meta-analyses based on the original Cochrane criteria were conducted.	To review recent initiatives in child health and discuss essential aspects of delivery systems, including: need for data at the subnational level to support health planning; regular monitoring of provision and use of health services, and of intervention coverage; and the need to achieve high and equitable coverage with selected interventions.
Findings	Inclusion of evidence-based interventions in MNCH programs in primary health care at pragmatic coverage in these two countries could prevent 20-30% of all maternal deaths (up to 32% with capability for caesarean section at first-level facilities), 20-21% of newborn deaths, and 29-40% of all postneonatal deaths in children aged less than 5 years. Strengthening MNCH at the primary health care level should be a priority for countries to reach their MDG targets for reducing maternal and child mortality. Case studies of MNCH indicators in Pakistan and Uganda show how primary healthcare interventions can be used effectively.	In low-resource settings, cost, distance and the time needed to access care are major barriers for effective uptake of antenatal and particularly intrapartum services. **A number of innovative strategies to surmount cost, distance, and time barriers to accessing care were identified and evaluated; of these, community financial incentives, loan/insurance schemes, and maternity waiting homes seem promising, but few studies have reported or evaluated the impact of the widescale implementation of these strategies on stillbirth rates. Neonatal resuscitation training** for physicians and other health workers shows potential to prevent many neonatal deaths currently misclassified as stillbirths. **Perinatal audit systems,** which aim to improve quality of care by identifying deficiencies in care, are a quality improvement measure that shows some evidence of benefit for changes in clinical practice that prevent stillbirths, and are strongly recommended wherever practical, whether as hospital case review or as confidential enquiry at district or national level. Following the example of high-income countries, improving **intrapartum monitoring for fetal distress** and **access to Caesarean section** in low-/middle-income countries appears to be key to reducing intrapartum stillbirth. In remote or low-resource settings, **families and communities can be galvanized to demand and seek quality care through financial incentives and health promotion efforts of local cadres of health workers, though these interventions often require simultaneous health systems strengthening.** Effective strategies to prevent stillbirth are known; gaps remain in the data, the evidence and perhaps most significantly, the political will to implement these strategies at scale.	Community-based initiatives can extend the delivery of interventions in areas where health services are hard to access, but strengthening national health systems should be the long-term aim. The millennium development goal for child survival can be achieved, but only if strategies for delivery interventions are greatly improved and scaled-up.

Author	Bryce J, Terreri N, Victora CG, Mason E, Daelmans B, Bhutta ZA, Bustreo F, Songane F, Salama P, Wardlaw T. Countdown to 2015: tracking intervention coverage for child survival. *The Lancet* 2006; 368(9541): 1067-1076.	Chawla M, Ellis RP. The impact of financing and quality changes on health care demand in Niger. *Health Pol and Planning* 2000; 15(1): 76-84.	Countdown 2008 Equity Analysis Group. Mind the gap: Equity and trends in coverage of maternal, newborn, and child health services in 54 Countdown countries. *The Lancet* 2008; 371(9620): 1259-1267.
Objective	To present the first report of the Child Survival Countdown, a worldwide effort to monitor coverage of key child survival interventions in 60 countries with the world´s highest numbers or rates of child mortality	To assess the demand effects of a cost recovery and quality improvement pilot study conducted in Niger in 1993.	To assess equity and trends in coverage rates of a key set of interventions through a summary index, to provide overall insight into past performance and progress perspectives.
Methods	A profile was developed for 60 countries with the highest burden of child mortality in 2004 to summarize information on coverage with essential child survival interventions. Criteria for inclusion were having more than 50,000 child deaths per year (n=42) or having an annual under-five mortality rate of 90 per thousand live births or higher, or both. Progress toward MDG 4 is summarized by comparing the average annual rate of reduction in under-5 mortality in each country with that needed to achieve the goal. Profiles include a comparison of the proportions of children in the poorest and richest quintiles of the population who received six or more essential prevention interventions. Each country's progress was put into one of three groups created on the basis of international targets: on track, watch and act, and high alert. For indicators without targets, arbitrary thresholds for high, middle, and low performance across the 60 countries were used as a basis for categorization	Direct user charges and indirect insurance payments were implemented in government health care facilities in different parts of the country, and were preceded or accompanied by quality changes in these facilities. Decision-making by patients is modeled as a three-stage process of reporting an illness, seeking treatment and choice of provider; and multinomial nested logit techniques are used to estimate the parameters of the decision-tree.	Data from household surveys from 54 countries in the Countdown to 2015 for Maternal, Newborn and Child Survival initiative during 1990-2006 were used to compute an aggregate coverage index based on four intervention areas: family planning, maternal and newborn care, immunization, and treatment of sick children. The four areas were given equal weight in the computation of the index. Standard measures were applied to assess current levels and trends in the coverage gap measure by wealth quintile. The overall size of the coverage gap ranged from less than 20% in Tajikistan and Peru to over 70% in Ethiopia and Chad, with a mean of 43% for the most recent surveys in the 54 countries. Large intracountry differences were noted, with a country mean coverage gap of 54% for the poorest quintiles of the population and 29% for the wealthiest.
Estimates and assumptions	Country data on demographic indicators and MDG targets were taken from the *State of the World's Children 2006*, with the exception of the *World Health Report 2005*.	There were three stages of the decision tree: (1) the decision to report an illness; (2) the decision to seek treatment from a formal provider or healer conditional on reporting an illness; and (3) the decision to seek formal rather than informal treatment.	
Findings	Only 7 countries are on track to meet MDG 4, 39 countries are making some progress, although they need to accelerate the speed, and 14 countries are cause for serious concern. Coverage of the key child survival interventions remains critically low, although some countries have made substantial improvements in increasing the proportion of mothers and children with access to life saving interventions by as much as a ten percentage points in 2 years. Children from the poorest families were less likely than those from wealthier families to have received at least six essential prevention interventions.	Overall, the results give a reasonably favorable impression of the policy changes. In neither case is there evidence of serious reductions in access or increases in cost. Particularly notable is that despite an increase in formal user charges, the observed decline in rates of visits is statistically insignificant, suggesting the success of measures to improve quality of health care in public facilities. The observed increase in the probability of formal visits in the district with indirect payments is also striking. Both contrast with the control region of Illela, where neither user charges were introduced nor were any efforts made to improve quality. The data suggest that higher utilization of formal care, probably due to improvements in quality, outweighed the decrease in utilization that may have come about due to introduction of cost recovery, so that the net effect of the policy changes was an increase in utilization. **Quality considerations appear to be important in ensuring the long-term success of cost sharing.**	Differences between the poorest and the wealthiest were largest for the maternal and newborn health intervention area and smallest for immunization. In 40 countries with more than one survey, the coverage gap had decreased by an average of 0.9 percentage points per year since the early 1990s. Declines greater than 2 percentage points per year were seen in only three countries after 1995: Cambodia, Mozambique, and Nepal. Country inequity patterns were remarkably persistent over time, with only gradual changes from top inequity (disproportionately smaller gap for the wealthiest) in countries with coverage gaps exceeding 40%, to linear patterns and bottom inequity (disproportionately greater gap for the poorest) in surveys with gaps below 40%. Despite most Countdown countries having made gradual progress since 1990, coverage gaps for key interventions remain wide and, in most such countries, the pace of decline needs to be more than doubled to reach levels of coverage of these and other interventions needed in the context of MDG 4 and 5. In general, in-country patterns of inequality are consistent and change only gradually if at all, which has implications for the targeting of interventions.

Author	Countdown Coverage Writing Group, on behalf of the Countdown to 2015 Core Group. Countdown to 2015 for maternal, newborn, and child survival: the 2008 report on tracking coverage of interventions. *The Lancet* 2008; 371: 1247-58.	Das J, Do Q, *Özler* B. Reassessing conditional cash transfer programs. *The World Bank Research Observer* 2005: 20(1): 57-80.	de Janvry A, Sadoulet E. Conditional cash transfer programs: Are they really magic bullets? *ARE Update* 2004; 7(6).
Objective	To report on 68 countries which have 97% of maternal and child deaths worldwide, and on 22 interventions that have been proven to improve maternal, newborn, and child survival.	To survey the existing literature for the use of conditional cash transfer programs and to assess whether or not they increase investment in human capital.	To analyze Mexico's Progresa program
Methods	Countries were selected with high rates of maternal and child deaths, and interventions with the most potential to avert such deaths. We analyzed country-specific data for maternal and child mortality and coverage of selected interventions. Cause-of-death profiles; indicators of nutritional status; the presence of supportive policies; financial flows to maternal, newborn, and child health; and equity in coverage of interventions were also tracked.		
Estimates and assumptions		Two important issues may arise in the program's ability to meet the stated objective: (1) participation: first requirement for a CCT program to achieve its objective. Conceptually, the participation problem is related to the size of the transfer and the cost of the condition. (2) fungibility of the conditioned-on commodity – when individuals are able to offset the conditionality with a close substitute for the conditioned-on commodity. Conditions work successfully when individuals are forced to take actions that they would not ordinarily take on their own.	
Findings	Of the 68 priority countries, 16 were on track to meet MDG 4. Of these, seven had been on track in 2005 when the Countdown initiative was launched, three (including China) moved into the on-track category in 2008, and six were included in the Countdown process for the first time in 2008. Trends in maternal mortality that would indicate progress towards MDG 5 were not available, but in most (56 of 68) countries, maternal mortality was high or very high. Coverage of different interventions varied widely both between and within countries. Interventions that can be routinely schedules, such as immunization and antenatal care, had much higher coverage than those that rely on functional health systems and 24-hour availability of clinical services, such as skilled or emergency care at birth and care of ill newborn babies and children. Data for postnatal care were either unavailable or showed poor coverage in almost all 68 countries. The most rapid increases in coverage were seen for immunization, which received significant investment during this period. Rapid progress is possible, but much more can and must be done. Focused efforts will be needed to improve coverage, especially for priorities such as contraceptive services, care in childbirth, postnatal care, and clinical case management of illness in newborn babies and children.	Most of the empirical literature focuses on the efficiency rationale arising from mismatched interests and the equity rationale. Findings are generally positive – CCT programs often meet their stated efficiency or equity objectives. When used to induce greater investment in human capital, they do lead to increases in schooling and greater use of health resources. When used to target resources to the poor, they ensure that the poor receive more than the rich. However, there is sometimes tension between the efficiency and equity objectives. In terms of participation, Ravallion and Wodon (1999) found that under Food for Education an extra 100kg of rice increases the probability of school enrolment by more than 15% for both boys and girls. For the Female Stipend Program, Khandker et al. (2003) estimated that an additional year of participation in the program leads to a 8% increase in girls´ enrolment. Two ways to evaluate whether fungibility is a problem is to either directly estimate the program's impact on close substitutes of the conditioned-on good or to examine an outcome that depends on both the conditioned-on good and the substitutes.	The programs are effective, but they can be made more efficient by following simple rules in selecting beneficiaries and calibrating transfers for maximum response per unit of transfer. By calibrating transfers to the level needed to induce response and by targeting children according to the risk that they may not be going to school but will go with a transfer, enrolment rates would increase from 64% to 78%, a 14 percentage point gain compared to the previous 12 points. Conclusions: 1. CCTs that aim at inducing socially beneficial behavior should be regarded as contracts with recipients for the delivery of a service, not as handout programs. In this case, the fundamental objective of the conditional payment is to increase efficiency by internalizing an externality to avoid a discrepancy between private and social supply of child time to school 2. CCTs should be seen as creating price effects, not income effects through transfers 3. Efficiency gains from CCTs can be enhanced by calibrating transfers for increased participation, and by reducing leakages by focusing on cases where the conditionality will be most effective in altering behavior. 4. The rule of targeting on likelihood that a condition will be met in response to a transfer (when it would not be without) and of calibrating transfers to increase uptake is a general principle for CCT programs.

Author	de Janvry A, Sadoulet E. Making conditional cash transfer programs more efficient: Designing for Maximum effect of the conditionality. *The World Bank Economic Review* 2006; 20(1): 1-29.	Eichler R, Auxila P, Pollock J. Performance-based payment to improve the impact of health services: Evidence from Haiti. *World Bank Institute Online Journal* 2001; available at http://www.worldbank.org/wbi/healthflagship/journal/Haiti.pdf	Fernald LCH, Gertler PJ, Neufeld LM. Role of cash in conditional cash transfer programs for child health, growth, and development: an analysis of Mexico's Oportunidades. *The Lancet* 2008; 371(9615): 828-837.
Objective	To assess the use of conditional cash transfer programs, and to encourage greater efficiency through increased impact of these programs' imposed conditions on human capital formation by designing the programs' targeting and calibration rules specifically to achieve this result	To describe the marked improvements in immunization coverage and positive changes in organizational behavior in a pilot study where NGOs had the opportunity to earn back a withheld portion of a historically funded budget usually received by NGOs in Haiti. The pilot was a USAID funded health systems strengthening project awarded to the Management Sciences for Health in 1995.	Any governments have implemented conditional cash transfer (CCT) programs with the goal of improving options for poor families through interventions in health, nutrition, and education. Families enrolled in CCT programs receive cash in exchange for complying with certain conditions: preventive health requirements and nutrition supplementation, education, and monitoring designed to improve health outcomes and promote positive behavior change. Our aim was to disaggregate the effects of cash transfer from those of other program components.
Methods	Data from Progresa's randomized experiment in Mexico was used	An independent survey research firm (IHE) measured baseline and end-of-pilot performance. IHE followed the standard cluster sampling methodology recommended by WHO to sample households in each of the NGOs service areas to establish baseline measures and results for the number of immunized children. Exit interviews were used to determine the percentage of women using ORS to treat diarrhea.	In an intervention that began in 1998 in Mexico, low-income communities (n=506) were randomly assigned to be enrolled in a CCT program (*Oportunidades*, formerly *Progresa*) immediately or 18 months later. In 2003, children (n=2449) aged 24-68 months who had been enrolled in the program their entire lives were assessed for a wide variety of outcomes. Linear and logistic regressions were used to determine the effect size for each outcome that is associated with a doubling of cash transfers while controlling for a wide range of covariates, including measures of household socioeconomic status.
Estimates and assumptions	Two sources of inefficiency include paying people for what they were already going to do and offering transfers that are either too high or too low relative to the minimum amount needed to induce the conditional action.	The total population in each service area was estimated by multiplying the 1982 population by the estimated national population growth rate. This figure is very imperfect because of population mobility and urbanization.	Primary results were reported as effect size for each outcome associated with a doubling of cash transfers from the median 7500 to 15000 pesos.
Findings	Large efficiency gains can be achieved by taking into account how much the probability of a child's enrolment is affected by a conditional transfer. Rules for targeting and calibration can be made easy to implement by selecting indicators that are simple, observable, and verifiable and that cannot be manipulated by beneficiaries. The Mexico case shows that these efficiency gains can be achieved without increasing inequality among poor households.	Most striking results were the increases in immunization coverage: 14,452 out of 19,277 children under age one in the NGO service areas were immunized as a result of the performance-based payment pilot (an increase of 6,143 children in Haiti who were immunized in the pilot year as a result of the performance-based payment scheme. The proportion of mothers who reported using ORT increased in two of three NGO service areas, and the proportions of mothers who reported using ORT and did so correctly also increased significantly. Performance in prenatal visits and reducing the discontinuation rates for oral contraceptives and injectables was relatively weak. The availability of modern contraceptive methods increased substantially. The results of the pilot test indicate that performance-based payment is a powerful way to hold NGOs accountable for achieving the results. The challenge is to define indicators that relate directly to health impact, consumer satisfaction, and institutional sustainability and to measure and monitor performance in a manner that is not prohibitively costly. Countries considering implementation of performance-based payment should not underestimate the changes that will be required of both the institutions that provide health care and the paying institutions. While changes have the potential to be positive in the long run, adjustment costs should not be underestimated.	A doubling of cash transfers was associated with higher height-for-age *Z* score (β 0·20, 95% CI 0·09—0·30; p<0·0001), lower prevalence of stunting (−0·10, −0·16 to −0·05; p<0·0001), lower body-mass index for age percentile (−2·85, −5·54 to −0·15; p=0·04), and lower prevalence of being overweight (−0·08, −0·13 to −0·03; p=0·001). A doubling of cash transfers was also associated with children doing better on a scale of motor development, three scales of cognitive development, and with receptive language. These results suggest that the cash transfer component of *Oportunidades* is associated with better outcomes in child health, growth, and development.

Author	Gertler P and Boyce S. An experiment in incentive-based welfare: the impact of Progresa on health in Mexico. April 3, 2001.	Gertler P. Do conditional cash transfers improve child health? Evidence from PROGRESA's control randomized experiment. *American Economics Research* 2004; 94(2): 336-341.	Lagarde M, Haines A, Palmer N. Conditional cash transfers for improving uptake of health interventions in low- and middle-income countries: a systematic review. *JAMA* 2007; 298(16): 1900-10.
Objective	To investigate the impact of *Oportunidades* on health outcomes.	To investigate the impact of Progresa in Mexico on child health outcomes including morbidity, height, and anemia.	To perform a systematic review on the effectiveness of cash transfers conditional on certain behaviors intended to provide access to social services in low- and middle-income countries
Methods	Three sources of data were used for the analysis: (1) utilization data from the administrative records of public clinics operated by IMSS-Solidaridad, (2) a large-scale panel survey of a random sample of *Oportunidades* eligible households from control and treatment communities, and (3) baseline and follow-up surveys collected from households, where baseline surveys do not include very many health care utilization data and follow-up surveys contain extensive information. The impact of *Oportunidades* on visits to public clinics was assessed using data from administrative records of public clinics operated by IMSS-Solidaridad. A difference-in-difference model was used to estimate the impact on visits to public health clinics, controlling for area- specific characteristics and secular trends that might confound the estimated impact on visits to public facilities.	A randomized-controlled design: 320 treatment and 185 control villages were chosen in seven states for a total of 505 experimental villages. Three indicators of child health outcomes were used to assess the impact: child morbidity measured as the mother's report as to whether the child experienced an illness in the four weeks prior to the survey; height measured in centimeters (stunting); and anemia (defined as hemoglobin less than 11g/dl). Survey collected child morbidity and socioeconomic characteristics in all households in the experimental villages prior to the intervention baseline, again two months after the intervention began, and then three more times at about six-month intervals. The latter two indicators were collected in a subsample of the 505 experimental communities because of the cost of collecting these measures. Specific variables included in the model are the child's age and sex; the mother's and father's ages, years of schooling and ability to speak Spanish; and household ownership, whether the house had electricity, household income, and average male and female wage rates in the village measured at baseline. A second specification is estimated that allows the program impact to vary depending on how long the program has been operating in the village. Treatment dummies correspond to 6-month, 12-month, and 24-month exposures.	Relevant publications were identified via electronic medical and social science databases from inception to April 2006. To be included, a paper had to meet study design criteria (randomized controlled trial, interrupted time series analysis, and controlled before and after study), and include a measure of at least 1 of the following outcomes: health care utilization, health expenditure, or health outcomes. 28 papers were retrieved for assessment and 10 were included in this review.
Estimates and assumptions		A series of dummy variables were included indicating the child's age in the follow-up survey in 3-month intervals, separately for males and females. Models were estimated separately for babies born during the intervention period and for children aged 0-35 months at baseline.	
Findings	The program significantly increased utilization of public health clinics for preventive care. The program also lowered the number of inpatient hospitalizations and visits to private providers, which is consistent with the hypothesis that *Oportunidades* lowered the incidence of severe illness. Children had about a 23% reduction in the incidence of illness, a 1 to 4% increase in height, and an 18% reduction in anemia. Adults experienced a significant reduction in the number of days of difficulty with daily activities due to illness and in the number of days in bed due to illness. Adults also reported a significant increase in the number of kilometers able to walk without getting tired.	**Morbidity results:** Treatment newborns were 25.3% less likely than the controls to be reported as being ill in the previous month (alpha=0.05). The illness rate of the treatment group was 39.5% lower than the control group with 24 months of program exposure. **Anemia and height results:** Treatment children are 0.96 centimeters taller than control children and are 8.6% less likely to be stunted (though not statistically significant). Treatment children are 25.5% less likely to be anemic. The effect of the program seems to increase the longer the children stay in the program, and children born during the two-year intervention to families benefiting from the program experienced an illness rate in the first six months of life that was 25.3% lower than that of control children.	Evidence suggests that CCT programs are effective in increasing the use of preventive services and sometimes improving health status. Further research is needed to clarify the cost effectiveness of CCT programs and better understand which components play a critical role. The potential success and desirability of such programs in low-income settings, with more limited health system capacity, also deserves more investigation Further research is needed to investigate the impact of conditional cash transfer in different settings and to assess the pathways by which any effects are achieved. The methodological limitations found in existing studies emphasize the need for carefully designed evaluations. Unplanned subgroup analyses of trials can lead to spurious conclusions. **Cost-effectiveness of CCT programs compared with supply-side interventions has not been examined. Size of transfers needed in different settings requires more attention. The existence of possible threshold effects of incentives levels may lead to inefficiency because the cash transfers will either be too high or too low to induce the conditional action**

Author	*Maluccio JA, Flores R. Impact evaluation of a conditional cash transfer program: The Nicaraguan Red de Proteccion Social. Washington, DC: International Food Policy Research Institute, 2005.*	Paxson C, Schady N. Does Money Matter? The effects of cash transfers on child health and development in rural Ecuador. *World Bank Policy Research Working Paper* 4226, 2007; 15.	Powell-Jackson T, Morrison J, Tiwari S, Neupane BD, Costello AM. The experiences of districts in implementing a national incentive program to promote safe delivery in Nepal. *BMC Health Serv Res* 2009; 9: 97.
Objective	To present the main findings of a quantitiatve impact evaluation of Nicaragua´s Red de Proteccion (RPS).	To examine how one government-run cash transfer program (Bono Solidario) targeted to poor mothers in rural Ecuador influenced the health and development of their children. In this program, unlike other transfer programs that have been implemented recently in Latin America, receipt of the cash transfers was not conditioned on specific parental actions, such as taking children to health clinics or sending them to school.	Nepal's Safe Delivery Incentive Program (SDIP) was introduced nationwide in 2005 with the intention of increasing utilization of professional care at childbirth. It provided cash to women giving birth in a health facility and an incentive to the health provider for each delivery attended, either at home or in the facility. This study explored the early implementation of the program at the district-level to understand the factors that have contributed to its low uptake.
Methods	Evaluation for RPS was based on a randomized, community-based intervention with measurements before and after the intervention in both treatment and control communities. One half of the 42 comarcas were randomly selected into the program. Given the geography of the program area, however, control and intervention comarcas are in some cases adjacent to each other	Random assignment at the parish level is used to identify the program's effects. Two separate randomized experiments were conducted. Six provinces were selected for the study, and parishes making up each province were stratified into urban and rural groups. Baseline survey collected information on household characteristics and health status on 50 eligible families from each parish. Outcome measures that were collected included physical outcomes (child's hemoglobin level, height-for-age, and fine motor control); cognitive and behavioral outcomes; and community-used scale for assessing behavior problems. Maternal outcomes were measured by mother's hemoglobin levels, center for Epidemiological Studies Depression scale, maternal punitiveness and lack of warmth, and Perceived Stress Scale.	Conducted in 10 study districts, key informant interviews and focus group discussions with staff from health facilities and the district health office and other stakeholders involved in implementation. Manual content analysis was used to categorize data under emerging themes.
Findings	RPS supplemented total annual per capita household expenditures by 18% and most of this increase was spent on food. The program resulted in an average increase of 640 Nicaraguan cordobas in annual per capita food expenditures and an improvement in the diet of beneficiary households. Expenditures on education also increased significantly, though there was no discernible effect on other types of investment expenditures. RPS produced a massive average net increase in school enrolment of 13 percentage points and an even larger effect of 20 percentage points on current attendance for the target population. The number of children in grades 1-4 who advanced two grades between 2000 and 2002 increased by 7.3 percentage points, despite the fact that advancement past the fourth grade was not a formal requirement of the program. The percentage of working children aged 7-13 declined by 5.6 percentage points. An average net increase of 16% in the participation of children under age 3 in a health care program. Vaccination rates climbed 30% in the intervention and control areas at a time when they were decreasing in rural areas nationally; however, it was not possible to demonstrate statistically that RPS increased vaccination coverage. A decline of 5.5% in the number of stunted children.	The cash transfer program had positive effects on the physical, cognitive, and socio-emotional development of children, and the treatment effects were substantially larger for the poorer children than for less poor children. The program appeared to improve children's nutrition and increased the chance they were treated for helminth infections. However, children in the treatment group were not more likely to visit health clinics for growth monitoring, and the mental health and parenting of their mothers did not improve.	Problems at the central level imposed severe constraints on the ability of district-level actors to implement the program. These included bureaucratic delays in the disbursement of funds, difficulties in communicating the policy, both to implementers and the wider public and the complexity of the program's design. However, some district implementers were able to cope with these problems, providing reasons for why uptake of the program varied considerably between districts. Actions appeared to be influenced by the pressure to meet local needs, as well individual perceptions and acceptance of the program. The experience also sheds light on some of the adverse effects of the program on the wider health system. The success of conditional cash transfer programs in Latin America has led to a wave of enthusiasm for their adoption in other parts of the world. However, context matters and proponents of similar programs in south Asia should give due attention to the challenges to implementation when capacity is weak and health services inadequate.

Author	Rawlings LB, Rubio GM. Evaluating the impact of conditional cash transfer programs. *The World Bank Research Observer* 2005; 20(1): 29-55.	Soeters R, Habineza C, Peerenboom PB. Performance-based financing and changing the district health system: experience from Rwanda. *Bull World Health Organ* 2006; 84(11): 884-9.
Objective	To review six conditional cash transfer programs aimed at improving children's human capital: Mexico's Progresa, Colombia's Families in Action, Honduras' Family Assistance Program, Jamaica's Program of Advancement through Health and Education, Nicaragua's Social Protection Network, and Turkey's Social Solidarity Fund.	To describe the experience with performance-based contractual relationships in Cyangugu province, Rwanda, and the changes that were made in the organization of the district health system to facilitate the process.
Methods	In health and nutrition, the evaluations included a wide range of health care utilization and quality indicators. Program variations in target population are reflected in the diverse selection of child, maternal, and adult health indicators. Child health indicators typically include vaccination coverage, malnutrition rates, incidence of diarrhea, and participation rates in child growth and development monitoring. Maternal health indicators include utilization rates and satisfaction with pre- and postnatal care. Honduras's PRAF evaluation is measuring final program impacts by analyzing changes in maternal and infant mortality. Evaluation of Oportunidades takes advantage of the proxy-means test used for beneficiary selection to construct a comparison group from households that applied to the program but were not selected because they fell above the cutoff point. A second comparison group will be drawn from eligible households in nonintervention areas, selected through propensity score matching techniques. The evaluation of Turkey's SSF anticipates a quasi-experimental design using panel data with a baseline and two follow-up measures, as well as a qualitative study. Data from the first follow-up survey – to be conducted about 1 yr after the program begins – will be used to assess poverty targeting, short-term welfare impacts, changes in utilization of health and education services, and stakeholder perspectives. New methodologies are being tested. Program pilots include only a process evaluation, reserving IE for the full-scale program. The second generation of CCT programs relies on quasi-experimental design.	Two household surveys were conducted in January 2003 and October 2005 in Cyangugu province and of a World Bank study conducted in 2005 in four provinces of Rwanda.
Estimates and assumptions	Many questions remain unanswered, including the potential of conditional cash transfer programs to function well under different conditions, to address a broader range of challenges among poor and vulnerable populations, and to prevent the intergenerational transmission of poverty.	
Findings	Evaluations have found improvements in child health and nutrition. The Progresa evaluation shows a significant increase in nutrition monitoring and immunization rates. Econometric estimates from diff-in-diff models accounting for individual fixed effects found that children 0-2 years old participating in Progresa increased their growth monitoring visits 25-60 percent with respect to the baseline value of 0.22 visits during the previous month. Progresa also lowered illness rates for the same group of children by 4.7 percentage points (Gertler 2000). The data also suggest that Progresa has had a significant impact on child growth, lowering the probability of child stunting or children ages 12-36 months (Behrman and Hoddinott 2000). In Colombia's FA the proportion of children under age 6 enrolled in growth monitoring rose 37 percentage points. The incidence of acute diarrhea in children under age 6 was reduced by 10 percentage points in urban areas, but there was no significant change in rural areas. The study applied various measures of malnutrition to children under age 6 and detected no impact on global or acute malnutrition in any of the program areas. It did find a positive impact on weight-for-height and weight-for-age in rural areas though not in urban areas (Attanasio et al. 2003). Nicaragua's RPS program generated similar improvements. After several months of program operation, more than 90% of children in RPS areas participated in nutrition monitoring compared with 67% in control areas (compared to 60% of children under age 3 participating in nutrition monitoring before the program). Rates of timely immunization among children 12-23 months old rose by 18 percentage points in the treatment group compared with the control group (IFPRI 2002b).	Out-of-pocket health expenditure decreased by 62% from US$9.05 to US$3.45. The percentage of residents declaring that user fee payments had been "catastrophic" decreased from 2.5% in 2003 to 0.7% in 2005. The proportion of women delivering in a health facility increased from 25% to 60%. The increase in family planning coverage might have contributed to the decrease in demographic pressure as the result of overpopulation and hardship at the household level in a politically volatile region of Africa. Conclusions: Performance-based financing is a feasible strategy in sub-Saharan Africa. It requires at least one new actor, an independent well-equipped fundholder organization in the district health system separating the purchasing, service delivery as well as regulatory roles of local health authorities from the technical role of contract negotiation and fund disbursement. In Rwanda, local community groups, through patient surveys, verified the performance of health facilities and monitored consumer satisfaction. A precondition for the success of performance-based financing is that authorities must respect the autonomous management of health facilities competing for public subsidies. These changes are an opportunity to redistribute roles within the health district in a more transparent and efficient fashion.

Table 3. Literature Review – Maternal and Child Health – Costing Analyses

Author	Borghi J, Bastus S, Belizan M, Carroli G, Hutton G, Fox-Rushby J. Costs of publicly provided maternity services in Rosario, Argentina. *Salud Publica de Mexico* 2003; 45(1): 27-34.	Borghi J, Ensor T, Somanathan A, Lissner C, Mills A, on behalf of The Lancet Maternal Survival Series steering group. Mobilising financial resources for maternal health. *The Lancet* 2006; 368(9545): 1457-1465.
Objectives	To estimate the costs of maternal health services in Rosario, Argentina	To consider how financial resources can be channeled to maternal health within countries, examining the limitations and successes of conventional financing mechanisms as well as some alternative methods in providing quality of care and ensuring access to the poor.
Methods	A high complexity referral hospital, a general hospital, and two health centers in Rosario City were selected for the study of provider costs. The criteria for site selection were that the number of hours per week allocated to antenatal visits and the number of monthly visits be representative of the district average. The costs of outpatient antenatal care were evaluated from the provider and patient perspectives. Data on costs were collected, and financial and economic costs were estimated and classified according to recurrent and capital inputs. The direct out-of-pocket treatment costs to women associated with antenatal care were considered, as well as the indirect, opportunity cost of travelling and waiting time. Average costs of services to the provider were estimated using a top-down approach. Services were classified as directly related to maternity care or as 'support' or shared services, which contribute to the functioning, rather than the provision, of health care. A questionnaire was used to measure women's costs. Salaries were scaled up to between 1.5 to 4 times the baseline level to reflect the differential between the public and the private sectors. A sensitivity and threshold analysis were performed.	Search strategy encompassing maternal, neonatal, and financing was performed in PubMed, Popline, Embase, UBSS, Paho, and Lilacs from 1990 to 31 July, 2004.
Estimates and assumptions	In Argentina, public hospitals provide the full range of routine outpatient and inpatient maternity services and deal with obstetric complications, while the health centers provide outpatient antenatal care alone. 95% of women deliver with trained personnel in health facilities and attend at least one antenatal visit, while the recommended national average is four antenatal care visits. The provider cost of maternity services in Argentina is driven by staff salaries, which contribute to between 72-94% of total costs.	Most countries have at least three mechanisms for financing maternal health services. Usually, there is a principal financing mechanism, such as tax revenue, or social health insurance, combined with user charges (both formal and informal), together with supplementary community financing for specific services and components of the health system. In most low-income countries, the funding for maternal health care is shared between government (through tax revenue) and households.
Findings	The average cost per hospital day is $114.62. The average cost of a caesarean section ($525.57) is five times greater than that of a normal vaginal delivery ($105.61). A normal delivery costs less at the general hospital and a c-section less at the maternity hospital. The average cost of an antenatal visit is $31.10. The provider cost is lower at the health centre than at the hospital. Personnel accounted for 72-94% of the total cost and drugs and medical supplies between 4-26%. On average, an antenatal visit costs women $4.70. Direct costs are minimal compared to indirect costs of travel and waiting time. These results suggest the potential for increasing the efficiency of resource use by promoting antenatal care visits at the primary level. Women could also benefit from reduced travel and waiting time. Similar benefits could accrue to the provider by encouraging normal delivery at general hospitals, and complicated deliveries at specialized maternity hospitals.	Coverage of cost-effective maternal health services remains poor due to insufficient supply and inadequate demand for these services among the poorest groups. Households pay too great a share of the costs of maternal health services, or do not seek care because they cannot afford the costs. Available evidence creates a strong case for removal of **user fees** and provision of universal coverage for pregnant women, particularly for delivery care. To be successful, governments must also replenish the income lost through the abolition of user fees. When insurance schemes exist, maternal health care needs to be included in the **benefits package**, and careful design are needed to ensure uptake by the poorest people. **Voucher schemes** should be tested in low-income settings, and their costs and relative cost-effectiveness assessed. Further research is needed on methods to target **financial assistance for transport and time costs**. Current investment in maternal health is insufficient to meet MDG 5, and much greater resources are needed to scale up coverage of maternal health services and create demand. Existing global estimates are too crude to be of use for domestic planning, since resource requirements will vary; budgets need first to be developed at country-level. Donors need to increase financial contributions for maternal health in low-income countries to help fill the resource gap. Resource tracking at country and donor levels will help hold countries and donors to their commitments

Author	Bryce J, Black RE, Walker N, Bhutta ZA, Lawn JE, Steketee RW. Can the world afford to save the lives of 6 million children each year? *The Lancet* 2005; 365(9478): 2193-2200.	Caldes N, Maluccio JA. The cost of conditional cash transfers. *J of Intl Dev* 2005; 17(2): 151-168.
Objective	To estimate the additional annual running costs for universal delivery of the child survival interventions capable of preventing 6 million annual deaths among C<5 in the 42 countries accounting for 90% of deaths. Estimates the costs of child survival service provision after a successful scale up to coverage.	To outline and implement a replicable methodology for a disaggregated cost analysis of a pilot conditional cash transfer program in Nicaragua (RPS, background available in the article), examining the administration and private costs associated with a one-unit transfer to a beneficiary – referred to as the cost-transfer ratio (CTR), including what to include as costs and how to measure them; what to include as transfers and how to measure them. This article also explores not only how much is spent on total administration, but also how those administrative resources are used.
Methods	All possible delivery methods were based on a (1) temporal dimension, indicating whether the intervention is delivered during pregnancy and in the early neonatal period (the first week after childbirth) or at a later time and (2) coverage dimension, reflecting whether a child or mother is currently receiving the intervention. All child survival interventions shown to reduce mortality from the major causes of death in children younger than 5 years were incorporated into a delivery timetable comprised of 18 contacts between a child or mother and a health-care provider in the period from before birth until the child reaches 5 years. The running costs of delivering the interventions at universal coverage levels were calculated as the sum of unit costs for drugs and materials, delivery costs, and program management and support costs, including supervision. We estimated the cost of providing interventions at coverage levels reported for 2000 and the additional costs of providing services at universal coverage levels. Coverage estimate were obtained from UNICEF's ChildInfo website (www.childinfo.org)	Delineation of program activities by categorizing activities to fixed or variable costs (information came from program's accounting records). For programs spanning a number of years, inflation and depreciation were factored. Association of program accounting costs with program activities. Where possible, line-item accounting costs were assigned to activities, resulting in "directly assignable costs" and "indirectly assignable costs" (the latter, shared costs were allocated across several programs via time-allocation matrix)
Estimates and assumptions	Model assumed that coverage with basic effective interventions were universal (i.e. delivered to all children who need them), and fewer children would need hospitalization after the 23 prevention and treatment interventions were universally available. Estimates are based on the integrated delivery schedule, since parallel delivery of the same interventions would be more costly. Costs include all interventions with proven efficacy for the major causes of death and have been calculated based on country-specific epidemiological profiles. Exclusively, costs are focused on provider costs.	It is important to note that it would be incorrect to interpret the CTR either as a measure of overall cost effectiveness of the program or as a cost-benefit ratio. CTR is interpreted only as a measure of cost efficiency. - the average wage of individuals in each activity is the same (true if there were an identical mix of personnel of different skill and salary levels working in each activity - the average use of other inputs is the same in each activity (e.g. computer time, transportation, furniture, and other overhead)
Findings	US$5.1 billion in new resources is needed annually to save 6 million child lives in the 42 countries responsible for 90% of child deaths in 2000. This cost represents $1.23 per head in these countries, or an average cost per child life saved of $887. Sensitivity analyses for salary levels for community delivery agents, drug costs, and coverage rates for 2000 were used to develop uncertainty estimates around the US$ 5.1 billion annual price tag that range from about $3.1 billion to $8.0 billion. Achieving the MDG for child survival is affordable for donors and developing countries. Scaling up health delivery is the challenge, and, along with the lack of funds, will be the limiting factor in reducing child mortality by two-thirds by 2015.	The CTR for the pilot was 0.629 – the cost to deliver one unit of transfers to a beneficiary. This overall average masks a sharp decline over time. CTR in the first year was quite high (2.5) since transfers only started at the end of 2000 and the program was undertaking a lot of its initial fixed investment. In the latter two years, it declined to less than 0.5, reflecting the declining importance of fixed costs and the increasing transfers. (i.e. an ongoing program requires approximately 50 cents in administration costs for every dollar of current benefit delivered). The CTR demonstrates that the usual approach to assessing cost efficiency can be misleading, since very different numbers emerge when a program is dissected by stages of development. In RPS, ongoing costs were halved when fixed costs were excluded. It is also important that complex programs such as CCT have costs associated with specific design features, e.g. inducing changes in beneficiary behavior.

Author	Caldes N, Coady D, and Maluccio JA. The cost of poverty alleviation transfer programs: A comparative analysis of three programs in Latin America. *World Development* 2006; 34(5): 818-837.	Ensor T, Ronoh J. Effective financing of maternal health services: A review of the literature. *Health Policy* 2005; 75(1): 49-58.	Johns B, Sigurbjörnsdóttir K, Fogstad H, Zupan J, Mathai M, Edejer TTT. Estimated global resources needed to attain universal coverage of maternal and newborn health services. *Bulletin of the World Health Organization*, 2007, 85(4): 256-263.
Objective	To propose and implement a replicable methodology for a detailed, comparative analysis of the level and structure of costs or three similar poverty alleviation programs in Latin America: Progresa in Medico, PRAF in Honduras, and the pilot RPS in Nicaragua.	To review the existing evidence of financing on equity (individual's ability to finance the costs of service – equity and cost sharing) and incentives (on both provider and consumer behavior). To discuss some of the main implications for maternal health and ways in which financing mechanisms might be extended in the future to make them more responsive to the needs of safe motherhood.	To estimate the amount of additional resources need to scale up maternal and newborn health services within the context of the MDGs, and to inform countries, donors, and multilateral agencies about the resources needed to achieve these goals.
Methods	Information on program costs originated typically from program's accounting records. Since PRAF and RPS both contain demand- and supply-side transfers, the sum of these is used to calculate the total transfer in the denominator of the CTR. Focus groups and key informant interviews with program officials and staff informed the preparation of a timeline of important activities: **program design and planning; identification of beneficiaries; incorporation of beneficiaries; delivery of demand transfers; delivery of supply transfers (and services); conditionality; monitoring and evaluation; external evaluation.**		A costing model based on WHO's clinical guidelines was used to estimate the incremental resource needs for maternal and newborn health care in 75 countries. The model estimated the costs for care during pregnancy, childbirth, the neonatal period, and the postpartum period, as well as the costs for postpartum family planning and counseling, abortion and post-abortion care. Program-level costs were also estimated. An ingredients-based approach, with financial costs for the years 2006 to 2015 as the output, allowed estimates to be made of country-specific and year-specific populations, unit costs and scale-up rates. Two scenarios using different scale-up rates were used (moderate and rapid).
Estimates and assumptions	Transfers are targeted to poor areas and to poor households within those areas, conditioned on households investing in the nutrition, health, and education of their children. The three programs have important differences in size, coverage, stage, services, program costs, etc.		A health-system constraint index was created to reflect the strength of the countries' health systems in relation to service requirements for maternal and newborn health care. The indicator 'percentage of births attended by skilled health personnel in a health facility' was determined to be the most suitable baseline indicator for the ability to scale up (reflects the need for improvements in quality), and the countries were divided into four categories based on this indicator.
Findings	For Progresa, the average CTR for the program to end 2000 is 0.106 (10.6 cents were spent on administrative costs for every dollar transferred to households). Annual CTR decreases rapidly over four years (1.342 in the first year and 0.054 in 2000). For PRAF, the average CTR is 0.499, and annual CTR declines from 0.959 to 0.305 between first and second years. For the pilot RPS, the program average CTR is 0.629. Examining CTR separately for each year sheds light on the relative importance of fixed and variable costs over time. Annual CTR should decrease over time because fixed costs are no longer expended and total transfers increase at a rate much faster than costs.	**User fees** have a negative impact on normal admissions and one study in Nigeria found that it appeared to lead to an increase in maternal deaths. Introducing user charges for services that either brings delivery care closer to homes or speed up the referral process could have both a positive impact on utilization of services and a minimal negative impact on patterns to use across households. Few schemes make provision for **transport costs**, though they represent 50% of the direct costs The success of **insurance schemes** depends on the structure of taxation or premium collection. Concerns for **incentives** on the consumer side raises the concern that upfront payments are required when a patient is ill when tends to encourage delays in treatment, and on the producer side, the key concern is that services remunerated for each procedure performed tend to encourage more and excessive treatment than those, such as case based or package payments. Households appreciate funding mechanisms that reduce uncertainty	The results show that a minimum yearly average increase in resources of US$3.9 billion is needed, although annual costs increase over the time period of the model. When more rapid rates of scale-up are assumed, this minimum figure may be as high as US$5.6 billion per year. The 10-year estimated incremental costs range from US$39.3 billion for a moderate scale-up scenario to US$55.7 billion for the rapid scale-up scenario. These projections of future financial costs may be used as a starting point for mobilizing global resources. Countries will have to further refine these estimates, but these figures may serve as goals towards which donors can direct their plans. Further research is needed to measure the costs of health system reforms, such as recruiting, training, and retaining a sufficient number of personnel.

Author	Ogunbekun I, Adeyi O, Wouters A. Costs and financing of improvements in the quality of maternal health services through the Bamako Initiative in Nigeria. *Health Policy and Planning* 1996; 11(4): 369-384.	Prata N, Greig F, Walsh J, West A. Ability to pay for maternal health services: what will it take to meet WHO standards? *Health Policy* 2004; 70(2004): 163-174.	Stenberg K, Johns B, Scherpbier WR, Edejer TTT. A financial roadmap to scaling up essential child health interventions in 75 countries. *Buletin of the World Health Organization,* 2007, 85(4):305-314.
Objective	To assess the quality of maternal health care in public health facilities in Nigeria and to identify the resource implications of making the necessary quality improvements.	To predict *safe motherhood* service utilization in a low-'income country (Tanzania), if the WHO recommended standard level of mother-baby package is provided, and how much can we expect households to contribute in these expenses if the MBP is implemented. Tanzania has a GDP US$280 (2002), and the maternal mortality ratio is estimated at 530 per 100,000 births. Total expenditures on health represent 1.3% GDP.	To estimate the additional resources required to scale up interventions to reduce child mortality and morbidity within the context of MDG 4.
Methods	Locally defined norms were used to estimate resource requirements for improving the quality of maternal health care. Data for the study were obtained from three out of 47 LGAs implementing the Bamako Initiative program in Nigeria as of June 1993. To determine specific baseline characteristics, each LGA's health facilities were screened. Detailed inventories of resources were checked (number and functional state of medical equipment and vehicles, quantities of drugs and supplies, number and cadre of staff along with the proportion of working time devoted to maternal care services); in-depth interviews on management and financing of PHC services; focus group discussions with health district supervisors and the members of the district health committee; budget and revenue data collection	Data came from the 1993 Living Standard Measurement Survey containing responses from 757 women of reproductive age who have had a birth in the past 12 months. Current spending on maternal health care (subdivided into three components: price paid for visit, price of the supplies, and price paid with transportation to and from the facility used) was estimated for different socio-economic groups and its share in relation to total household expenditures. Logistic regression analysis was used to examine the effect of prices paid for maternal health care on the likelihood of using antenatal and safe delivery services, controlling for relevant socio-economic and demographic factors.	A costing model was developed to estimate the financial resources needed in 75 countries to scale up priority interventions that address the major causes of mortality among C<5, including malnutrition, pneumonia, diarrhea, malaria and key newborn causes of death such as sepsis. Pre-existing models developed by WHO's department of immunization, vaccines and biological and the Roll Back Malaria Partnership were used to assess costs for immunization and malaria interventions. Additionally, costs for antiretroviral prophylaxis and replacement feeding were assessed using the resource needs model developed by Constella Futures (Futures Group). Calculations were made using bottom-up and ingredients-based approaches. This allowed financial costs to be estimated for each intervention, country, and year.
Estimates and assumptions	A locally acceptable standard process for the delivery of antenatal care and intrapartum care was agreed upon. Resource norms which correspond to the standard process were identified. The incremental costs (fixed and variable) needed to achieve the resource norms were estimated by recording the differences between actual and desired levels of resources. Analysis was conducted sing a variety of scenarios.	Standard costs of providing maternal health care services were calculated using the mother-baby package standard costing model in the Ugandan safe motherhood costing study by the WHO. These costs are considered to be the lower bound of the cost of implementing standard level of care in low-income countries.	Costs reflect WHO guidelines on inputs and delivery strategies and encompass the delivery of interventions at community and facility levels. These costs also include program-specific investments needed at national and district levels. It was assumed that no major changes to the health system were made, and a simplified model was used that allowed for the delivery of interventions within existing (non-financial) constraints.
Findings	Revenue generation from health services is poor and appears to be more related to inadequate supply of essential drugs and consumables than to the use of uneconomic fee scales. There is a potential disadvantage to introducing and/or increasing user fees without immediate quality improvements that are visible to clients. When increased fees were accompanied b visible improvements in the quality of care, service utilization increased, especially for the poorest segments of the population.	If the MBP recovered 100% of its costs, most of the households would have to allocate more than half of their annual consumption on maternal health care. Poor socio-economic groups would experience the greatest increase in service utilization if MBP care were subsidized. Subsidies should be targeted according to socio-economic group, in order to attain equitable and sustainable maternal health services	The scale-up scenario predicts that an additional US$52.4 billion will be required for the period 2006-2015. This represents an increase in total per capita health expenditure in the 75 countries of US$0.47 in 2006. This is projected to increase in US$1.46 in 2015. Projected costs in 2015 are equivalent to increasing the average total health expenditure from all financial sources in the 75 countries by 8% and raising general government health expenditure by 26% over 2002 levels. The latest data available at the time of the study were for 2002. The scale-up scenario indicates that countries with weak health systems may experience difficulties mobilizing enough domestic public funds. While the results are approximate estimates, they show a substantial investment gap that low- and middle-income countries and their development partners need to bridge to reach MDG 4.

Table 4. Literature Review – Maternal and Child Health – Cots-benefit Analyses & Willingness-to-pay Analysses

Author	Alderman H, Lavy V. Household responses to public health services: cost and quality tradeoffs. *The World Bank Research Observer* 1996; 11(1): 3-22.	Bärnighausen T, Liu Y, Zhang X, Sauerborn R. Willingness to pay for social health insurance among informal sector workers in Wuhan, China: a contingent valuation study. *BMC Health Services Research* 2007; 7: 114.
Objective	To describe the types of health services for which households indicate they are willing to pay increased fees, and to indicate the potential gains from improving these services, as well as the consequences of moving faster on cost recovery than on providing improved or better-targeted services.	To assess the maximum WTP for **basic health insurance (BHI)** among informal sector workers, including unregistered rural-to-urban migrants, in Wuhan City, China. Most of the about 140 million informal sector workers in urban China do not have health insurance. A 1998 central government policy leaves it to the discretion of municipal governments to offer informal sector workers in cities voluntary participation in a social health insurance for formal sector workers, the so-called 'basic health insurance'.
Methods	Recent research is reviewed which asks whether consumers will take advantage of higher-quality health services if out-of-pocket payments are increased, as well as the kinds of improvements that matter most to consumers, particularly low-income consumers, and whether complete cost recovery for these improvements is possible.	Respondents were selected in a two-stage self-weighted cluster sampling scheme.
Findings	The interest is to not merely guide cost recovery for a system of delivery but to find out, first, how policy changes affect that system's contribution to public health and, second, which services affect two indicators of community health – anthropometric measures of the nutritional status of children and child mortality rates. Despite the evidence that consumers are willing to pay more for better health care, price increases have measurable consequences for indicators of health, in part because quality improvements do not always match price movements, and in part because the poor cannot afford to take advantage of quality improvements without additional support. One study in Cameroon found that when drugs became available at a local health centre, the increase in the value of the service far outweighed the fee charged compared with the time, transportation and treatment costs formerly borne by the patient, and thus the number of people treated rose. Households in Ghana were most willing to pay 2.6 percent of their monthly income to reduce the distance (or travel time) to the nearest clinic by half. Additionally, households will pay smaller amounts to ensure that childcare and immunization and laboratory services are available and to double the number of doctors and nurses. More importantly, they are willing to pay more for combined and simultaneous quality improvements than the sum of the discrete improvements. The price a household in Ghana will pay for a given quality of health care increases with income. These are combinations of prices and quality that will be chosen by the average consumer, yet deemed unaffordable by the poor. In some cases, the poor have been shown to take greater advantage of simultaneous increases in health care quality (drug availability) and fees than have the wealthy. In this population, the demand for quality is so high that if the availability of drugs and services and the physical condition of public facilities were improved by 100 percent, the percentage of individuals choosing treatment in a public clinic would not decline unless prices were raised by more than 1,200 percent.	On average informal sector workers were willing to pay substantial amounts for BHI (30 Renminbi (RMB), 95% confidence interval (CI) 27-33) as well as substantial proportions of their incomes (4.6%, 95% CI 4.1-5.1%). Average WTP increased significantly when any one of the copayments of the BHI was removed in the valuation: to 51 RMB (95% CI 46-56) without reimbursement ceiling; to 43 RMB (95% CI 37-49) without deductible; and to 47 RMB (95% CI 40-54) without coinsurance. **WTP was higher than estimates of the cost of BHI based on past health expenditure or on premium contributions of formal sector workers**. Predicted coverage with BHI declined steeply with the premium contribution at low contribution levels. When equity weighting was applied in the aggregation of individual WTP values in order to adjust for inequity in the distribution of income, mean WTP for BHI increased with inequality aversion over a plausible range of the aversion parameter. Holding other factors constant in multiple regression analysis, for a 1% increase in income WTP for BHI with different copayments increased by 0.434-0.499% (all $p < 0.0001$), and for a 1% increase in past health care expenditure WTP increased by 0.076-0.148% (all $p < 0.0004$). Being male, a migrant, or without permanent employment significantly decreased WTP for BHI. Education was not a significant determinant of WTP for BHI. From a normative perspective, BHI for informal sector workers is likely to increase social welfare because average WTP for BHI is significantly higher than estimates of the average cost of BHI. Informal sector workers do not value the BHI as a mechanism to recover the relatively frequent but small financial losses associated with common illnesses, but because it protects against the rare but large financial losses associated with catastrophic care. From a behavioral perspective, our results predict that at a price equal to the average premium contribution of formal sector workers 35% of informal sector workers will enrol in the BHI. Subsidies and changes in insurance attributes (e.g. including catastrophic care and portability) should be effective in increasing BHI coverage. Coverage should expand with rising incomes among informal sector workers in China. Finally, adverse selection will be unlikely to be a large problem, if the BHI is offered to informal sector workers.

Author	Borghi J. Aggregation rules for cost-benefit analysis: a health economics perspective. *Health Econ* 2007; 17(7): 863-875.	Borghi J, Jan S. Measuring the benefits of health promotion programs: application of the contingent valuation method. *Health Policy* 2008; 87(2): 235-48	van der Pol M, Shiell A, Au F, Jonhston D, Tough S. Eliciting individual preferences for health care: a case study of perinatal care. *Health Expect* 2009; [Epub ahead of print].
Objective	To provide an overview of aggregation methods, to review current evidence of practice in the health sector, and to present estimates of the total economic value of a women's group program to improve mother and newborn health using different aggregation rules. Few willingness-to-pay (WTP) studies in the health sector have used their results within a cost-benefit analysis.	To explore the use of the contingent valuation method to value the broader benefits of a women's group program to improve maternal and newborn health in Nepal.	To demonstrate how a discrete choice experiment (DCE) can be used to elicit individuals' preferences for health care and how these preferences can be incorporated into a cost-benefit analysis.
Methods	A contingent valuation survey was conducted with 93 women's group members, 70 female non-members and 33 husbands. Aggregation was conducted with and without the values of non-users, and with different units of aggregation. The unadjusted mean, median and a weighted mean transfer were used to aggregate values. Equity weights were introduced to adjust WTP for income. A study carried out as a part of an economic evaluation of a community-based participatory intervention of women's groups convened by locally employed female facilitators with the aim of improving birth outcomes in a rural area of Nepal. A CBA was conducted and is presented as an illustrative case study of the practical issues involved in aggregating WTP values and the impact of different assumptions on final results.	Interviews were conducted with 93 women's group members, 70 women non-members and 33 men. Respondents were asked to give reasons for their WTP in terms of health and/or non-health benefits. WTP was regressed against socioeconomic and demographic variables using ordinary least squares.	A DCE which elicited preferences for three perinatal services: specialist nurse appointments; home visits from a trained lay visitor; and home-help. Cost was included to obtain a monetary measure of the value that individuals place on the services. In total, 292 women who had previously participated in a randomized trial of alternative forms of pre-natal care were interviewed.
Findings	Table 1 shows the advantages and disadvantages for the overview of aggregation methods (unadjusted sample mean, weighted mean, non-respondents have zero value, re-classifying non-respondents; OLS regression, weighted least-squares regression). Total WTP more than doubled when the values of husbands were added to that of women, and increased over 10-fold when the values of women who were not members of the group were added. The inclusion of non-use values, and the unit of aggregation, had the greatest effect on results. Researchers must reach agreement on the most acceptable method of aggregating WTP values to promote the use of WTP in resource allocation decisions in the health sector.	Seventy eight percent of respondents were willing-to-pay for the women's groups. There was no significant difference between the WTP of women's group members compared to female non-members. Men were willing-to-pay significantly more than women. WTP reflected non-health benefits in over 80% of cases. At least 11% of women attending meetings and 38% of those not attending were WTP for altruistic motives. Future research should address the relative value of non-health compared to health benefits; and motivations behind non-user values and their consistency across settings.	The most preferred service configuration consisted of three nurse appointments and two home visits before birth and 4 h of home-help per week for the first 4 weeks after birth. On average, women are willing to pay $371 for this package. A package that excluded home-help was valued at $122 whilst provision of three nurse appointments only was valued at $97. The predicted uptake of the services ranged from 37% to 93% depending on the woman's experience with the service, whether or not it was her first child and her level of education. The willingness to pay values were much higher than the costs for nurse appointments, suggesting this service produces a net social benefit. The willingness to pay for the package including both the nurse appointments and home visits only just exceeded the costs of the package, suggesting there is a relatively high chance that this package produces a net social loss.

Table 5. Literature Review – Maternal and child health – Cots-effectiveness Analyses

Author	Adam T, Lim SS, Mehta S, et al. Cost effectiveness analysis of strategies for maternal and newborn health in developing countries. *BMJ* 2005; 331: 1107.	Darmstadt GL, Bhutta ZA, Cousens S, Adam T, Walker N, de Bernis L, for the Lancet Neonatal Survival Steering Team. Evidence-based, cost-effective interventions: how many newborn babies can we save? *The Lancet* 2005; 365(9463): 977-988.
Objectives	To determine the costs and benefits of interventions for maternal and newborn health to assess the appropriateness of current strategies and guide future plans to attain the MDGs.	To identify interventions for use in low- and middle-income countries; to summarize the findings of a review of the evidence on the efficacy (implementation under ideal conditions) and effectiveness (implementation under conditions that pertain within health systems) of a wide range of potential interventions to reduce perinatal and neonatal mortality.
Methods	Analysis included 21 interventions and all possible combinations of interventions, taking into account interactions in costs or effectiveness when interventions are implemented together. Interventions were categorized according to the level of care required to deliver them (first level maternal and newborn care, referral level maternal and newborn care, community-based newborn care) and the period of implementation (antenatal, intrapartum, postpartum, newborn). Effectiveness data came from several sources, including trials, observational studies, and expert opinion.	Interventions were selected on the basis of biological plausibility and feasibility for inclusion in maternal and neonatal healthcare systems in LMIC settings with a focus on randomized control trials. The WHO Choice generalized cost-effectiveness framework allowed the comparison of interventions and programs across more than one disease area. Costs were divided into program-level costs (administration, supervision, and training) and patient-level costs (primary or referral care visits, home visits, diagnostic tests, and medicines). Physical inputs were identified from published work, consultants, and program staff; unit costs were based on country-specific estimates developed by the WHO Choice project. Medicine costs were based on off-patent drug prices, the primary source being *The International Drug Price Indicator Guide* or http://www.supply.unicef.dk/catalogue1. All costs and effects at 3%, and Intl$ will be used to account for differences in PPP across countries.
Estimates and assumptions	For resource inputs, quantities came from WHO guidelines, literature, and expert opinion, and prices from the WHO Choosing Interventions that are Cost Effective (CHOICE) database. Main outcome measures are valued as cost per DALY averted in year 2000 international dollars.	Costly, high-tech interventions, such as assisted ventilation or surfactant therapy, were not included. To estimate the numbers and proportions of neonatal deaths that could be averted, the input data for cause-specific neonatal deaths by country was based on the work of the Neonatal Group of the Child health and epidemiology reference group (CHERG). Estimates of coverage with interventions were derived from UNICEF ChildInfo data or by consensus expert opinion. Costs were calculated for current (2000) and expanded (90%) coverage of neonatal interventions in the 75 countries in the database. Initial investment costs (building new facilities and strengthening health systems' capacity and management)
Findings	The most cost effective mix of interventions was similar in Afr-E and SEAR-D. These were the community-based newborn care package, followed by antenatal care (tetanus toxoid, screening for pre-eclampsia, screening and treatment of asymptomatic bacteriuria and syphilis, community based management of neonatal pneumonia, and steroids given during the antenatal period were relatively less cost effective in SEAR-D. Scaling up all of the included interventions to 95% coverage would halve neonatal and maternal deaths Preventive interventions at the community level for newborn babies and at the primary care level for mothers and newborn babies are extremely cost effective, but the MDGs for maternal and child health will not be achieved without universal access to clinical services as well.	If all listed interventions, including situational and additional elements, were implemented at full coverage (99%), an estimated 41-72% of neonatal deaths could be averted in the 75 countries in the analysis. Implementation of the universal packages only at full (99%) coverage would avert an estimated 35-66% of neonatal deaths. Outreach is especially important early in health-systems' development, in countries with NMRs greater than 45, and as the health system develops and coverage of universal facility-based clinical care increases, the proportion of deaths averted rises to 31-61%. Also, there is a clear need for integrated management strategies to promote public-private partnerships, as well as the integration of interventions that are more high tech and costly

Author	Edejer TT, Aikins M, Black RE, Wolfson L, Hutubessy R, Evans DB. Cost effectiveness analysis of strategies for child health in developing countries. *BMJ* 2005; 10(1136): 1-6.	Evans DB, Lim SS, Adam T, Edejar TT-T, for the WHO Choosing Interventions that are Cost Effective. Evaluation of current strategies and future priorities for improving health in developing countries. *BMJ* 2005; 331: 1457-1461.	Fox-Rushby JA. Foord F. Costs, effects, and cost-effectiveness analysis of a mobile maternal health care service in West Kiang, The Gambia. *Health Policy* 1996; 35: 123-143.
Objective	To determine the costs and effectiveness of selected child health interventions – namely, case management of pneumonia, oral rehydration therapy, supplementation or fortification of staple foods with vitamin A or zinc, provision of supplementary food with counseling on nutrition and immunization against measles	To include two methods into analysis of improving health in developing countries: (1) whether or not the cost effectiveness of the existing use of resources could be evaluated at the same time as the cost-effectiveness of possible future courses of action should new resources become available (traditional CEAs usually considers future use of resources only) and (2) the incorporation of interactions between costs and effects of interventions that are undertaken simultaneously as they would be in practice.	To evaluate the cost-effectiveness of a new maternal health service in West Kiang, The Gambia from the viewpoint of government, donors, patients, and families. There was also interest from WHO in whether the service was a potential model for the provision of maternal health care in other African settings.
Methods	Nine interventions at three levels of coverage (50%, 80%, and 95%) were evaluated singly or in various combinations. Prevented cases and deaths due to pneumonia, diarrhea, and measles in the under-5 age group were converted into DALYs averted. Interventions were modeled for 10 years, after which time managers were assumed to re-evaluate their strategies. An expansion path was mapped first by comparing interventions with a scenario of doing nothing to improve child health from today. If more resources are available, the decision whether to add a new intervention or to expand the first intervention was made on the basis of the incremental cost effectiveness ratio compared with the first intervention, and this sequential comparison is continued until there are no more additional health gains. A sensitivity analysis was carried out with and without 3% discounting for DALYs and with and without age weighting.	Synergies resulting from common delivery platforms across all health goals have been added, as well as cost synergies.	A health post was chosen as comparison since maternal health care was provided almost entirely by the government with little involvement from NGOs. A broad societal viewpoint was taken so that all costs falling on the ministry of health, other agencies, and patients and families were considered. Inpatient costs were considered, because referral patterns may be altered. Daily time sheets and travel logs completed by drivers, and questionnaires to establish out-of-pocket payments by patients during pregnancy were specially collected during a 1-month period. Effectiveness was evaluated using a quasi-experimental design comparing the effect of the new service in West Kiang with the usual method of delivering maternal care Provides three scenarios chosen to reflect the differences in capacity of the health centre and health post (i.e. spare capacity available, no spare capacity, and visiting more villages)
Estimates and assumptions	Efficacy data were from published systematic reviews with meta-analysis of numerous large community based trials in several developing countries and before and after program evaluations for diarrhea control. For resource inputs, quantities came from literature and expert opinion, and prices from the WHO Choice database, with a separate specification of units of utilization and costs.	Interventions were deemed highly cost-effective if they cost less than the GDP per capita to avert each DALY and cost effective if each DALY could be averted at a cost of between one and three times the DGP per capita.	Four major areas of influence on total costs: the overhead costs of regional headquarters allocated to the program, training of other TBAs, salaries and running costs of the vehicles. Sensitivity analysis tested the rate of exchange, discount rate, life of capital goods, methods of allocating overheads, freight charges, distance travelled by vehicles and servicing/spare parts required, maternity staff input (expatriate and Gambian salaries separately) and number of TBAs/midwives trained. Does not account for reported differences in still births between the two areas, which would dramatically change the efficiency of the program.
Findings	Cost effectiveness ratios clustered in three groups, with fortification with zinc or vitamin A as the most cost effective intervention and provision of supplementary food and counseling on nutrition as the least cost effective. Between these were oral rehydration therapy, case management of pneumonia, vitamin A or zinc supplementation, and measles immunization. On the grounds of cost-effectiveness, micronutrients and measles immunization should be provided routinely to all children, in addition to oral rehydration therapy and case management of pneumonia for those who are sick. The challenge of malnutrition is not well addressed by existing interventions.	Cost-effectiveness analyses focus only on health gains associated with different uses of resources and do not incorporate other effects of concern to society.	There was a lower maternal death rate in the intervention area compared with the control area, but this was not statistically significant. The three most influential chances of assumptions were different in intervention and control. In the intervention, the most significant change was assuming the number of midwives and TBAs trained doubled (+30%). This would be important should the current program be extended to more villages. Increasing the supervision time of the principal midwife increased total costs by 14%. Assuming capital goods have a maximum life of 5 years, total annual costs increased by 15%. Doubling the kilometers travelled by trekking vehicles increased total costs by 20%.

Author	Hounton S, Sombié I, Meda N, Bassane B, Byass P, Stanton C, De Brouwere V. Methods for evaluating effectiveness and cost-effectiveness of a Skilled Care Initiative in rural Burkina Faso. *Trop Med Int Health* 2008; 13(Suppl 1): 14-24.	Jowett M. Safe motherhood interventions in low-income countries: an economic justification and evidence of cost effectiveness. *Health Policy* 2000; 53(3): 201-228.	Lagarde M, Haines A, Palmer N. Conditional cash transfers for improving uptake of health interventions in low- and middle-income countries: a systematic review. *JAMA* 2007; 298(16): 1900-10.
Objective	To assess cost-effectiveness of the Skilled Care Initiative in reducing pregnancy-related and perinatal mortality in Ouargaye district, Burkina Faso. SCI focused on two main areas to increase rates of skilled attendance by at least 10%: improving the availability and quality of maternity care, and promoting increased utilization of maternity services. Additionally, it aimed to strengthen obstetric care at the district hospital to where women with more serious complications should be referred.	To examine the economic case for investing in safe motherhood interventions. Little detailed evidence exists regarding the relative cost-effectiveness of antenatal care, post-abortion care and essential obstetric care. Despite this there is clear evidence that interventions such as substituting manual vacuum aspiration for dilatation and curettage can result in significant savings both for health facilities and patients.	To assess the effectiveness of conditional monetary transfers in improving access to and use of health services, as well as improving health outcomes, in low- and middle-income countries.
Methods	Quasi-experimental design, mixed methods and a composite of tools were used to compare mortality and severe morbidity (near-miss) of women in reproductive age, perinatal mortality, facility functionality, perceived quality of care, utilization of maternal health services, and costs borne by families and the health care system for maternal health care in Ouargaye and Diapaga districts. Structured questionnaires and interview guides were developed, pre-tested and piloted prior to the main survey. A household census was used to retrospectively assess pregnancy-related and perinatal mortality over the previous 5 years, and causes of pregnancy-related death were identified using a newly developed and tested probabilistic model for interpreting verbal autopsy data. Analyses included univariate and multivariate regressions and incremental cost-effectiveness ratios.	Reviews economic arguments for investing in safe motherhood, and examined evidence of the cost effectiveness of key interventions in the WHO mother baby package.	To be included, a paper had to meet study design criteria (randomized controlled trial, interrupted time series analysis, and controlled before and after study) and include a measure of at least 1 of the following outcomes: health care utilization, health expenditure, or health outcomes. Twenty-eight papers were retrieved for assessment and 10 were included in this review. Methodological details and outcomes were extracted by 2 reviewers who independently assessed the quality of the papers. Mean societal cost estimates per woman per arm of trials were compared using nonparametric bootstrapping methods.
Estimates and assumptions	Causes and profiles of deaths among women of reproductive age were characterized using InterVA-M, a new probabilistic model for interpreting community-based verbal autopsy. Principal cost categories were derived from the WHO guidelines for costing of health services.		
Findings	A population census covering over half a million people, three qualitative surveys and facility surveys in 47 health centers have been carried out. A partnership with key stakeholders and the use of mixed methods proved feasible for evaluating complex safe motherhood strategies, and the use of hand-held computers proved possible for direct data capture, even in this remote rural environment.	The paper estimates first that 26% of maternal deaths are avoidable through antenatal/community-based interventions, costing around 30% of the WHO Mother Baby Package; and secondly that access to quality essential obstetric care can prevent a further 48% of maternal deaths, consuming 24% of total Mother Baby Package costs. There is growing consensus that risk screening is not effective in preventing maternal mortality, although recognizing and responding appropriately to complications can make a significant impact. Three antenatal interventions are considered highly effective and include treatment of STDs, TT immunization, and treatment of anemia. Further work on the cost effectiveness of safe motherhood interventions would provide useful information for policy makers concerned with reducing maternal mortality in the most efficient manner possible.	Overall, the evidence suggests that conditional cash transfer programs are effective in increasing the use of preventive services and sometimes improving health status. Further research is needed to clarify the cost effectiveness of conditional cash transfer programs and better understand which components play a critical role. The potential success and desirability of such programs in low-income settings, with more limited health system capacity, also deserves more investigation.

Author	McIntosh E, Barlow J, Davis H, Stewart-Brown S. Economic evaluation of an intensive home visiting program for vulnerable families: a cost-effectiveness analysis of a public health intervention. *J Public Health (Oxf)* 2009; [Epub ahead of print].	Morrell CJ, Spiby H, Stewart P, Walters S, Morgan A. Costs and benefits of community postnatal support workers: a randomized controlled trial. *Health Technol Assess* 2000; 4(6): 1-100.
Objective	To evaluate the cost-effectiveness of an intensive home visiting program directed at vulnerable families during the antenatal and postnatal periods in reducing the risk of abuse and neglect in the first year of life.	To measure the effect and the total cost per woman of providing postnatal support at home, based on a Dutch model. The research hypothesis was furnished by some existing evidence that postnatal support could reduce the risk of postnatal depression and encourage breastfeeding.
Methods	The design was an economic evaluation alongside a multicentre randomized controlled trial, in which 131 eligible women were randomly allocated to receive 18 months of intensive home visiting (n = 67) or standard services (n = 64). A cost-effectiveness analysis of this public health intervention was undertaken from a societal perspective.	The randomized controlled trial aimed to measure differences in health status in a group of women who were offered postnatal support from a community midwifery support worker (SW) compared with a control group of women who were not offered this support. Women were followed-up by postal questionnaire at 6 weeks and 6 months postnatally. All women who delivered a baby at the recruiting hospital were eligible to take part in the trial if they lived within the study area, were aged 17 years or over, and could understand English. The intervention consisted of the SW offering practical and emotional support and to help women rest and recover after childbirth. The SW offered ten visits in the first 28 days postnatally, for up to 3 hours per day. The SW's activities included housework, talking with the mother, and care for the baby or other siblings. The service was provided in addition to routine visits by the community midwife.
Estimates and assumptions	A societal perspective was adopted such that costs to the health service, social services, legal costs, local authority housing costs and costs to families were included. Discount rates of 3.5% were applied where appropriate for both costs and benefits.	The primary outcome was the general health perception domain of the Short Form-36 at 6 weeks. Secondary outcomes were mean Edinburgh Postnatal Depression Scale (EPDS), Duke Functional Social Support (DUFSS) scores and breastfeeding rates. The 623 randomized women were well-matched by group with a good response to follow-up.
Findings	The mean costs in the control and intervention arms were pound3874 and pound7120, respectively, a difference of pound3246 (P < 0.000). The mean 'health service only' costs in the control and intervention arms were pound3324 and pound5685, respectively, a difference of pound2361 (P < 0.000). One of the three independent objective assessments, predictive of infant abuse and neglect, showed improvements in maternal sensitivity (P < 0.04) and infant cooperativeness (P < 0.02) in the intervention arm. There was also a non-significant increase in the likelihood of the intervention group infants being removed from the home due to abuse and neglect. The results of the study provide tentative evidence to suggest that, within the context of regular home visits, specially trained health visitors can increase maternal sensitivity and infant cooperativeness and are better able to identify infants in need of removal from the home for child protection. These potential benefits were delivered at an incremental societal cost of pound3246 per woman.	At 6 weeks there was no evidence of a significant difference between the two groups for the primary outcome. There was a non-significant trend for the control group to have better mean DUFSS and EPDS scores at 6 weeks. Breastfeeding rates were not significantly different at follow-up. At 6 months, both groups had similar health status. Satisfaction with the service was higher than for all other services received. The incremental cost of introducing the service comprised setting up and running the service. There were no differences between the groups in other resource use (general practitioner contacts, hospital services, prescriptions or medicines bought for mothers and babies) to 6-month follow-up. The total mean NHS cost to 6-month follow-up for the intervention group was pound180 per woman greater than for the control group (confidence interval, pound79.60, pound272.40). Although women valued the service, there was no evidence of any health benefit at the 6-week or 6-month follow-up, no difference in use of NHS services, and the additional cost of the service provision would be around pound 180 per woman.